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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

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Three dollars a year

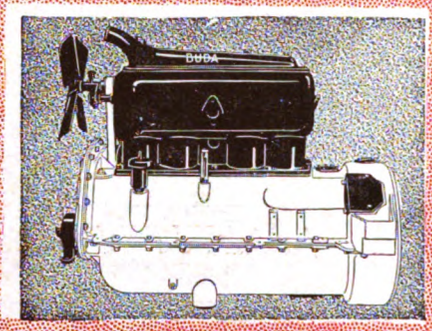


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"LET US HAVE THE FACTS"—No. 12



COOLING SYSTEMS

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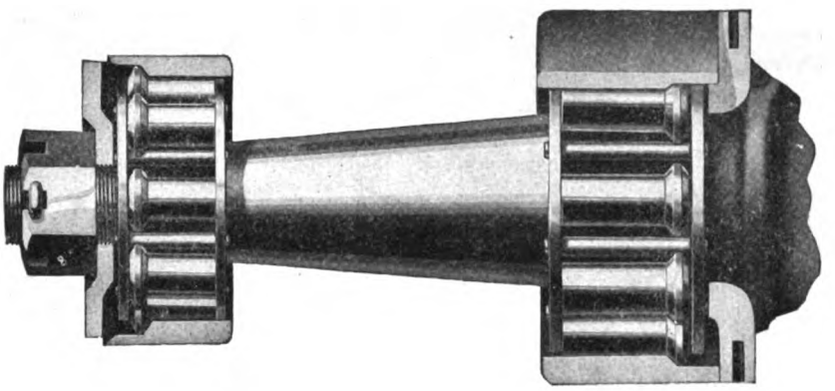
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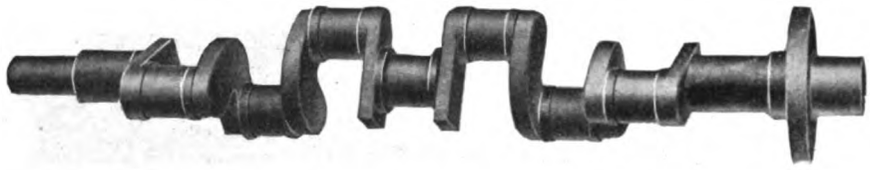
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The Automobile
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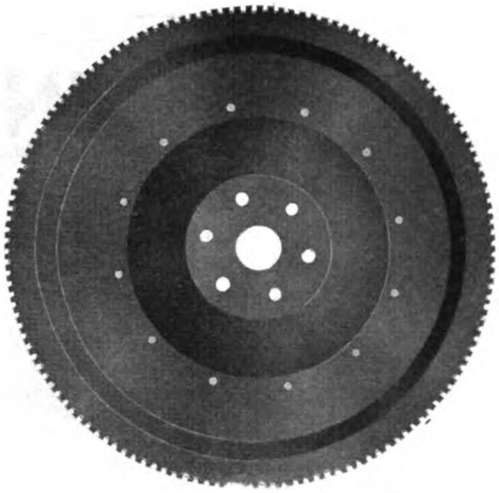
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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XXXVIII NEW YORK—THURSDAY, JANUARY 3, 1918—CHICAGO NO. 1

Efficient Transportation Demanded of Engineers

Sharp Change of Practice Necessary to Eliminate Extravagance of Wheelbase and Engine Size

By J. Edward Schipper

ENGINEERING practice in passenger car work must make a sharp change. The war has brought us face to face with a condition which normally would not have been due for 3 yrs. During these 3 yrs. we would have changed gradually to meet the new state of affairs and normal trends would have carried us through without a break. We have suddenly awakened to the fact that automobiles are not efficient and not economical just at the same time that the people have been awakened by the trumpet call of war to the fact that our daily lives and habits, whether they are concerned with transportation or what not, must be efficient and economical.

The drop in automobile sales is not only because there is not as much money to spend in this country as heretofore, but people are watching more closely the results that they are securing for money expended. People are buying transportation and not automobiles. They measure the expenditure of money for a passenger car by the standards of transportation afforded by the car they buy. They want stability, flexibility, Pullman car comfort, reliability and all the qualities that go to make up good transportation, and above all economy.

Up to the time this country entered the war the people of the United States had been noted as being the most extravagant in the world. There has been a remarkable revulsion of feeling. A wave of economy has arrived. It has exerted its influence in the clothing we wear, in the things we eat, in the places we go to and above all in our transportation. It has exerted itself in the automobiles we buy.

For example: Walk along Automobile Row in any large city and look into the windows of the used car dealers. You see a most significant thing. Big cars which in 1915 sold new for $3,000 and $4,000 are selling for $300 and $400. A depreciation of 90 per cent in 3 yr., and why? Not because the cars are not good automobiles; not because they have not good materials; not because the bodies are out of date, but simply because they are not efficient.

Change in Demand Has Arrived

The extravagance of wheelbase, the extravagance of engine size, the extravagance of fancy metal fittings all built to meet the popular clamor of a public which through the very element of national wealth thought only in extremes. Now a change has arrived. We buy only what we can use. We are no longer patient of wastefulness, our country is at war and conservation must take the place of waste. Unconsciously we have swung around a 180 deg. arc in our national psychology.

This finds the engineering profession unprepared to a large extent. It is true that efficiency in transportation has been in the mind's eye of the engineer for a long time, but he has had to build a car to suit the public as interpreted by the sales department. This is natural enough, as cars must be built to sell.

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His laboratory work and his engineering discussions have pointed out time and time again that what he would like to build and what the sales departments demand has been exemplified by the difference between sound and unsound engineering fundamentals.

The potential change in the public mind has been sensed but not realized and analyzed by the automobile sales departments, taking the industry as a whole. The drop in sales in certain cars has been interpreted in the commonplace words, "Business is bad," yet business, when transportation is being sold, is never bad. The article sold and the article demanded do not happen to fit.

There have been several clues to this situation. While the business of certain cars in the high-price class has fallen off, the business of other companies in the same field has remained almost at normal. The business of the companies selling lower-priced cars has been exceptional in certain parts of the country and in others has not dropped very seriously. In almost all territories a falling off in business has been directly traced to a tendency on the part of people who changed their cars every year or two, to keep these cars for an additional season or more. It is just another indication of the economy spirit.

Want Economical Transportation

People want economical transportation. If an article is wanted, it makes little difference what sort of a package it is wrapped in, and if the desired article of "economical transportation" comes wrapped in the shape of an automobile, it is not goingto scare away the buyers even though we are at war. Rather, with a universal tendency toward speeding up, it is going to be desired more than ever.

This brings the matter to the engineer. The sales department will quickly adjust itself to the new condition and this demand is sure to fall upon the engineer in turn. In a large measure the engineer is, as a class, prepared for it. If he has been thinking ahead 3 yrs. he is ready at least to logically analyze the problem that he has now before him.

In a large measure it cannot but be a relief to the engineering mind to feel that now a true advance is to be made in automobile engineering. It seems as if the big difficulty of the opposing demands of the public for a big car on the one hand a flexible car with plenty of get-away on the other seems to be passing away. The lesson of the used car just pointed out seems to establish that. The change has been complete even though it is not realized fully as yet by the public.

Where we have been led astray in an engineering way is quite clear. We have been what the public wanted us to be, extravagant. We have been extravagant of wheelbase, extravagant of engine size, extravagant of tonneau, extravagant from radiator to back end, simply to suit a public which asked not what kind of a car, but how much car for the money. Cars have been sold by the pound rather than by their capability of returning to the purchaser the worth of the price in good transportation.

In a great many ways it has been the fault of the industry, which has run with the tide against its better judgment. It is the industry which has led the campaign of high-gear performance, big engine displacement or horsepower, and above all, size.

From an analytical viewpoint we should focus our attention on two matters: wheelbase and displacement. Weight per inch of wheelbase can be materially reduced, it is true, by a scientific distribution of materials and by the use of the best in materials, but it is carrying space per inch of wheelbase, which in other words can also be expressed as pounds of car per pounds of passenger, that is more important. Why should a person buy a car that weighs 7 lb. per pound of passenger weight when it is possible to so design a car that performance will be better and the car weigh but 3 lb. per pound of passenger on a five-passenger car? It must be necessary to show a great gain in comfort or other features before it seems right to take a man's money for a product.

Wasteful Wheelbase

We have been wasteful of wheelbase because we have not economically used space. Every inch of unnecessary wheelbase means unnecessary weight. This in turn requires gasoline, oil and tire upkeep. One typical medium-priced car was shortened 7 in. in wheelbase 3 months ago. The car has equally as much room in the tonneau and 2 in. more room in the front compartment. This is one example of what can be done. It is not necessary to sacrifice space, but to utilize it.

We demand acceleration: To get it with a heavy car means that we must add weight to the engine and this again takes more of all the factors that work against economy. Why is there no real high-priced car on the market with a wheelbase around 112 in? Because the public would expect to see a big car for that money. This condition is going to change. The public is going to demand a car in which it can be shown that every dollar spent brings its return in car value either in direct transportation ability or in comfort. The public is willing to pay for its extra comfort and convenience when it travels by automobile in just the same way that it will pay for its extra comfort and convenience when it travels in a Pullman railroad car.

Explicit directions for shortening wheelbase cannot be given for every make of car because space is lost by different cars in different ways. This is because the wheelbase has been fixed before the car is laid out and is simply utilized because it is there. Almost universally engines are too large. It would be perfectly feasible to secure all the good performance that anyone could demand in a five-passenger car with an engine of 200 cu. in. piston displacement. An engine of this size, regardless of the number of cylinders used, would require but a short hood. Due to its light weight and small capacity the structural members which support it could be correspondingly reduced.

With an eye which was ever watchful to secure the most from every part in the car, to make every part do the duty of two or more, it would not be

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any great feat to bring the weight of the finished product below the 2000-lb. mark rather than above it. This could be done with plenty of space in the front compartment and tonneau. If the car is to be an expensive one the extra expense will go into comfort and endurance due to the choice of the finest materials and the most careful workmanship. The trimming, upholstery and painting work can reflect the excellence of the equipment and artistry in the vehicle.

Talking Horsepower

Perhaps one of the greatest errors the sales department has injected into the industry is the matter of talking horsepower. It has led indirectly to our use of large engines, whereas horsepower means nothing. It is the combined units of engine torque, gear ratio and car weight which spell the story of performance. The demand for acceleration and hill-climbing ability will always remain with the American public on account of our lack of long, straight, level roads. It is part of the American psychology also to demand that getaway. Attempts to educate the public to gear-changing have failed and probably never will succeed.

Reserve torque is what is demanded and not horsepower, but the exaggeration of the catalog writer has led the layman to believe that if he has an engine of high maximum power under the hood, he has an engine which will enable him to get away faster than other cars which have smaller engines. He does not even think of the other factors of torque, weight and gear ratio.

On page 5 are reproduced some curves which bring out clearly the wide variations in existing types of cars. If these curves are taken as a basis of thought and analysis in connection with the present demand for the ultimate in performance as well as economy the public will part with some of its craving for ultra-long wheelbases and other weight-creating elements. It can have the very kind of transportation it wants with minimum first cost and with minimum upkeep.

There is no doubt that the greatest demand for torque occurs between car speeds of from 14 to 25 miles per hour. The praiseworthy effort to so design the engine that the torque curve rises high and remains flat during this zone, must be continued. The available engine torque is a direct measure of the accelerative power and hill-climbing ability of the car. It is not complete in itself, however, as car weight must also be a factor.

The curves herewith illustrate this point: They show four up-to-date cars, of four, six, eight and twelve-cylinder designs—the actual torque curves of the engines plotted against a speed of miles per hour of the car. These curves show the torques in pounds-feet at the different car speeds and, of course, take in the factor of gear ratio, which would not be concerned were the engine torque plotted alone against r.p.m. In other words, these curves represent the effective torque of the engine at the rear wheels, the size of the wheel also being considered as effecting the final reduction between the engine and the propulsive member.

As a further indication of car performance, these same curves were taken and the weight factor of the car included. The dotted lines illustrate these final curves and are the actual measurement of what can be expected from these four types of cars in definite speed zones.

Probably as interesting a comparison as it is possible to make from the curves herewith given is that between the twelve cylinder and the six. In the actual plotting of torque in pounds-feet, the curve C of the twelve-cylinder engine is higher than that of curve A of the six-cylinder engine for almost its entire length. This would naturally be affected as the displacements are 42.41 for the twelve-cylinder and 288.6 for the six cylinder.

Owing to the fact, however, that the weight of the twelve is more than 1000 lb. heavier than that of the six, 4375 as against 3214, and owing to a slight advance in gear ratio, the indicated accelerative ability of the six surpasses that of the twelve at 19 m.p.h. In the zone between 10 and 19 m.p.h. the twelve-cylinder engine is considerably higher. Thus it would be expected that if high gear were used on both cars the twelve-cylinder car would show a marked advance in get-away at the lower speeds. This is not due to the number of cylinders, but simply to the torque-weight-ratio relationship.

The little four-cylinder engine shown at curve D has an exceptionally flat torque curve and represents what might be called typical effort to secure the highest possible torque as early as possible in the range of speeds. The maximum torque of this engine is reached at a car speed of about 30 m.p.h. At this time about 73 lb.-ft. of turning energy are available. More than 80 per cent of this torque is available at a car speed of only 8 m.p.h.

Torque Curve of Eight-Cylinder

The torque curve of the eight-cylinder engine is another which may be commented upon for its flatness. It is not, however, so flat as that of the twelve or four in lower ranges of car speed. This shows up particularly on the weight ratios. Naturally a direct comparison cannot be made on these four engines from an output standpoint because of the difference in displacement. On the other hand, these series of curves tends to show the difference in torsue to car-weight ratio, and hence gives a direct measure of what may be expected from typical designs.

The connection between the flat torque curve in the early speed ranges and the high-efficiency, high-speed engine has not been brought home. The city driver appreciates being able to throttle down in traffic and at the same time without a change of gear to accelerate up to his speed-limit of 20 m.p.h. This means that the torque curve has got to be high within that range and also that the torque to weight ratio must be high. The terms of engine efficiency and engine ability are often confused. It is quite possible for an engine of low efficiency to have a high ability and the torque curve is no measure of efficiency.

This method of analysis is a key to one of the phases of the situation which confronts us. If it

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were followed through to its logical conclusion we would have automobiles that are better and which would at the same time bear the relationship to some of our present designs that is best expressed by saying that they give equal comfort with higher efficiency and economy.

War has a purifying influence. It turns the searchlight upon us in such a way that our errors are shown up more clearly than they are in peace times. If we have a national failing in that we are extravagant, let us search out the influence of this extravagance in our best means of personal transportation, the automobile, and bring it up to the level it should be brought to.

It does not seem right, in the face of the struggle we have on hand, to see a little woman weighing perhaps 100 lb. driving alone and unaccompanied a huge touring car weighing more than 2 tons. This is bad economy, it is wasting fuel, rubber, oil, metal, and it is not what we want in any times, much less now. This is only an exaggerated case of what we see every day, but people are not going to keep up buying cars that are as far removed from their everyday needs as this. The car has got to be of the correct size for the purposes to which it is to be put.

Buying Transportation

It will not take long for the sales departments with their fingers on the pulse of the buying public to discover the definite effects of the national wave of economy on car buyers. When the sales department discovers this, it is but a step to the engineering room, and it will not surprise the wide-awake engineer when he is called before the board of directors and asked to produce a car which will wring the last ounce of performance out of every drop of fuel, which will travel the last available mile on its tires, which will have all the get-away and flexibility possible with plenty of room for the occupants, but no wasted wheelbase, no wasted engine displacement and with all the excess comfort and style that the buyer purchases, without having the extra money go into dead weight which has to be carried around to no purpose.

Standardize War Truck Repair Work

Every Repair Job to Be Done by Manual—Even Buildings to Be Standardized

WASHINGTON, D. C., Dec. 29—In line with the general plan for standardization pursued by the transportation division of the Quartermaster Corps under direction of General Chauncey B. Baker comes the new plan of standardization of repair base units for service at home and abroad, by means of which there will be standardized repair shop buildings, standardized corps of mechanics, standardized systems for repair and standardized repair equipment.

What Investigation Revealed

Following beginning of production the B heavy-duty war trucks and completion of designs of the A and AA sizes, the Military Truck Production Board started on its work for the maintenance of the trucks in France. George C. Randles, in charge of the manufacturing equipment, together with James F. Borquin, head of the production work, made a thorough investigation of truck repair on the Mexican border, learning the achievements and the errors of the past. They found some shops excellent, others not so good, with the chief problem that of the inefficient soldier mechanic, soldier foreman and soldier superintendent, who were found among the many soldier mechanics, foremen and superintendents at work.

Many repair jobs were found to be wrongly handled because of ignorance, others because of different opinions between mechanics, and still others because of inferior machinery and tools. The result was the decision to standardize insofar as possible.

The repair base units have been planned on standardized lines. Each average building will have 230,000 sq. ft. of floor space. All buildings will be exactly alike with stock rooms, tool rooms and racks the same in each. And the general plans for these buildings are so arranged that in event the building should be made larger or smaller the change in the plans can be made within a very few minutes by adding or taking away the number of bays required, without affecting the efficiency of the plant. These plans also include consideration of light, heat, power, etc., which can be increased or decreased at will along similar lines.

The value of this plan lies in the fact that where workers are taken from one plant to another they can at once enter upon their duties without strangeness, knowing where to find stock, accustomed to the tool racks, used to certain methods which can be pursued equally well in the new shop. For example, the Quartermaster Corps is now building a large mechanical repair shop unit at Baltimore, where 2000 mechanics will work on the trucks coming overland from the factories to the seaboard. Construction of this plant and also of the warehouse which will adjoin it and serve as a commissary to the trucks began last week. Completion is expected in 90 days. If after these mechanics have been thoroughly trained at the truck repair work in this shop the War Department decides to send them to France, it will be a simple matter. The men can be transferred readily, and when they enter the shop in France will find the stock rooms, tools, machinery, light, power laboratories, everything exactly as in Baltimore.

Manual to Guide Mechanics

The next standardizing step is that of rebuilding and repairing. There are certain fundamental principles of mechanics for this work, and the plan provides a system that insures that each mechanic will follow the proper methods. A book to be known as the Shop Manual is now being compiled which so definitely lays down the rules to be followed for repairs that it will be impossible for a mechanic or a foreman to use his own judgment. The plan insures uniform work at every base and on every job. Instead of depending upon the foreman to say, for example, that a cylinder is not in need of regrinding, the workers will turn to their manual, which strictly defines the cylinders that are out of round or tapered beyond good practice and definitely specifies the regrinding and the oversize, which is also standardized. This also applies to the crankshaft, where if the pins are egg shaped all must be ground to a certain undersize to clean up properly. In this way every job must be done thoroughly.

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and there will be no opportunity for men to use individual judgment or to experiment at a time when experiment may mean a penalty of lives. The shop manual is now being compiled and will be completed in the near future.

All tools and machines are being standardized in so far as this is consistently possible with good judgment. All machine tools, for example, are standard belt driven because belt-driven machine tools are easier to secure than motor driven, because there is always possible the conflict of alternating and direct currents and of different voltages in the use of the motor driven, and because with a line-shaft drive if emergency demanded a gasoline engine could be attached and used efficiently.

All mechanics' tool kits will be standardized, each mechanic of the different classes carrying identical tools, which will be subjected once a week to military inspection, much the same as with the arms of the infantry soldier. This inspection will apply particularly to the finer tools, which have to be almost perfect to insure efficient results.

Thus between the standardized shops, machines, tools and repair instructions of the shop manual, every truck entering the shop for repair will proceed through exactly the same movements from entrance to exit that every other truck in its class will pass.

The standardization extends also to the mobile repair units, the trucks carrying small repair shops aboard for making field repairs. These will carry standardized repair tools and machinery, and plans are now being made to perfect every detail of the repair mechanism to the highest degree. For example, a large drilling machine in the original equipment has been eliminated and a small drilling attachment substituted that is more efficient, and the original lathes standing on two legs, which were unable to withstand the shocks over the roads and usually resulted in lathes out of line, have been changed so they rest on a center pedestal over a cabinet, insuring firmness of position.

The numerous results of this system are quickly apparent. They include:

The making of good mechanics, versed in the fundamentals of efficient repair work.

The elimination of the "hammer and cold chisel" sort of repair men, well known to the average motorist.

The training of men mechanically and with a discipline that will make them most valuable in civil life.

The elimination of all chance for experiments. Familiarity with shops and systems instead of strangeness with every transfer.

A repair system that insures maximum efficiency in the maintenance of the quartermaster trucks in France.

The average base repair unit is expected to hold 1163 men under the direction of a major.

The plan of organization of this general scheme of maintenance includes:

Supervision of standardization by George E. Nandles, whose duties include provision for standardizing all buildings, power plants, stock rooms, warehouses, lighting, heating, plant transportation, manufacturing equipment and methods, together with various details connected with modern plants and manufacturing practices for the work to be performed and the compiling of all data necessary. He is being assisted by:

F. A. Barnes, industrial engineer of Cleveland, Ohio, whose duties include building design, building construction, cranes, power plants, water, heating, lighting and sewage.

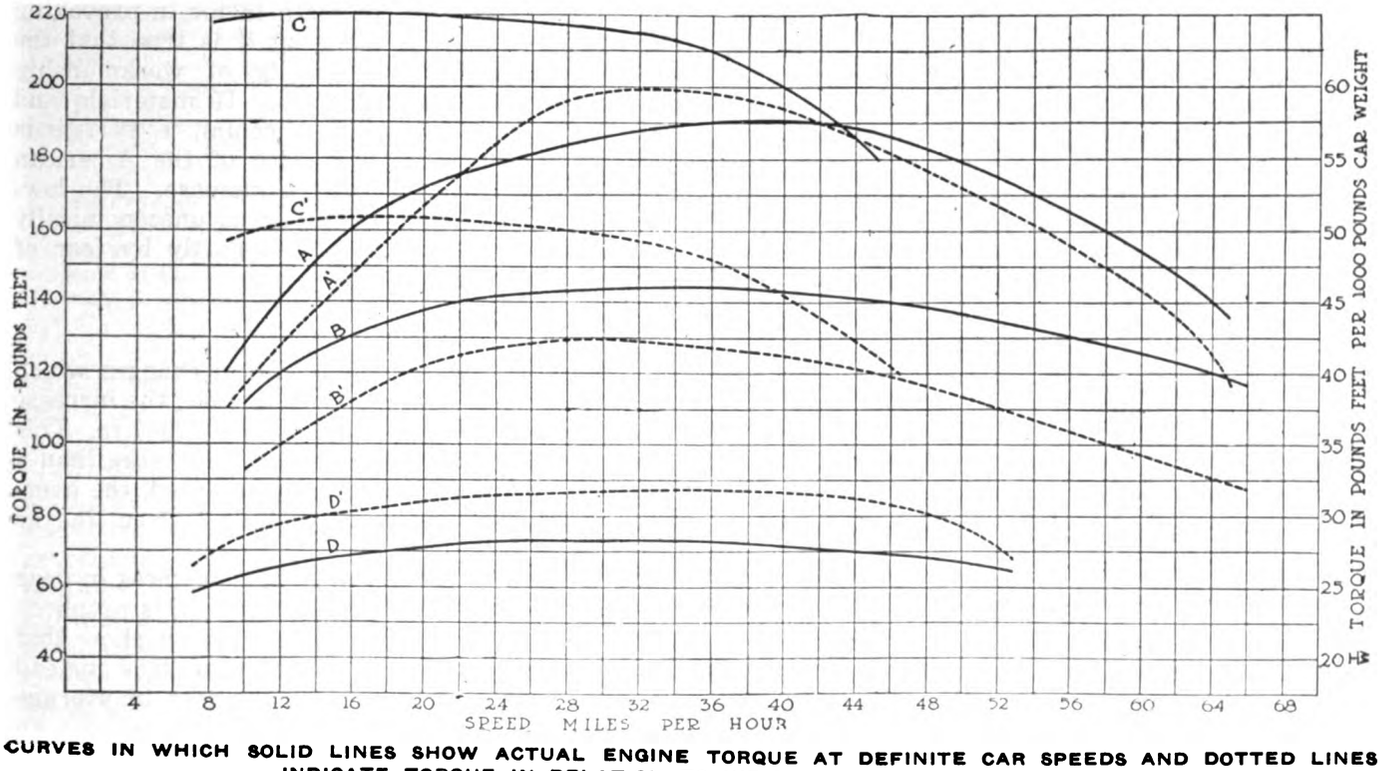
D. C. Selheimer, production engineer, formerly with the Packard Motor Car Co. and the Hal Motor Car Co., who is working out the details of all manufacturing equipment, such as machine tools, small tools, mechanics' tools, shop transportation, arrangement of departments and manufacturing layout details. He will be assisted by Lieutenant Rogers.

Major North, who will provide complete plans and specifications for recommendations for procurement of various items; follow up purchases and maintain purchasing records.

Lieutenant Lord, who will work out the shop manual of standardized operations, together with parts lists and instruction books of the Class AA, A and B trucks.

B. H. Eaton, who is arranging details of plant systems, including tool cribs, warehouses, receiving, stock room and shipping.

Major Parramore, an army officer, who will act in a consulting capacity. Major Parramore has seen active truck repair service on the Mexican border.



CURVES IN WHICH SOLID LINES SHOW ACTUAL ENGINE TORQUE AT DEFINITE CAR SPEEDS AND DOTTED LINES INDICATE TORQUE IN RELATION TO WEIGHT AT THE SAME SPEEDS

A=Six-cylinder, 3½ x 5, geared 4.46 to 1, 35-in. wheels; weight, 3214 lb.
B=Eight-cylinder, 2⅞x4¾, geared 4.05 to 1, 34-in. wheels; weight, 3375 lb.
C=Twelve-cylinder, 3x5, geared 4.36 to 1, 35-in. wheels; weight, 4375 lb.
D=Four-cylinder, 3x4¼, geared 4.70 to 1, 30-in. wheels; weight, 2200 lb.

A'=Car A plotted against T/W per m.p.h.
B'=Car B plotted against T/W per m.p.h
C'=Car C plotted against T/W per m.p.h.
D'=Car D plotted against T/W per m.p.h.

T=Torque in foot-pounds; W=Car weight/1,000; M.P.H.=Miles per hour

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1918 Engineering Trends

¶ War Has Restricted Engineering Development in Passenger Automobiles, But Major Trends Show Continued Progress.

¶ Full Pressure Oiling Systems, Spiral Bevel Rear Axle, Unit Motor and Gearbox Design, Disk Clutches, Single Ignition, Helical Drive for Motor Parts, and Overhead Valve Engines Show Increasing Percentages in Use.

¶ Engine Revolutions Per Mile Are Lowered and Tire Sizes Slightly Increased—Expected Weight Reduction Has Not Materialized.

By A. Ludlow Clayden

ON another page in this issue is a chart which shows the rapid rise into favor of the spiral bevel—how it arose in January, 1915, shot upward, became the standard type almost. The curve starts gently, rushes up rapidly and then tails off gradually.

With a different notation the selfsame curve might very well be used to represent engineering activity in the passenger automobile field for the same period.

The year 1917 has been one of practically no development. War has stopped experiment in many directions, and the realization of war has not been with us long enough to have started it in other lines. The immediate effect of war is a large increase in average price, but this is purely temporary. It does, however, serve to drive home the fact that the sort of cars building to-day are rendered more costly by difficult conditions; and in similar measure the cost of operation has been raised in common with nearly all other living costs. The automobile engineer's next task is to fight and conquer cost of operation—to produce cars which will do essentially the same work for the old price instead of the new one.

None the less the trends shown in the analysis of all the chassis listed in January, 1918, will in the future come to be one of the most interesting series ever prepared. The present year must be a turning point in many ways; it cannot fail to mark a point of change in automobiles as in so many other things.

Meaning of Average

Before proceeding to analyze the trends it is necessary to make the annual explanation of the fact that by considering all the chassis listed without regard to the output of each maker the averages deduced are averages of engineering opinion; and it is this which such analyses seek to discover. An analysis by production would throw into absurd prominence the features of a very few cars which happen to be very cheap and to be made in huge amounts. That which the small producer is doing to-day the big producer will generally be found to be doing to-morrow.

Average Price $1,822

From $1,687 to $1,822 the average price of the American made five-passenger touring car has risen a total of $135 in 1917. The bottom price was touched two years ago, when the average was $1,600. The present price is $96 less than the average of 3 years ago. Of course it is the rising cost of everything which has been the main factor in provoking the rise in price this year, but it is true that the tendency toward better quality of workmanship noted last year has continued. If materials and labor had not risen in price since Jan. 1, 1917, it is probable that the average price of the American car would still have shown an increase. The low-water mark of January, 1916, was uneconomically low; it was a low price caused partly by fear of decreasing demand.

Wheelbases Are Longer

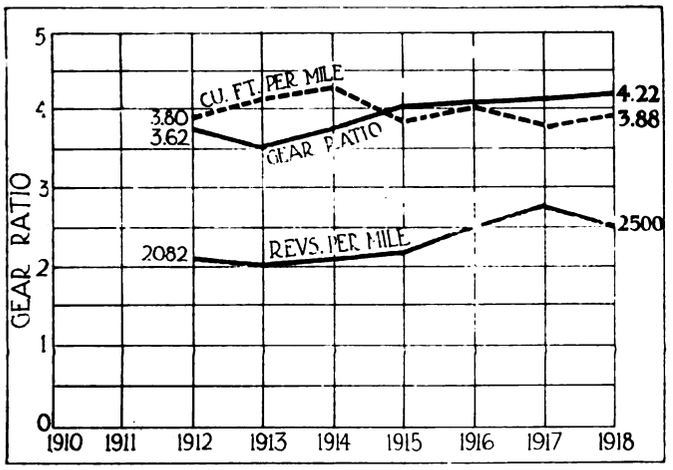
There have been some mechanical changes which stand out prominently, as, for example, the increase in average wheelbase from 113¼ to 120¾ in. This takes us back to the average of a little more than a year ago. Engine size has also enlarged, the average piston displacement now being 269 cu. in., as against 222 last year.

It was commented last year that lowness in gear ratio had probably been reached, and this prophecy is upheld by the present figures, which show that the revolutions per mile now average 2500 instead of 2726. This is owing to an increase in average tire size from 31 to 34 in., for there has been an actual decrease in gearing ratio, last year's average being 4.15 to 1 and this year's 4.22.

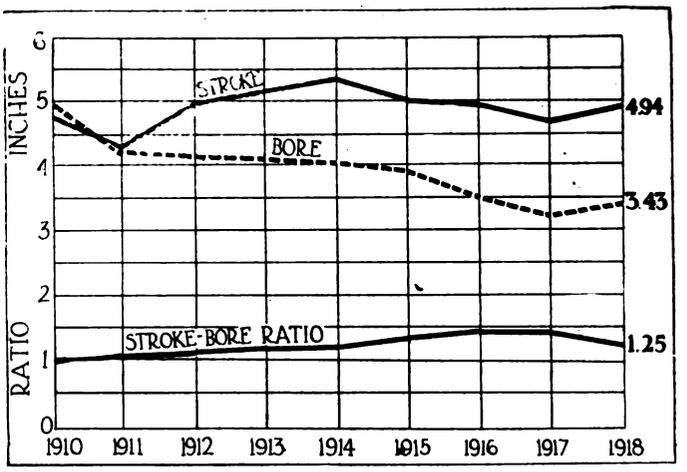
Among all the other averages tabulated there are few showing more than the very slightest alteration. Most of the curves illustrated follow their

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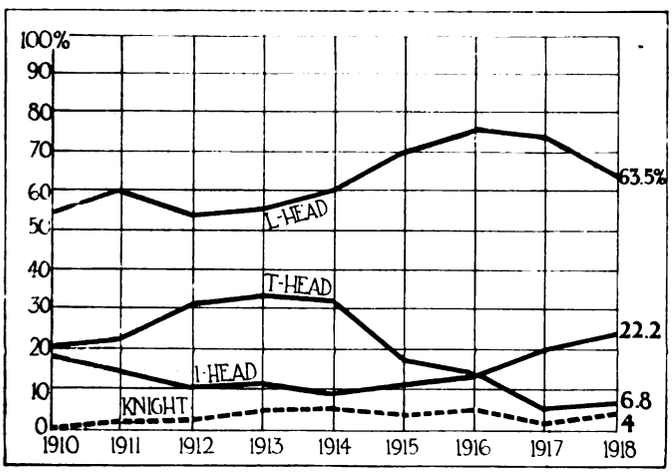
1918 Automobile Engineering Tendencies



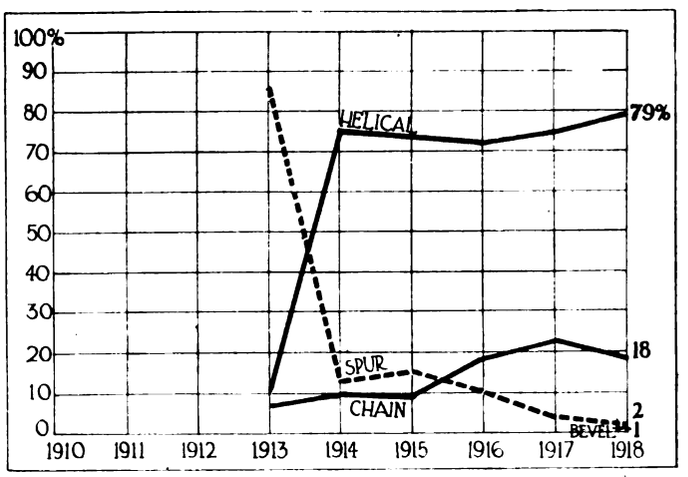
Compared with last year the crankshaft revolutions per mile are 2500, whereas a year ago they were 2726. Average tire sizes have increased and the rear axle gear ratio which one year ago averaged 4.15 to 1 to-day averages 4.22 to 1. The reduction in car weight anticipated a year ago has not materialized largely due to war conditions greatly restricting engineering changes



This year, 1918, models show an increase in engine size, the average piston displacement being 269 cu. in. instead of 222. For three years previous to 1918, the engine displacement has been constantly growing less until the upward tendency of this year. The bore and stroke ratio has dropped from 1.36 last year to 1.25 at present; the average cylinder size to-day is 3½ by 5 in.



The increase of the valve-in-the-head engine which has been gaining steadily since 1914 continues, the net gain this year being 2.2 per cent, which is made at the expense of the L-head, which for 2 years has been losing in the percentage list. The T-head has held its own and the Knight type has gained



In the drive of motor accessories, three positive trends which gave indications one year ago are continued. Helical drive after its phenomenal use of 5 years ago continues to gain, whereas chain and spur gear drives continue the downward curve which was in evidence last year

natural tendency; as, for example, the rise in the percentage of overhead valve engines, and the increase in popularity of the disk clutch.

Cylindricity remains much the same, rather more sixes; 51.7 as against 47 per cent and fewer eights and twelves in proportion. There are six fewer makers and twelve fewer chassis listed in the specifications.

Nineteen seventeen has been a year of manufacture rather than of design. It has been a year when a manufacturer's task was to get material and not to improve his machine—a year when engineers have been handicapped as never before. The only changes which really count for anything, which are matters of principle as distinct from body changes or other matters of fashion, are those made to facilitate the burning of heavier fuel. These changes probably mark the beginning of a new era. They probably are the heralds of the time when gasoline will cease to be the motive power of road vehicles. The change is from the purely gas engine to something more allied to the purely oil engine. Instead of merely metering the fuel and mixing it with air, the later engines vaporize the fuel as well, or partially vaporize it. We are within sight of the practical engine which will *start*, as well as *run*, on fuel with no light fraction if necessary; of the time when double the present percentage of crude will be available as an automobile fuel.

Many of the anticipations of a year ago have not been realized, largely owing to the impossibility of doing much development work. Thus the expected general decrease in weight has not come about. Aluminum remains too scarce and expensive and

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the high-grade steels required are in the same category. Electric or magnetic drive is another feature much discussed in 1916 and now hung up by war conditions.

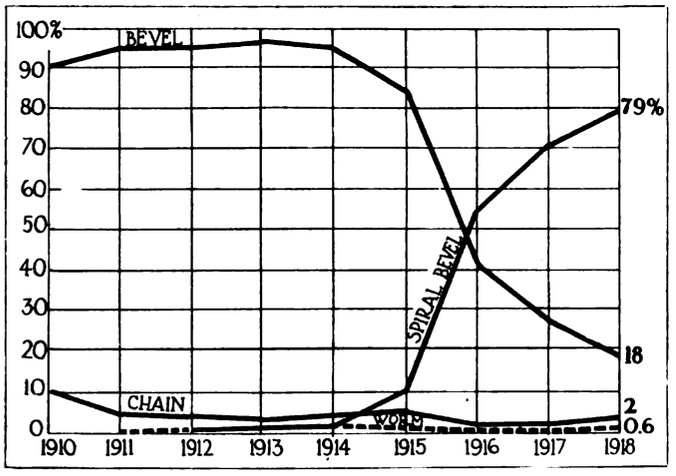
The year of greatest change was 1915. Nineteen sixteen was the year of greatest production; 1917 has been a year of consolidation of the engineering development of 1915 and the engineering experience of 1916. A great many old-fashioned stock parts have vanished. There has been a considerable cleaning up of stock motors in particular. The period of spring experimentation has ended in a triumph for the semi-elliptic, although the cantilever and platform and even the elliptic springs have still their supporters. Argument that any one form has inherent advantages over another has ceased, it being realized that it is possible to get any desired result with any type of spring if sufficient care is taken with the design.

In axles, steering, electrical gear, carbureters and transmissions there have been no changes worth mentioning.

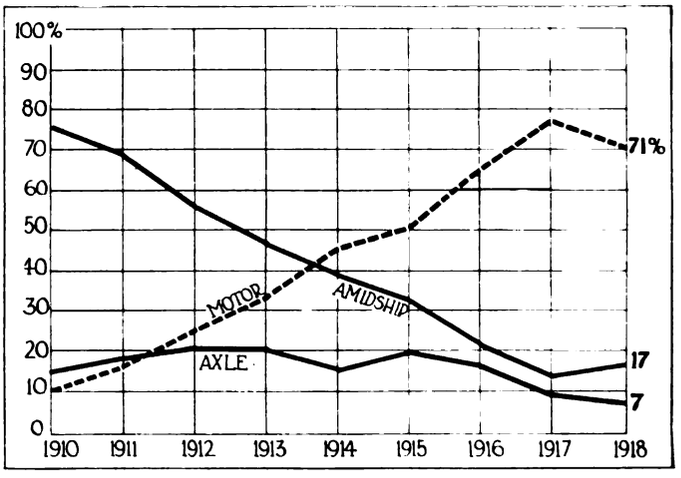
The alleged shortage of materials has failed to materialize in a drop in the use of alloyed steel for chassis parts. The percentage of alloyed steel in the chassis is relatively small, and even though there are detailed alterations in parts to permit of the use of the high-carbon product in some instances, these alterations have not been of enough importance to show up in the tabulations and curves.

Trends in accessory design have not been marked. Perhaps one of the features of the year is the introduction of improved priming devices to aid in overcoming starting difficulties. Accessories which are used as standard fittings such as steering wheels, dash meters and gages have not been materially altered, although their arrangement is such that the devices are more easily seen by the driver.

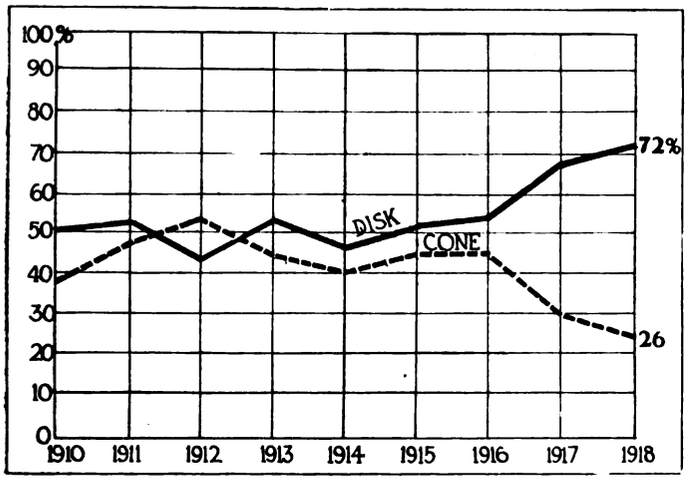
Engineering Trends Shown by Curves



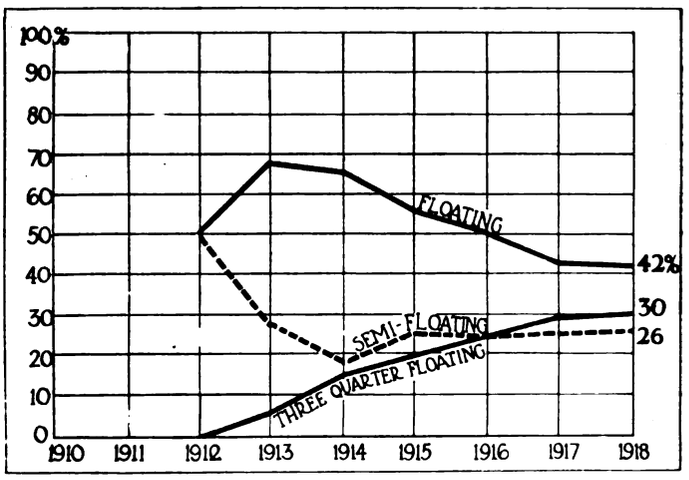
The trend of rear axle design started in 1914 has continued consistently to date, with spiral bevel rising steadily to 70 per cent, bevel losing steadily and now at 18 per cent and worm and chain remaining stationary. The popularity of the spiral bevel is marked



It was in 1914 and 1915 that definite trends in gearset location set in, although the last year has introduced some counter movements, notably the falling off of mounting as a unit with the engine, and a corresponding gain of the amidship location



From 1910 to 1916 the clutch field was quite evenly shared beteween the disk and cone, with the cone leading in 1912, but since 1916 the disk has gained so as to have nearly three times the percentage following the cone has



The definite movement in rear axle design extending over 8 years has been the constant, consistent gain of the three-quarter floating type and the equally steady loss of the floating design; the semi-floating type has held its own

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Engine Design for 1918

Cylinder Sizes Slightly Larger Than 1917 — Pressure Lubrication Has Gained — Overhead-Valve Types Increasing — More Counterweighted Crankshafts — Bore-Stroke Ratio Is Lower—3½x5 Average Size

PROBLEMS of heavy gasoline have completely ended the cylinder controversy. Looking backward over the past three years it seems that the eight and twelve have served to bring back the four into higher favor, since despite a decrease in the proportion of fours in the whole list there have been several new high-grade fours put on the market in the last two years. It was predicted by Howard E. Coffin that the eight and twelve would compel the production of *better* sixes; and this has indeed come to pass, for the average engineering quality of the stock six-cylinder engine is far above what it was even a year back.

The Average Cylinder

The nearest to an average for all American passenger cars would be a six-cylinder machine with an engine having dimensions 3½-in. bore by 5-in. stroke. The engine size proportions and variations in dimension with the different numbers of cylinders are rather interesting. Of all the cars listed in the specification tables, eliminating chassis which are duplicates except for wheelbase variation, 34.6 per cent are fours, 51.7 sixes, 10.2 eights and 3.4 twelves. The grand average dimensions are 3.93 by 4.94 in., giving a displacement of 269 cu. in. Splitting the engines up in order of cylinder number gives the results following:

Cyl. Number	Bore	Stroke	P.D.
4	3.6	4.95	221
6	3.46	5.00	282
8	3.13	4.59	282
12	2.87	4.96	386

It is a curious thing that the average size of the six and eight should be the same, and probably this may be taken as meaning that the normal, medium-size car of to-day is best suited by an engine of this size. It is perhaps a little surprising that the fours average so high a displacement. Allowing for the fact that many of the fours have small wheels, this probably indicates that the displacement per mile run differs only a little as between the sixes, eights and fours.

The average engine is larger than it was a year ago; 269 cu. in. as compared with 222; the gear ratio has changed from 4.15 to 4.22, yet the increase in average tire size from 31 to 34 in. has prevented a large increase in the displacement per mile run on high gear. A year ago this averaged 384 cu. ft., and it now comes out 388 cu. ft. This means that ability as measured by displacement per unit of distance has not been increased. Probably there has been a little increase in mean effective pressure, especially among the newer sixes, but this will not have been great. On the whole, therefore, the ability ratio may be said to be unchanged.

There are more overhead valve engines by 2.2 per cent, and fewer L-head motors. Also there is a new type never before listed on stock cars, this being the horizontal valve. This is employed on the new Duesenberg stock engines, and this motor is used on 2.3 per cent of the listed chassis. The listed Knight engine chassis have doubled in proportion, increasing from 2 to 4 per cent.

Thus while the L-head motor remains the commonest type, it is apparently on the wane. Taking the years 1915, 1916 and 1917, the L-head showed 70, 73.3 and 73 per cent, while it has now dropped to 63.5 per cent, and a falling off of 10 per cent in a year of stagnation in design is significant.

There are no more adherents to the multi-valve idea sponsored by Stutz and White, but this is perhaps due to the paucity of new designs. It is a somewhat expensive design and most novelties are in the direction of cheapness rather than increased cost.

Unfortunately figures for the proportion of detachable cylinder heads are not available, since there has without question been a large increase in its use. It is a long time since any new engine has appeared without this feature, and this year has seen Cadillac change over as well as Packard.

Single Ignition Leads

Ignition has followed the natural trend toward single-current source, this being now the battery. Details have been improved in both batteries and breaker mechanisms, so the magneto shows no signs whatever of returning to its original position of universality despite its continued employment on many of the most expensive cars. The weakest points in ignition systems are now the automatic advance, which is developing slowly but surely, and the material available for contact points. Both platinum and tungsten are so scarce and so much in demand for war purposes that every magneto and distributor maker has had his troubles in maintaining the supply of contact material. The established manufacturers have been able to keep up the quality fairly well, but with the return of peace a

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big increase in the life of contacts will be observed.

Engine balancing has been a continued study during 1917, and the day of the counterweighted crankshaft has arrived. There is a considerable difference of opinion as to how far it is really necessary to go in balancing, this subject being as yet only partly understood. The matter is discussed fully in another part of this issue. Still the 1918 Show does mark the emergence of the counterweighted crankshaft from the peculiarity stage into the realm of conventionality.

Pressure Oiling Gains

In lubrication, circulating splash or combined splash and pressure systems have gained a great deal. In percentage the full pressure system has fallen off a trifle from 30 to 28 per cent, but this is due to decrease in models rather than to decrease in the number of believers in the system. In the tabulation the old style of separating splash-pressure and circulating splash (trough system) has been abandoned because of the many degrees of variation possible. Some engines have practically a full-pressure system plus dip troughs for the connecting-rods, and some rely mainly on the troughs but use separate feeds to the main bearings. The real distinction comes now between those engines which have the troughs as an accessory or as the main lubrication source and those which rely entirely on pressure and have no dip for the connecting-rods. Thus the two percentages given under "splash" and "splash-pressure" last year should be added together in comparing them with the total of 71.6 per cent for this year, and we then see an increase for this system of 1.6 per cent. There is only one car listed with plain splash lubrication, that is dip for the connecting-rods without troughs.

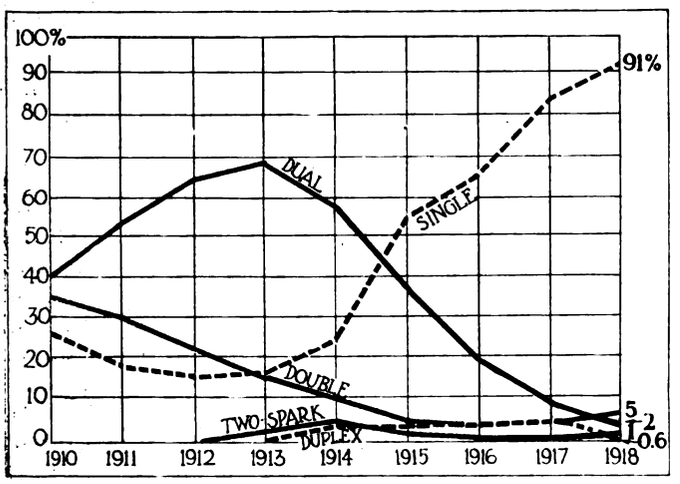
In pressure systems there are many variations. Last year it was anticipated that the 1918 tabulations would show a strong trend toward controls which would proportion the oil supply to the engine bearing loads. This has not come to pass. Most of the pressure systems are low-pressure systems; that is to say the maximum shown in the gage with warm oil seldom exceeds 10 lb. per square inch.

Probably the difference between splash-pressure systems and pure pressure ones has been exaggerated. The former is only different in that oil is supplied to the crankpins externally instead of internally. The pressure shown on the gage in a full-pressure system is often higher than that prevailing actually between the crankpin and its connecting-rod bush; while oil supplied externally to a connecting-rod is given some pressure by the relative reactions within the bearings.

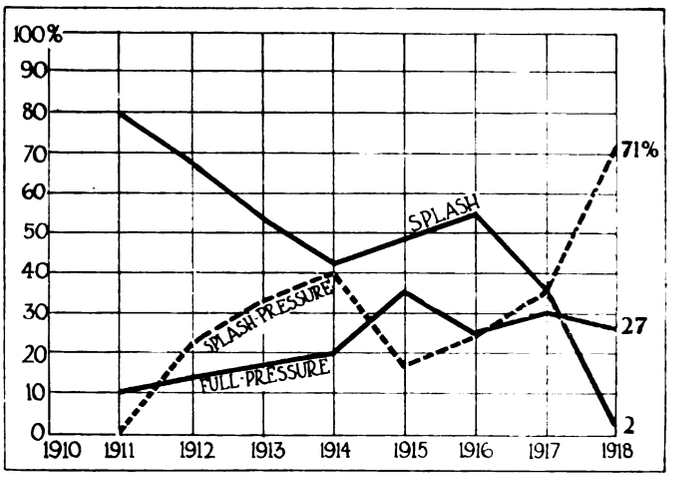
Speaking broadly, the majority of manufacturers whose prices permit the drilling of the crankshaft prefer to supply the pins in this way, and most of those who prefer to use dip troughs do so because they give almost the same if not quite the same results when in combination with direct feeds to the main bearings. The leading advantage of the pressure system is that it gets the oil to the bearing surfaces quicker in cold weather, and most of the wear on bearings takes place during the first five minutes of running.

Probably the most satisfactory feature of engine improvement is in the line of better volumetric efficiency. Engines are giving bettre torque curves and higher ultimate performance, simply because they are being filled better on the intake stroke. This is true in spite of the fact that the intake passages are heated to a higher temperature now than ever before, thus, although there is a normal expansion of the gases due to the higher temperature of the intake, this expansion is more than compensated for by improvements in cam design and by carbureter manipulation resulting in higher velocities of the intake gases.

The so-called hot spot intake does not do anything towards making engines easier to start. It has a marked influence, however, in shortening the period of warming up, and this is highly gratifying to the user of present day fuel.



Ignition movements since 1914 have been generally consistent. Thus single ignition that started gaining in 1912 has risen constantly and is now a 91 per cent factor and dual and double has been consistently losing. The two-speed movement is stationary



Last year the engine lubrication field was almost equally divided, with 35 per cent each for splash and splash pressure and 30 per cent for pressure. In the last 12 months splash pressure has doubled its following and the other two divisions have lost, splash being almost eliminated

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1918 Chassis Design Features

Semi-Elliptic Springs Established—Wheelbase Raised from 113 to 120.7 Inches—Frame Changes—No Weight Reduction

APART from changes in engine design extremely little has been done this past year. Chassis were greatly cleaned up in 1915 and 1916; there is not room for a great deal more change without introducing new principles. The gearsets produced by the stock-parts makers are nearly all identical with previous designs, the axles are likewise unaltered and there are no novelties in steering gears worth mentioning. Even spring design has been stagnant.

The three-speed transmission integral with the engine as a unit is found on three-quarters of the listed cars; the relative proportions of full and semi-floating axles remain about the same; there is nothing new in frames or springs. The spiral bevel is the predominant form of final drive, having increased from 70 to 79.4 per cent. Wheels are larger, being now shod on the average with 34 by 4-in. tires instead of 31 by 4-in., a return to the conditions of January, 1915, which is a little surprising in the light of the popularity of the 32 by 4-in. tire. There are more wire wheels, these being now either standard or optional without extra charge on 27.8 per cent, leaving 72.2 per cent on which only wood wheels are fitted. This is mainly a manufacturing matter, and if progress is normal during 1918 there will be more wire wheels to list in January of next year.

Semi-Elliptic Most Popular

In springs 44.4 per cent of the listed chassis have semi-elliptic, 29.6 cantilever and 17 per cent three-quarter, the balance being divided between platform, transverse and special systems. Two cars, the Jackson and the Franklin, remain the only users of the elliptic system. Cadillac, Dorris and Peerless are the only cars using platform springs, Packard having changed to semi-elliptic. Hotchkiss drive is used on 53 per cent of American chassis to-day.

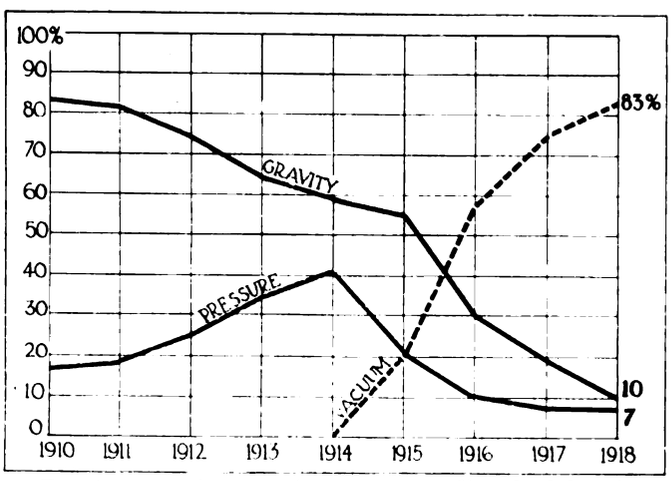
Increase in wheelbase to an average of 120.7 is unexpected, since last year it had shrunk to 113. The present figure is almost the same as that prevailing the year before last. It means that the average body on 1918 cars will have perceptibly more leg room. Of course a slight increase in wheelbase is to be expected at a time when we also see an increase in six-cylinder models, but a couple of extra cylinders on 5 per cent of American chassis is not enough to provoke more than a fraction of an inch on wheelbase average.

A change which does not show on tabulations, but which is quite important is that toward deeper frame sections and stiffer frame construction. This goes hand in hand with the tendency to use more leaves in springs, in that its sole purpose is to make for better riding. It is hardly possible to use an 8-in. frame section except when entirely redesigning a chassis, so in this quiet year there have been few extreme cases of deep frames. A good many manufacturers have added a half-inch, or some similar amount which is insufficient to necessitate completely new brackets all over, a new motor support, and so on. Still it is certain that the next redesigning period, which will most probably be the year after peace is declared, will see automobile frame construction greatly changed. Such frames as the Marmon and the Premier are typical of the construction of the future.

Weight Reduction Halted

Weight-saving in chassis parts which had begun a year ago is halted by the present need for using only medium-grade materials wherever possible. The amount of interest which the automobile engineers are now taking in aviation will certainly provide them with plenty of ideas for the future, and many have plans laid for a much lighter after-the-war car.

Every year for many years, in reviewing the annual progress of either America or Europe, it has been necessary to remark that steering and brake design are on the average poor. The *best* in brakes and steering is much higher above the *average* than is the best of most other features. Steering gear and the brakes remain the poorest parts. Nothing has been done in 1917 which can be regarded as a general improvement. It is a welcome feature, however, that accessibility in the front compartment has been noticeably improved because of the almost universal increase in leg room. This has been as much as 2 in. on a number of cars.



For 4 years the use of vacuum gasoline feed has increased steadily, and gravity and pressure feed have decreased just as steadily. Present curves would indicate a further continuance of these movements

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Modern Manifolds

Hot Spot, First Effect of Scientific Study, Still Semi-Experimental — Too Much Heat Injurious—Four Typical Examples

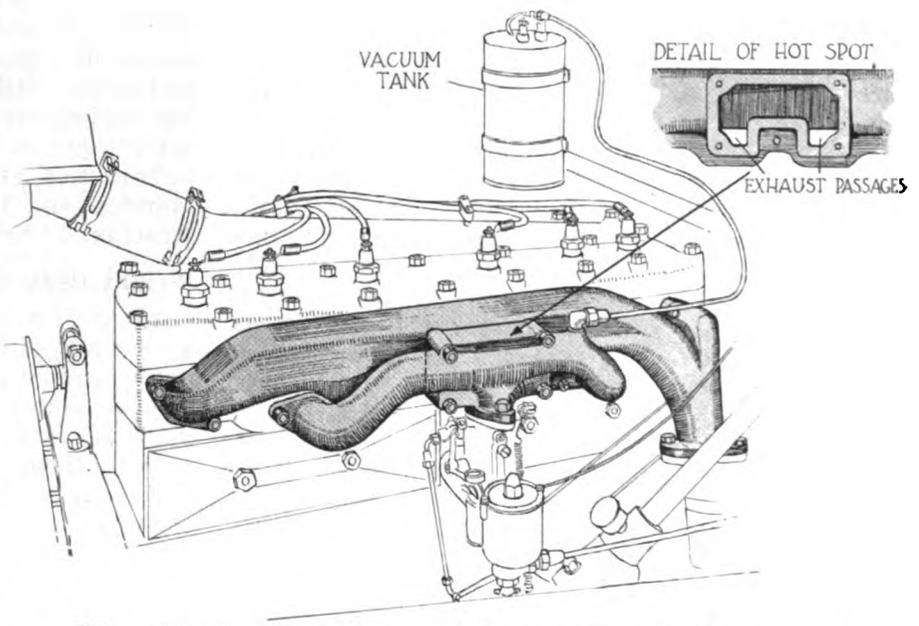
ONE of the details which have been given the closest attention during the past year has been the intake manifold and the methods used for preheating it. It has been universally conceded that owing to the high boiling point of the present-day fuel it is necessary to apply external heat before proper care can be taken of the fuel. The methods, however, which have been utilized to secure this heat differ in a great many respects.

Owing to the fact that flexibility is one of the main factors demanded of the passenger car, care has to be used in how the heat is applied. It is readily possible to secure an excellent mixture for *constant* throttle conditions, but when the varying throttle conditions met with in passenger car practice are taken into consideration, it is not so simple to secure the flexibility. Preheating the fuel and preheating the intake air before it comes in contact with the fuel are both methods which work out satisfactorily for constant throttle openings. For variable throttle openings, however, it is necessary to heat the intake mixture and also to preheat the air in addition, to some extent, depending upon outside temperature conditions.

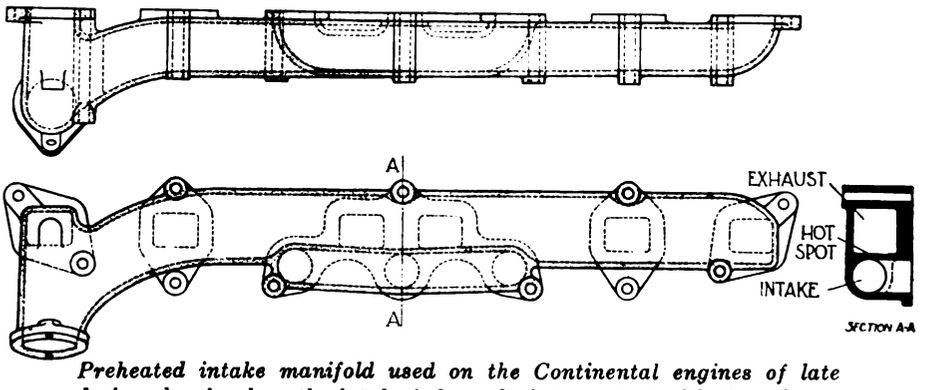
It must be conceded that the hot-spot intake manifold does not completely solve the heavy-fuel problem. There are weak points in its application, although it cannot be denied that it has many good points and it does do the work well, if not at all times in a perfectly satisfactory manner. Where it falls down is in starting.

Another place where it is weak is that when running slowly there is a lack of heat, and when doing heavy work, such as on hills or on sandy roads, there is an excessive heat. It is the starting problem which presents the most serious difficulty at the present time. It is because of the cold starting condition that so much of the fuel works its way past the piston rings and into the crankcase, giving rise to crankcase dilution, where the lubricating oil is so reduced in quality that it becomes a menace instead of a benefit to the engine.

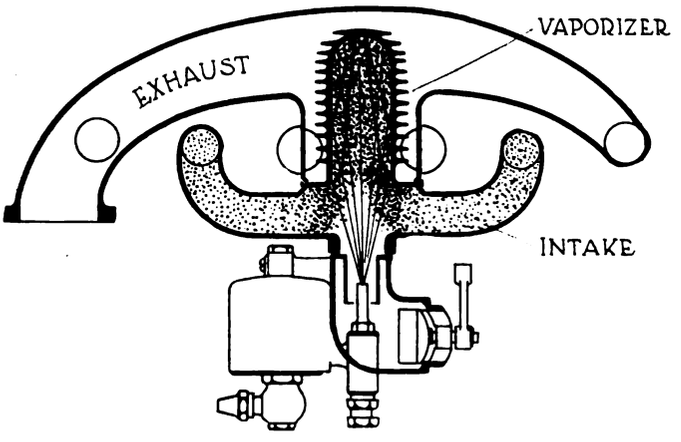
This matter of cold starting is the



Hot spot used on the ram's-horn intake manifold on the latest type of Chalmers engines



Preheated intake manifold used on the Continental engines of late design showing how the intake is brought into contact with the exhaust



A typical hot spot arrangement—section through California heavy fuel vaporizer for Fords

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next thing which must have the attention of the designer, and it is surely going to mean that some extra equipment must be added to the car to take care of it as it should be handled.

One company is placing a heat coil in the carbureter float bowl, and other companies are experimenting with the use of a heated coil at other points of the intake system. This may be a solution to the cold starting problem. If it is not, it is at any rate a long step in the right direction.

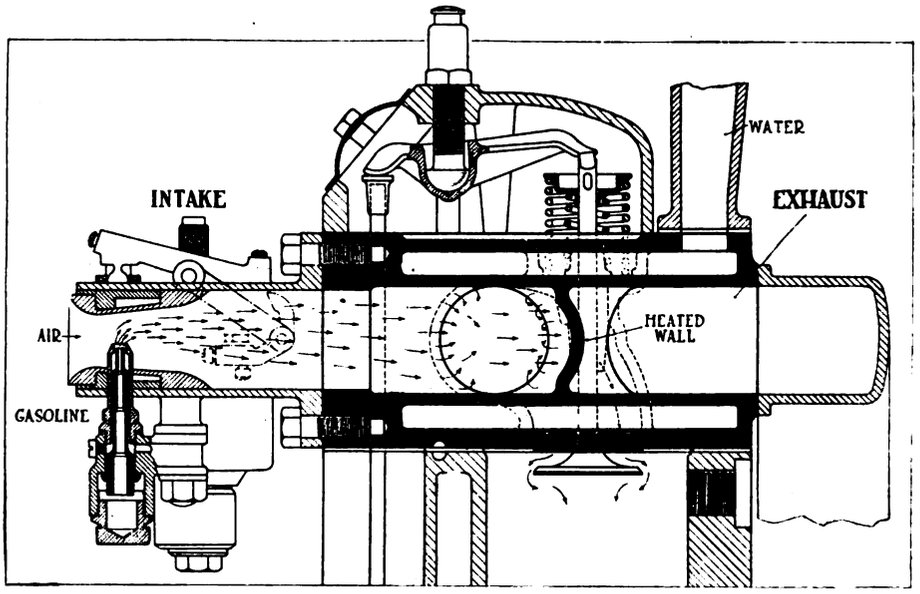
Once the engine is running, there is no doubt but what under normal conditions the hot spot provides the final step necessary in completing vaporization of the fuel. The unvaporized globules of non-volatile fuels which impinge against the hot spot are immediately transformed into vapor and the loss of volumetric efficiency is not great; in fact, a study of the torque curves of the engines using hot spots shows that there is an improvement in torque in a great many instances, due to the use of the hot intake.

The opinion that the hot-spot intake is the best way of handling the situation is not unanimous. Some engineers raise the question as to whether it would not be better to have a much larger water jacket on the carbureter and intake manifold in handling the present-day gasoline. It is claimed that the water heats up more readily, it keeps hot during short stops, and never heats the mixture to excess. Furthermore, it is claimed that it is easily regulated for summer and winter running, and it appears to give very satisfactory results. Of course it will not give sufficient heat to satisfactorily use kerosene.

Air Must Be Preheated

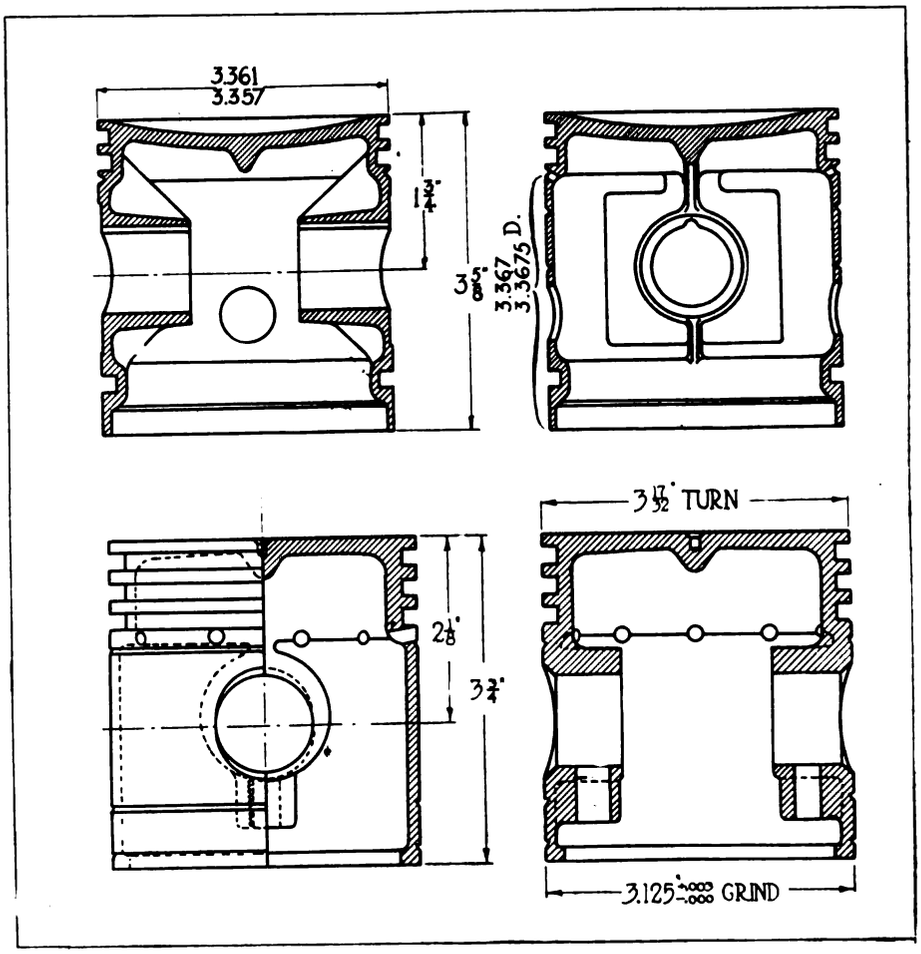
Even with the integral intake and exhaust, where the intake is exposed for some distance of its length to the direct heat of the exhaust manifold, it is necessary to preheat the air to some extent. The amount that the air is preheated, however, should be varied for summer and winter conditions. The system used on the Model R Hupmobile may be cited as an example of where the principle is applied, as there is a summer and a winter position for controlling the pre-heating of the intake air.

Another system which may be cited as typical is that employed on the Hudson carbureter, where, in the latest model, no hot air horn or stove is used at all. Owing to the employment of the shutter on the radiator, the space beneath the bonnet becomes practically a closed room, and it is heated in accordance with the necessity of the case, depending upon the temperature of the external air. The colder it is outside the more the shutters are closed, and, conversely, the warmer it is the more the shutters are open.



Section through Brush manifold showing how gasified fuel enters intake gallery while liquid particles strike heated wall where they are evaporated

Summing up the matter of hot spots, it appears that they offer as good a means as we have available at the present time for handling a difficult fuel situation. Under average running conditions it provides a good, clean, dry mixture without sacrifice of a material amount of volumetric efficiency. Its weak points are the conditions of starting and the unusual conditions of very slow running in cold weather and pulling through heavy roads in hot weather.



Above—Aluminum piston used in the Model 88-8 Overland car. Below—Section through piston of Continental engine used by the Willys-Overland Co.

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Variety in Auxiliary Drives

Disposal of Engine Accessories Far from Standardized—Different Schemes Have Individual Advantages—Trend Keeps Units High Placed

THE layout of the auxiliary drives of an automobile engine is of supreme importance in securing the proper performance of these parts. In a great many instances the satisfactory performance of a unit depends entirely on the method of attaching it to the engine and to the method of drive, as well as to location. There are a few fundamental facts which are well realized and which are closely adhered to in up-to-date practice. Probably the first consideration is that the drives be as compact as possible, and wherever it is at all feasible one drive should take care of two or three units. This has been growing practice and is a noticeable element in securing lightness of the powerplant. The combinations which have been worked out show a great amount of ingenuity in this respect.

For example, Oldsmobile and Nash might be cited as typical, in that the belt which operates the fan also operates the generator. On the Oldsmobile this drive passes on to the distributor, while in the Nash a separate distributor drive is used in the center of the engine, operated from the camshaft.

This practice of combining drives is one which could be carried out much further than it is. Where individual drives are taken for each of the auxiliary parts, a much greater amount of power than necessary is consumed, and there is sure to be a tendency toward noise, because there are so many more parts in which quietness must be maintained.

Short Plug Leads

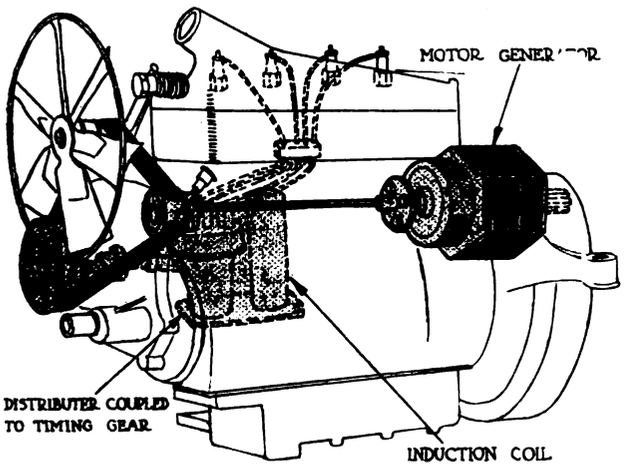
Another feature which is of considerable importance is that the distributor be placed in close proximity to the spark plugs. The amount of current which can leak from the spark plug leads is remarkable, and with the high tension current a small leakage will materially cut down the heat of the spark and reduce the speed of ignition, lowering the rate of flame propagation, and thus reducing the mean effective pressure.

With this in mind it has been practice on the part of some designers to extend the distributor shaft so as to bring the distributor close to the spark plugs. The Hupmobile is a good example, the vertical shaft being extended upwards to bring the distributor above the top of the engine, thus giving comparatively short leads. It is also necessary for the same reason that the coil be located quite close to the distributor, as leakage between the coil and the distributor is just as harmful as it is between the distributor and the plugs.

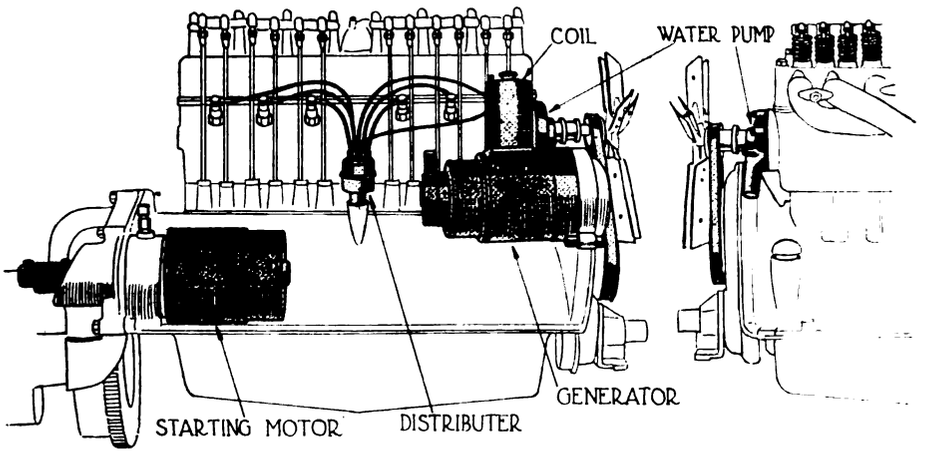
The tendency towards separating the starting motor and the generator is growing, but it is by no means universal. A very compact unit is used on the Dodge car, and a balanced drive is secured by placing the starter-generator on one side of the engine, with the water pump and distributor on the other. As shown in the sketch herewith, the distributor mounting on the Dodge is solid and at the same time affords a support for the coil.

Balance the Drive

Where more than one drive is necessary, general practice appears to be in favor of establishing balance as far as possible by putting the units to be driven on opposite sides of the engine. This balancing scheme can be car-



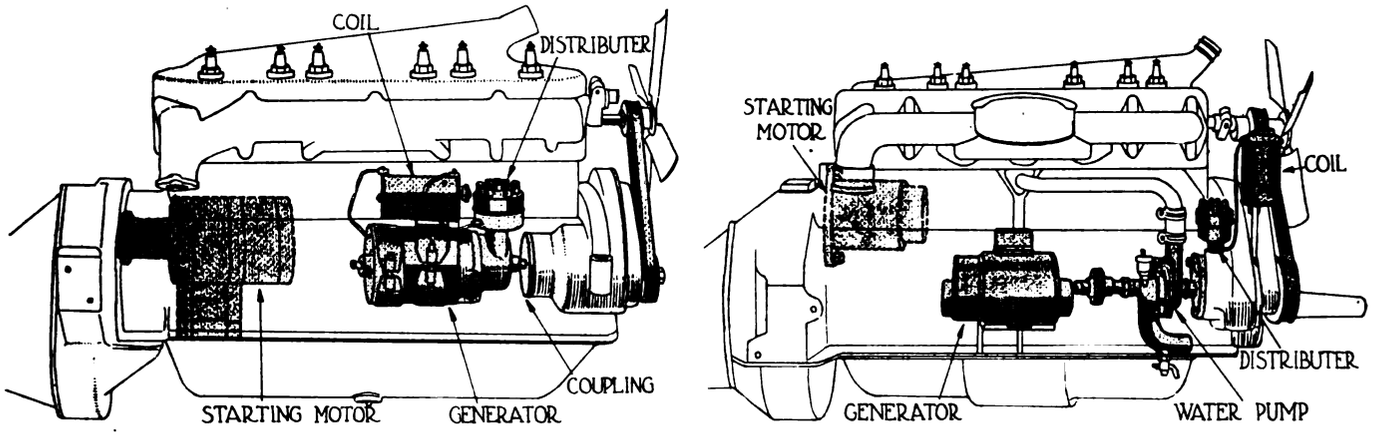
Triangular belt drive with motor generator used on Maxwell



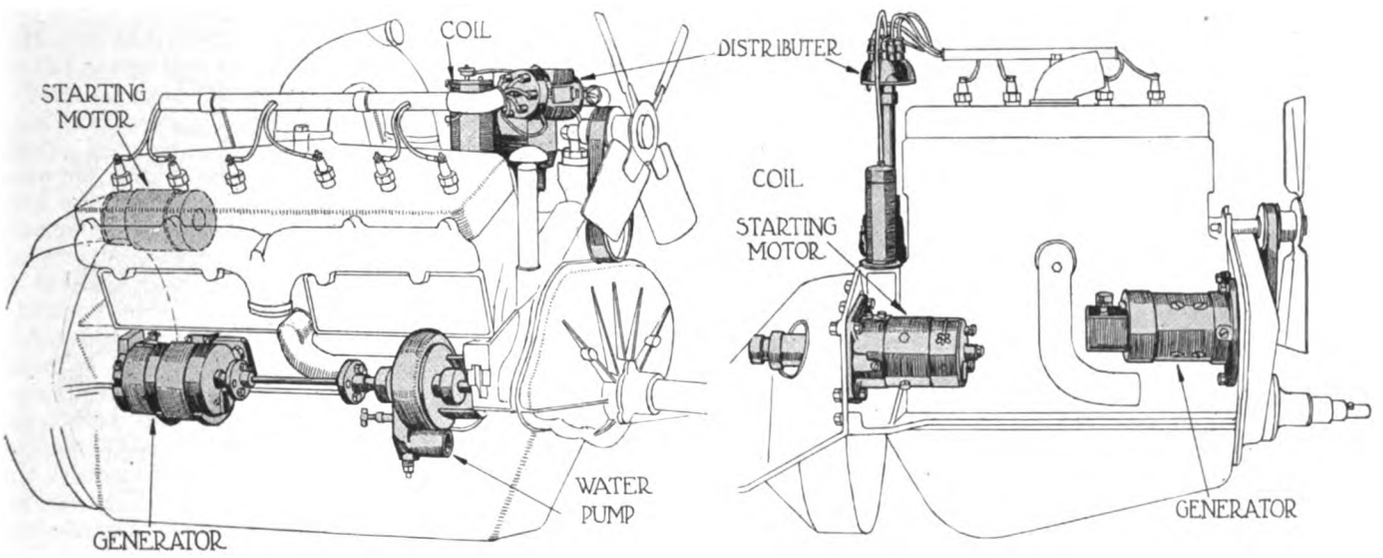
On the Oakland car the water pump is driven by the fan belt, with the distributor drive taken from the camshaft at the center of the engine

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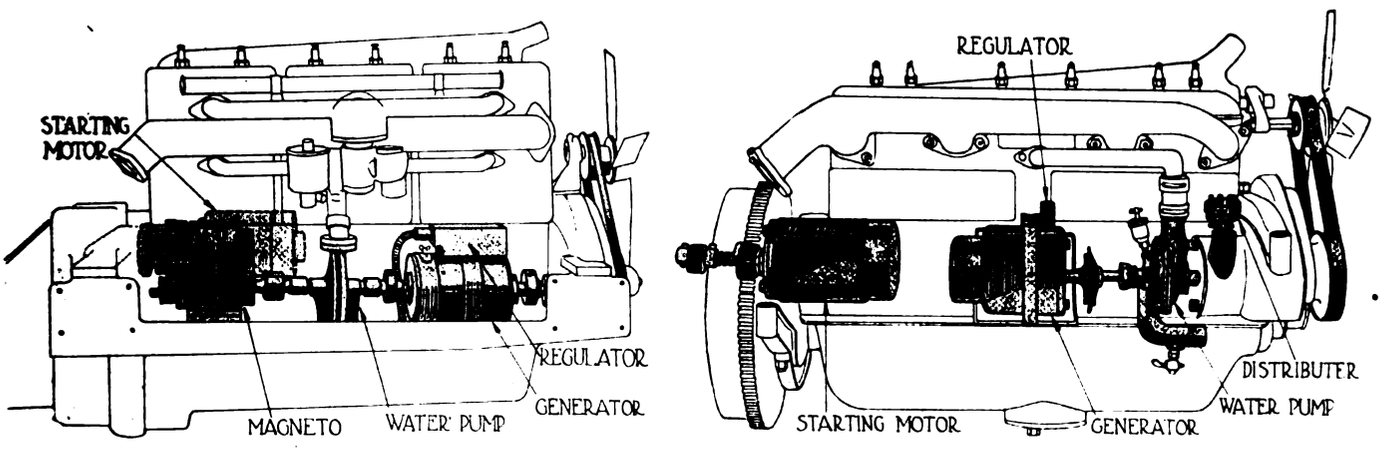
Examples of Different Layouts



Left—Generator, water pump and magneto driven from same shaft on Winton. Right—Layout used on Overland Model 85-6. Note location of distributor

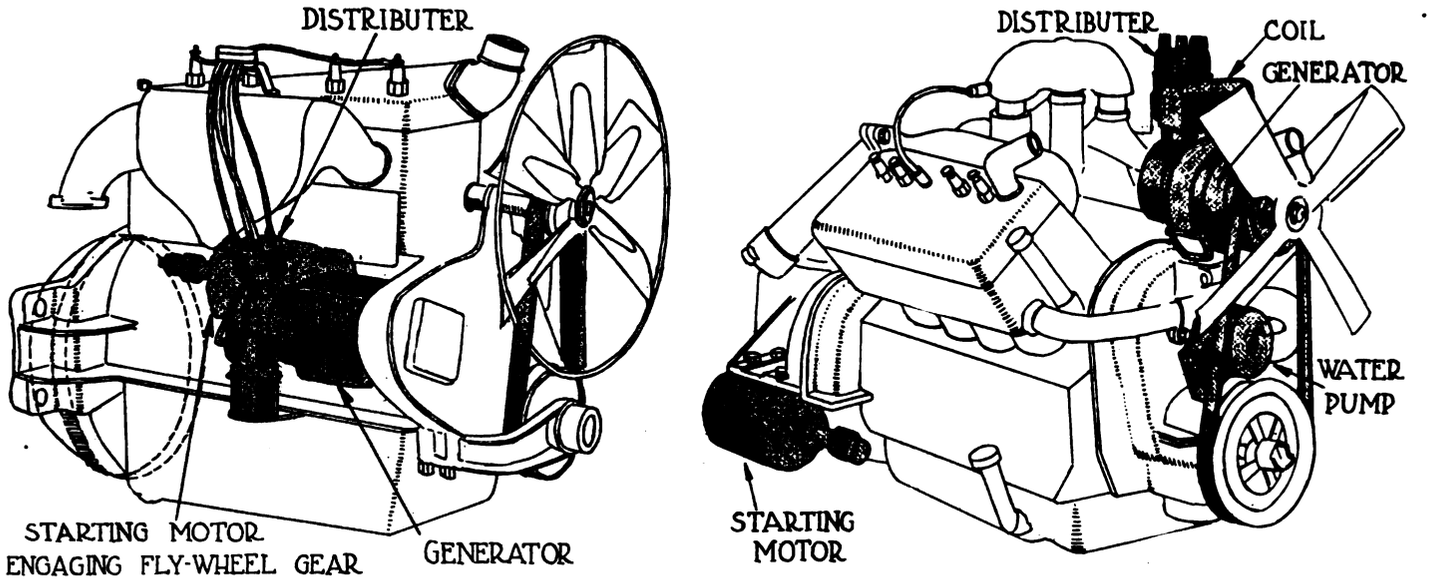


Left—National Twelve layout showing center line starting motor mounted in the V. Right—Hupmobile bolts the starting motor and generator by means of the flanges against the bell housing and timing gear case with an extra long distributor shaft

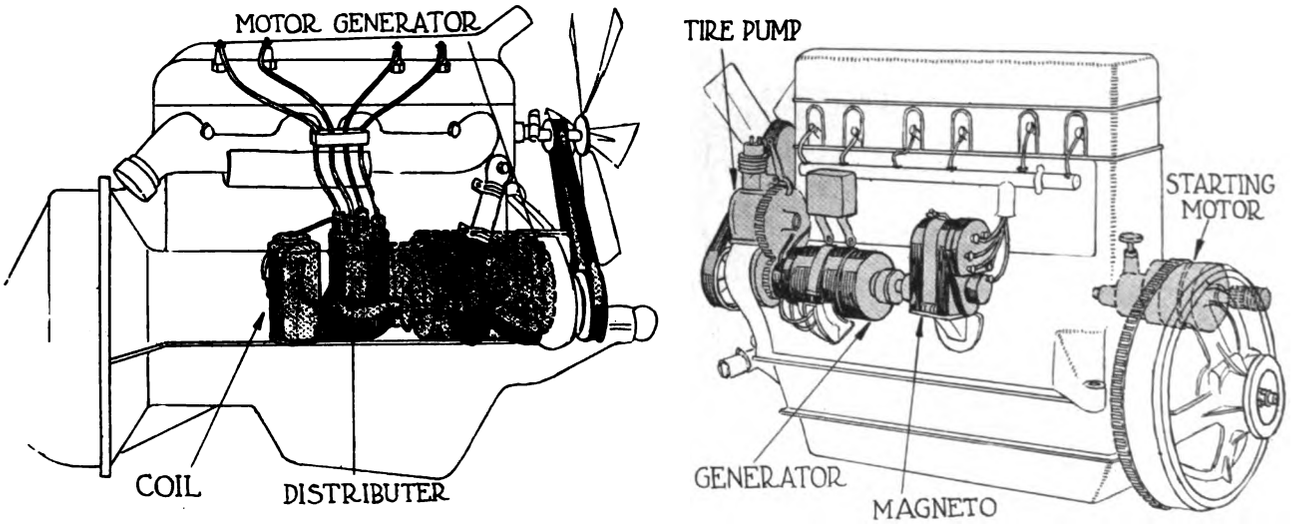


Left—On the Liberty the coil and condenser, as well as the distributor, are mounted with the generator, the moving parts being driven off the same shaft. This is a thermo-syphon engine. The entire unit can be removed by taking out the coupling. Right—On the Paige 55 the distributor, water pump and generator are driven off the same shaft

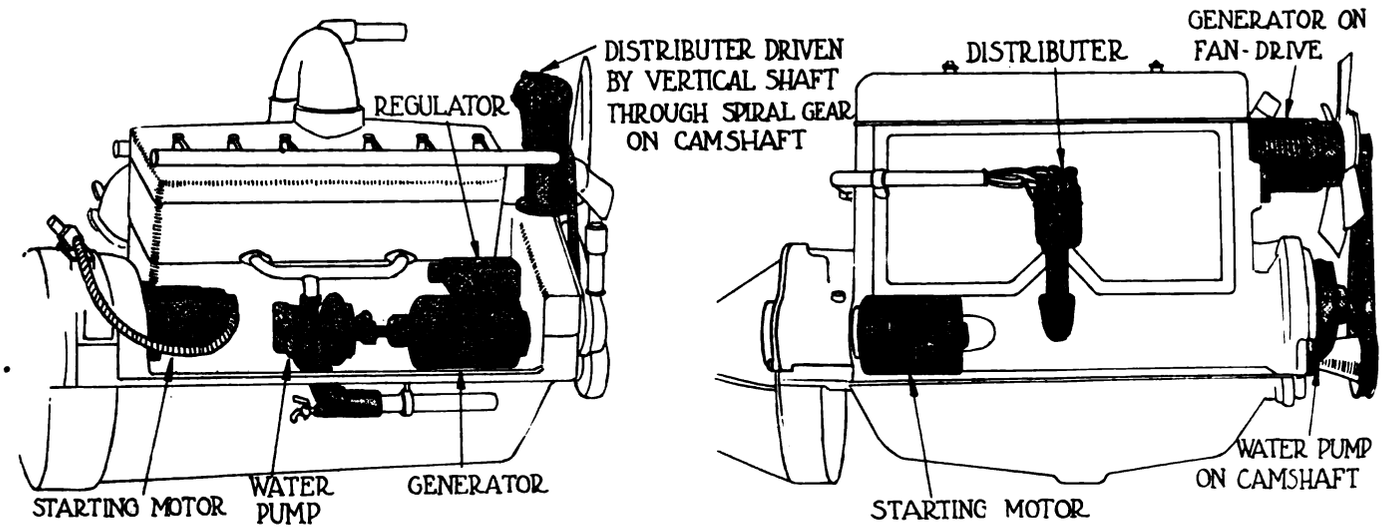
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Left—A compact generating-distributor unit as used on the Case 40. Right—Oldsmobile mounts the generator on the fan shaft, with the water pump also on the timing gear housing

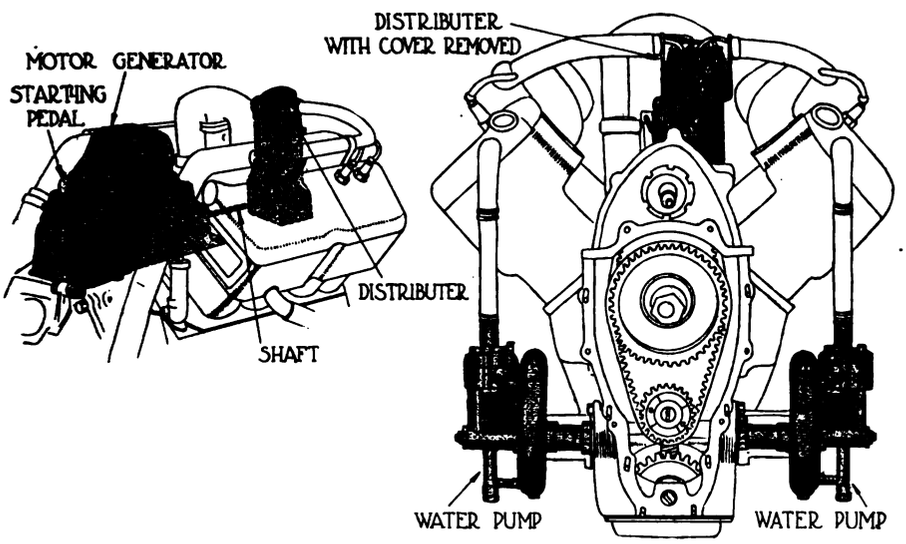


Left—Dodge uses a motor generator with the distributor drive on the pump shaft. Right—Marmon layout, showing generator, magneto drive with extra gear for tire pump

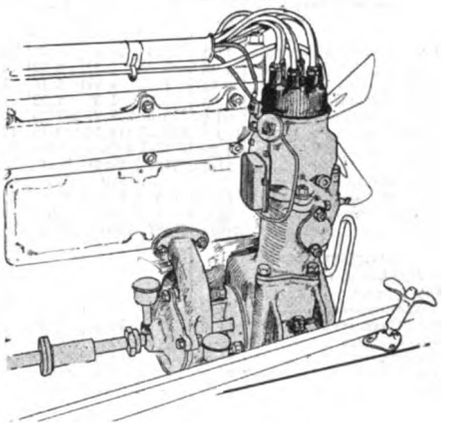


Left—Packard Twin Six with generator and water pump on one shaft, with distributor mounted on timing case. Right—An example of compact layout on the Nash, the generator and fan being one unit and the water pump mounted on the end of the camshaft

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Left—A good example of balance drive is shown in the Cadillac Eight, with the water pumps mounted on a cross shaft and the motor generator and distributor in the V. Right—Pump and ignition unit mounting employed on Hudson



ried out quite completely in V-shaped engines where the duplicated members can be balanced on opposite sides of the crankshaft, while the single members can be put on the center line of the engine. The example shown herewith of the Cadillac illustrates this very clearly. The two water pumps are on opposite sides of the engine, with the distributor and the motor generator mounted on the center line between the V.

Starting motor supports are better this year than they have ever been before. The necessity for rigidity has always been recognized, but the methods of securing it have not always been as well thought out as they should have been. On the Paige car the flange system is clearly illustrated, in which a substantial flange on the end of the starter housing bolts direct against the bell housing of the engine, giving a connection which is capable of withstanding the torque needs in cranking the engine.

A somewhat similar system to this is used in Packard, which is also bolted to the bell housing. On the Hupmobile this style of mounting is used for both the starting motor and the generator, with the starting motor bolting against the bell housing and the generator bolting against the front chain case. On the Oldsmobile a reversed system is used, with the starting motor mounted behind the fly-wheel to a flange on the clutch housing.

The practice of using the fan belt to drive other units is not confined to the generator. On the Oakland the water pump drive is also secured from the fan belt. On the Maxwell the pulley on the end of the camshaft drives the fan belt, which is also connected with the motor generator by means of a long shaft with a flexible coupling. This gives a triangular layout for the drive of the two members.

Various means of driving the distributor have been used successfully. Overland and Paige take the drive off the pump and generator shaft. In both these instances this same shaft runs continuously, forming the means of driving the fan pulley, distributor, water pump and generator. Very much the same idea is used by Dodge and Marmon, with the exception that the Dodge uses a motor generator and the Marmon a magneto. The drive is also similar in some respects on the Case 40, except that the fan pulley in this instance is not on the same shaft, but the generator and coil are located with the distributor along the side of the engine.

The Nash gives a very good example of compactness in drive, with the generator mounted on the camshaft, combining two units at that point, and the water pump mounted directly on the same shaft, doing away with any intermediate units at this point. The distributor is driven direct from the camshaft also, so that there is no exterior shafting nor any extensive timing gear set.

Choosing a Name Scientifically

IT would be interesting to know the circumstances which led to the adoption of many of the most popular and best known names in the motor car industry. The combination of initials which form a word is very common with the Italian makers, as witness F.I.A.T., S.P.A., S.C.A.T., etc. When the F.I.A.T. Co. was formed it was decided to adopt a title which would fully explain the nature of the business and the location of the firm, and *at the same time* to get such a combination of initials as would form a readily-remembered word. This was no easy matter, dozens of combinations being obtained without anything satisfactory being arrived at. The best combination appeared to be Fabbrica Italiana Automobili, the initials of which gave the word Fia. This was placed on the office wall, together with a number of others, with a view to soliciting suggestions from all comers. Probably the word Fia would have been adopted, when some stranger entered the office and wrote after the title the word "Torino," followed by a big interrogation mark. This was a happy thought, for the factory was being established in the town of Turin, and the four initials gave the word F.I.A.T., a word which is easily pronounced in all tongues, which is readily understood in all languages, and which most appropriately applies to a motor car. While a "Fabbrica Italiana Automobili Torino" car would have been just the same as a F.I.A.T., it is certain that the production would have been handicapped if it had gone forth with such an unwieldy title.

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Philippine Tractor Need Grows

LONG continued ravages of rinderpest have reduced the number of carabas, the common beast of burden in the Philippines, and the continued expansion of agriculture in the islands is creating a good demand for a light farm tractor to sell at a reasonable price. Purchases of heavy tractors which sell at high prices will be limited to a few of the larger haciendas, but the market for light tractors for small planters and co-operative groups will be general. So far no such tractor introduced into the islands has been satisfactory. Manufacturers can reach this market either by forming connections with a machinery house now in business here or by sending their representatives into the field.

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Comparison of Average American Car for 8 Years

General Averages	1918	1917	1916	1915	1914	1913	1912	1911	1910
Horsepower, S.A.E. rating	27.4	24.3	28.66	29.97	33.2	33.60	33.60	32.7	31.5
Bore	3.43	3.37	3.57	3.82	4.12	4.19	4.34	4.42	4.85
Stroke	4.94	4.66	4.97	5.10	5.28	5.15	4.97	4.46	4.68
Stroke bore ratio	1.25	1.38	1.39	1.33	1.28	1.23	1.09	1.01	1.03
Displacement	26.9	222.5	278.87	307.38	349	345	316.2	313.2	281.5
Wheelbase	120.7	113.25	119.56	122.19	121	122	121	114	112
Gear ratio	4.22	4.15–1	4.08–1	3.88–1	3.6–1	3.57–1	3.62–1	.....	.....
Tires	34x4	31x4	23x4½	34x4	35x4½	35x4½	35x4	34x4	34x4
Number cars	.....	.....	519	535	607	.....	.....	.....	.....
Number chassis	180	188	176	200	236	339	381	393	364
Number makes	125	131	108	119	133	156	193	270	239
Price	$1822	$1687	$1600	$2005	$2635	$2585	$2508	$2560	$2214
PERCENTAGE									
Number of Cylinders									
One cylinder	0	0	0	0	0	0	1	1	5
Two cylinders	0	0	0	.5	1	1	1	2	3
Four Cylinders	34.61	37	39.2	51.0	54	62	78	80	82
Five cylinders	0	0	0	0	0	1	1	0	0
Six cylinders	51.76	47	45.8	47.5	45	36	19	17	10
Eight cylinders	10.22	12	12.6	1.0	0	0	0	0	0
Twelve Cylinders	3.41	4	2.4	0	0	0	0	0	0
Shape of Cylinders									
I cylinder type	22.2	20	13.7	16.5	30	31	30	22	20
V motors	63.5	73	73.3	70.0	59	56	55	60	56
T cylinder type	6.8	5	13.0	8.5	6	9	9	14	18
Knight type	4	2	3.6	3.0	3	3	2	1	0
Two cycle	0	0	0	1.0	1	1	4	3	6
Mondex Magic type	0	0	0	0	1	0	0	0	0
Gasoline electric	0	0	1	0	0	0	0	0	0
H	2.3								
F	1.2								
Cooling									
Air colled	0.6	1	.6	.5	2	4	5	6	7
Thermo syphon	32.4	38	38.2	27	19	17	19	28	23
Pump circulating	67.0	61	61.2	72.5	79	79	76	66	70
Ignition Systems									
Single ignition	91.04	84	76.0	56	23	15	14	18	25
Dual Ignition	2.14	9	19.2	36	59	68	63	53	40
Two spark	1.14	1	1.2	1.45	4	2	0	0	0
Double	5.12	3	1.8	4.55	11	15	23	29	35
Duplex	.56	3	1.8	2.0	3	0	0	0	0
Engine Lubrication									
Splash oiling	57	35	52.7	46.5	42	53	68	81	0
Splash pressure	71.6	35	23.35	16	39	32	20	0	0
Oil in fuel	0	0	0	0	1	1	2	3	6
Pressure oiling	26.7	30	23.35	37.5	18	14	10	19	0
Splash gravity	1.19	0	.6	0	0	0	0	0	0

General Averages	1918	1917	1916	1915	1914	1913	1912	1911	1910
Engine Starting									
Electric starter	99.4	99	98.8	94.5	87	37	2	0	0
Acetylene starter	0	0	0	0	1	14	0	0	0
Air	0	0	0	0	4	9	2	1	1
Optional	0	0	0	1.5	2	5	0	0	0
Mechanical	0	0	.0	.5	1	4	0	0	0
No starter stock	0.6	1	1.2	2.5	5	31	98	99	99
Fuel Feed									
Gravity	9.7	18	31.8	57	58	65	75	81	82
Gravity pressure	...	1	2.4	.5	1	0	0	0	0
Pressure	6.8	7	12.0	22	41	35	25	19	18
Vacuum	83.5	74	53.8	20.5	0	0	0	0	0
Gas Tank Location									
In cowl	.....	.....	No	7.2	13	.....	.....	.....	.....
At rear	.....	.....	1916	51.1	41	.....	.....	.....	.....
Under seat	.....	.....	figures	21.2	46	.....	.....	.....	.....
			avail.						
Type of Clutch									
Disk	73.8	68	53.4	51	48	52	44	51	49
Cone	25.64	30	45.6	44	41	45	52	47	39
Expanding band	0	0	0	.5	3	1	3	2	6
Contracting band clutch	0	0	0	4.5	5	2	1	1	3
None	0	1	0	....	3	....	....	....	....
Electric	0	1	1.0	.....	.....	.....	.....	.....	.....
Location of Gearset									
Amidship	17.6	14	20.6	32.5	39	46	55	67	75
Unit with axle	7.37	9	15.3	18.2	15	20	20	17	15
Unit with motor	71.2	77	63.5	49.3	43	34	25	16	10
None	0	.....	0	.....	3	.....	.....	.....	.....
Infinite	0	.....	6	.....	.....	.....	.....	.....	.....
Final Drive									
Shaft and bevel	18.32	28	41.0	84.5	93	94	92	91	89
Chain	1.7	1.5	1.7	4.5	4	4	6	8	11
Shaft and worm	0.56	0.5	.5	1.5	1	1	1	0	0
Roller	0	0	0	0	1	1	1	1	0
Shaft spiral bevel	79.42	70	56.8	9.5	1	.....	.....	.....	.....
Type of Axle									
Floating	42.35	43.5	51.8	56.5	65	67	50	0	0
Semi-floating	26	25.5	23.6	23.0	17	26	49	0	0
Three-quarter	30.5	29.5	22.8	18.5	14	4	0	0	0
Seven-eighths	.....	0	0	0	1	0	0	0	0
Dead	1.15	1.5	.6	2.0	3	3	1	0	0
Timing Gear Drive									
Spur Gear	2.27	4	8.4	16.1	13	83	.....	.....	.....
Helical or spiral	79	74	73.0	73.7	77	10	.....	.....	.....
Silent chain	17.6	21	18.1	9.1	10	7	.....	.....	.....
Worm	0	1	.5	1.1	0	0	0	0	0
Bevel	1.13	.....	.....	.....	.....	.....	.....	.....	.....

Models Listed by Manufacturers for 1918, 1917, 1916 and 1915, Showing Changes in Proportion of Sixes, Fours and Other Engine Types

Car	VARIETIES OF ENGINE MANUFACTURED											
	1918			1917			1916			1915		
Abbott		6			6			6	8	4	6	
Aland				4								
Allen	4			4			4			4		
American		6			6							
Ams Sterling				4								
Anderson		6			6							
Apperson		6	8		6	8		6	8	4	6,6,6,6	
Arbenz	4			4			4			4		
Auburn		6			6,6		4	6,6		4	6,6	
Austin			12			12						
Bell				4			4					
Biddle	4			4			4					
Bour-Davis	4	6			6							
Brewster	4			4			4					
Briscoe	4			4			4		8	4		
Buick	4	6		4	6			6,6		4,4	6	
Cadillac			8			8			8			8
Cameron					6							
Campbell	4											
Case		6		4			4			4,4,4		

Car	VARIETIES OF ENGINE MANUFACTURED											
	1918			1917			1916			1915		
Chalmers		6			6,6			6,6,6			6,6	
Chandler		6			6			6			6	
Charter Oak					6							
Chevrolet	4		8	4		8	4,4,4,4			4,4		
Cole			8			8			8	4	6	
Columbia		6										
Commonwealth	4											
Comet		6										
Crawford		6										
Crow-Elkhart	4			4			4			4,4	6	
Cunningham			8			8						
Daniels			8			8			8			
Davis		6			6,6			6,6		4	6	
Detroiter					6		4			4		
Disbrow	4											
Dispatch	4			4			4					
Dixie				4								
Dodge	4			4			4			4		
Dorris		6			6			6,6		4		
Dort	4			4			4					

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Car	1918			1917			1916			1915		
Drexel				4								
Drummond						8						
Elcar	4	6		4								
Elgin		6			6							
Emerson				4								
Empire	4	6		4	6		4	6		4		
Enger						12			12		6	
Fageol		6										
Fergus		6										
Fiat	4			4			4	6		4	6	
Ford	4			4			4			4		
Franklin		6			6			6			6	
F.R.P.	4			4			4			4		
Geneva					6							
Geronimo	4	6										
Ghent		6										
Glide		6			6			6		4		
Grant		6			6			6		4	6	
Hackett	4			4								
Hal			12			12			12			
Hatfield				4								
Harroun	4			4								
Harvard	4			4			4					
Haynes		6	12		6	12		6, 6		4	6, 6	
Hollier		6	8		6	8			8			
Homer-Laughlin			8			8						
Howard					6							
Hudson		6			6			6			6, 6	
Hupmobile	4			4			4, 4			4, 4		
Inter-State	4			4			4			4		
Jackson			8			8	4		8, 8	4	6	
Jeffery				4	6		4	6		4	6, 6	
Jones		6			6							
Jordan		6			6							
Kent				4								
King			8			8			8, 8	4		8
Kissel		6	12		6, 6		4	6		4	6, 6, 6	
Kline		6			6			6			6, 6	
Lambert				4	6							
Laurel				4								
Liberty		6			6							
Lexington		6			6, 6		4	6, 6			6, 6	
Locomobile		6			6, 6			6, 6			6, 6	
Luverne					6			6			6	
Madison		6			6			6				
Maibohm	4	6		4								
Majestic						8, 8						
Marion-Handley		6			6, 6			6				
Marmon		6			6			6			6, 6	
Maxwell	4			4			4			4		
McFarlan		6			6			6, 6			6, 6	
Mercer	4			4			4			4		
Metz	4			4			4			4		
Mitchell		6			6, 6			6	8	4	6, 6, 6	
Monitor		6		4	6							
Moline-Knight	4			4, 4			4			4, 4		
Monroe	4			4, 4								

Car	1918			1917			1916			1915		
Moon		6			6, 6			6, 6		4	6	
Moore	4											
Morse				4			4			4		
Murray			8			8						
Napoleon				4								
Nash		6										
National		6	12		6	12		6, 6	12		6	
Nelson	4											
Oakland		6			6	8	4	6	8	4	6	
Ogren					6							
Oldsmobile		6	8			8	4		8	4	6	
Olympian	4											
Overland	4	6		4, 4	6		4, 4	6		4, 4	6	
Owen-Magnetic		6			6, 6			6, 6			6	
Packard			12			12			12		6, 6	
Paige		6			6, 6			6, 6			6	
Pan American		6										
Partin-Palmer				4, 4			4, 4		8	4, 4		
Paterson		6			6			6		4	6	
Pathfinder						12		6	12		6	
Peerless			8			8			8	4	6, 6	
Pennsy	4	6										
Phianna	4			4								
Pierce-Arrow		6			6, 6, 6			6, 6, 6			6, 6, 6	
Pilot		6			6			6, 6, 6	8		6, 6	
Premier		6			6			6			6	
Princess	4			4								
Pullman				4			4	6		4	6	
Regal	4			4		8	4, 4		8	4		
Reo	4	6		4	6		4	6		4	6	
Richmond					6							
Roamer	4	6			6							
Ross						8			8, 8			
Saxon	4	6			6		4	6, 6		4	6	
Sayres		6										
Scripps-Booth	4		8	4		8	4		8	4		
Seneca	4											
Shad-Wyck		6										
Simplex		6			6		4, 4	6		4, 4		
Singer		6			6			6			6	
Standard			8			8, 8		6	8			
States		6										
Stearns-Knight	4		8	4		8	4	6	8	4, 4	6	
Stevens		6			6							
Studebaker	4	6		4	6		4	6		4	6	
Stutz	4			4			4, 4			4, 4, 4	6, 6	
Sun					6							
Templar	4			4								
Tulsa	4											
Velie		6			6, 6			6, 6		4	6, 6	
Westcott		6			6			6, 6		4	6	
White	4			4			4, 4			4, 4		
Willys-Knight	4	6	8	4	6	8	4			4		
Winton		6			6, 6			6, 6			6	
Wolverine	4											
Woods	4			4								
Yale			8			8						

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Piston Refinements Increase Weight

Tolerance Limits Are Close, Even in Commercial Practice of Large Production Companies—Limit of Lightness Passed

PISTON weights show no tendency to decrease further. Rather in a few instances the weights have been increased in order to secure additional stiffness. It would almost be indicated from this that the prominence given to light reciprocating parts led some of the engineers to rather overshoot the mark in this respect. One of the prominent eight-cylinder manufacturers in Detroit used pistons which weighed last year, at the beginning of the season, 15 oz., minus the wrist pin and rings. This company has been forced to increase the weight of these pistons, due to inability to obtain stiffness, so its pistons now weigh 1 lb. and 3 or 4 oz. This is a cast-iron piston.

It is also true that the aluminum pistons are being made heavier, and this is in line with aeronautical practice abroad, where the aluminum pistons are at least as heavy as cast iron, but are employed because of their ability to rapidly carry off a great quantity of heat. From all accounts, it would seem that the bottom of the weight scale in pistons was reached at the end of the year 1916, and during 1917 there has been a tendency to either remain stationary or go slightly upward.

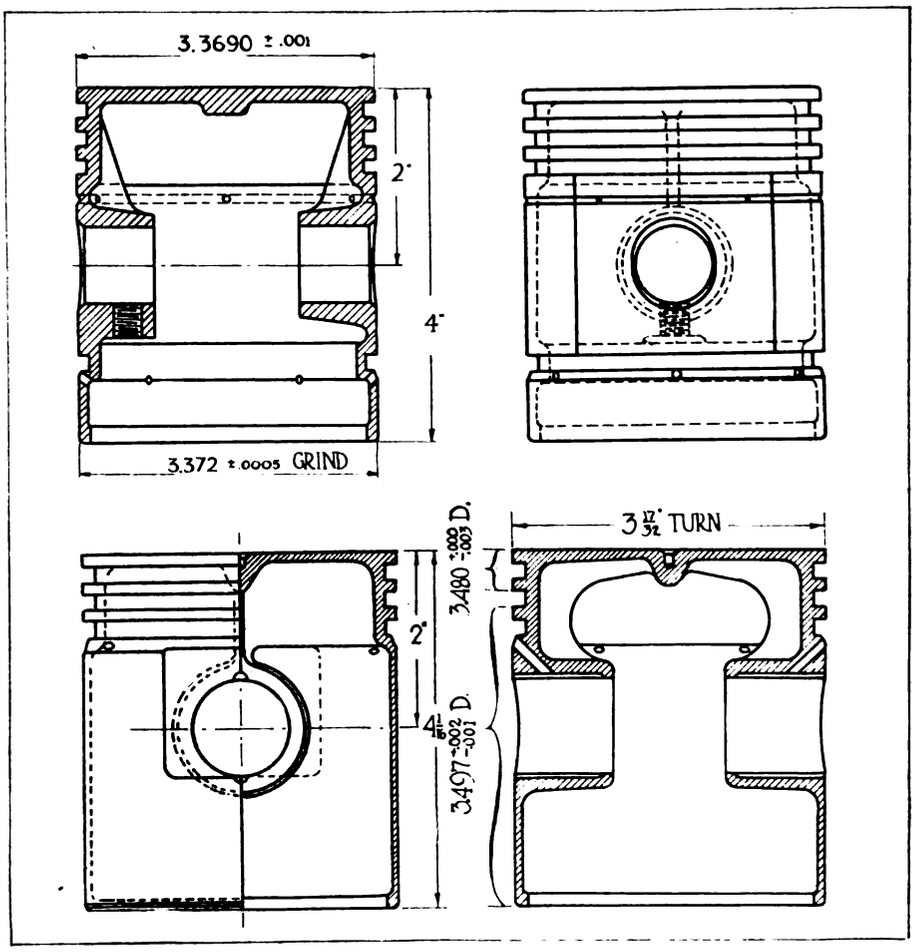
For example, the Hudson company, which decreased the weight of their pistons to a noticeable extent until the end of 1916, at which time a weight of 30 oz. was reached, including rings, will now keep the same weight piston for 1918. On the other hand, the Cadillac company has added about 5 oz. to its piston weight. The weights of the Willys-Overland pistons as measured on Nov. 12, 1917, are given in the table herewith:

Weights of Standard Pistons

Model 89-6 H.A. 306		
Cast Iron Diam. 3½ In.		
1—2.06 lb.	1—2.12 lb.	1—2.04 lb.
1—2.08 lb.	1—2.06 lb.	1—2.04 lb.
Model 88-8, No. 26038		
Aluminum Alloy Diam. 3⅝ In.		
1—0.66 lb.	1—0.68 lb.	1—0.72 lb.
1—0.56 lb.	1—0.72 lb.	1—0.72 lb.
Model 88-4, No. 25596		
Cast Iron, Diam. 4¼ In.		
1—2.90 lb.	1—2.80 lb.	1—2.84 lb.
1—2.90 lb.	1—2.80 lb.	1—2.84 lb.
Model 90, No. 19277		
Gray Iron, Spec. No. 12 Diam. 3⅝ In.		
1—2.20 lb.	1—2.20 lb.	1—2.16 lb.
1—2.20 lb.	1—2.18 lb.	1—2.14 lb.

It is very possible, also, that a gain in weight has been due to the tendency to increase the number of rings to three at the top of the piston, or of adding a wiper ring at the bottom. This tendency has been caused by the trouble due to leakage of fuel past the piston rings as much as it has been to the desire to prevent the leakage of oil into the combustion chamber after the engine has become warmed up.

Another point on piston design which may be commented upon is the tendency toward closer limits. It would not be surprising to learn that this tendency is a development from airplane practice, because fits are certainly much closer since the art of building racing and aircraft engines has advanced. A sample of what is required in piston manufacture may be mentioned, the practice cited being that of one of the most prominent manufacturers of six-cylinder cars in Detroit. The piston, which is 3 11/32 in. in diameter, has a clearance of 0.0035 in. after running-in. The maximum out-of-round tolerance for lands and barrels is not more than 0.001 in. The diameter of the piston barrel must be maintained in relation to the diameter of the two top lands, with a tolerance of plus nothing and minus 0.001 in. The thickness of the walls and the wall under the ring grooves must be maintained within plus 0.005 and minus 0.015. The weight of the piston must be between 29 and 32 oz. The pistons are to be balanced in groups of six, and the variation between the heaviest and lightest must not exceed ½ oz. The piston pins have a maximum clearance of 0.0015 and a minimum of 0.0005.



Above—Typical piston which shows the tendency toward an increased number of rings. This has three above the wrist pin and a wiper ring below the wrist pin. Below—Section through the piston used in the Hudson 1918 *car*

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Commercial Crankshaft Balancing

Machine Vs. Design Balancing of Crankshafts—Two Schools Not Influenced by Cost but by Engineering Belief

By J. Edward Schipper

WHEN the crankshaft balancing question began to assume serious proportions, due to increased rotative speeds, considerable discussion was started as to why the various methods suggested could not be put into practice on regular production jobs. At the present time this matter has been threshed out to two common methods, the first being where the dynamic balancing of the shaft is a part of its design and consequently no machine treatment is afterward necessary, and the second method where some type of machine is used to secure the dynamic balance. Manufacturers are divided between these two schools quite evenly in both the higher and lower-priced cars.

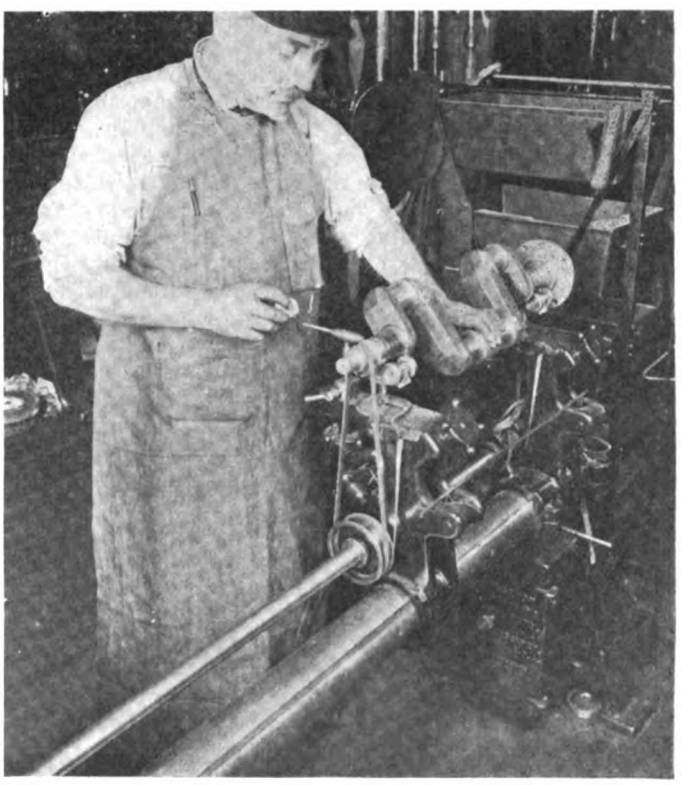
Packard does not use any balancing machine, but gets the shafts into proper running balance by machining them all over to very close limits. The theory is that after the balance is carefully figured in the design of the shaft and then the shaft is accurately machined to those figures, a perfectly satisfactory result will be secured. This type of engine, being a high-speed, twelve-cylinder design, representative of higher-priced cars shows that this is done not as a matter of cost, but because it is what is believed to be correct engine practice.

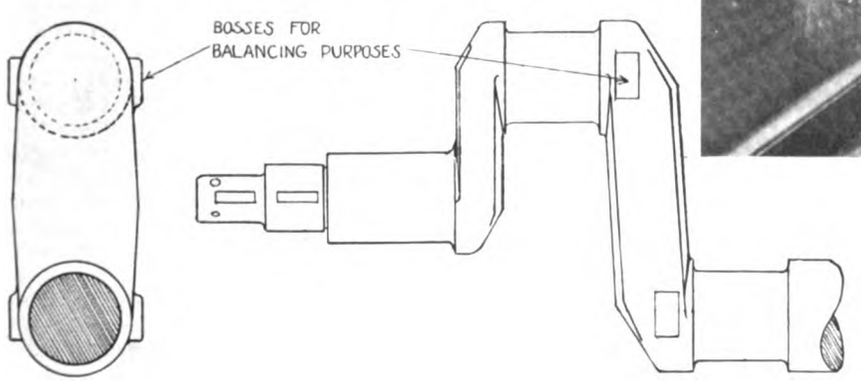
Maxwell Uses Design Balance

Another concern at the opposite end of the price scale which takes very much the same view of the situation is the Maxwell Motor Co. The Maxwell shafts are given only a static balance. During the process of designing the crank, however, the matter of dynamic balance was taken into account, and it was so constructed that it requires the removal of a very small amount of metal to bring the shaft into static balance. Since, theoretically, the inherent design of the crank is such as to bring it into dynamic balance, it is thought that the slight amount of metal removed to secure static balance does not affect this particular engine to any extent.

In the Hupp laboratory, experiments made by the engineering department have led this concern to doubt the practicability of dynamic balancing and also its usefulness upon touring-car engines. The reason for this as assigned by the engineering department is that the flywheel of automobile engines contains a clutch which is practically impossible to balance dynamically, for two reasons: First, because the parts of the clutch are not centered exactly with the crankshaft; second, because at least one element of the clutch does not maintain its phase with the crankshaft, but usually takes a different position every time the clutch is disengaged and engaged again.

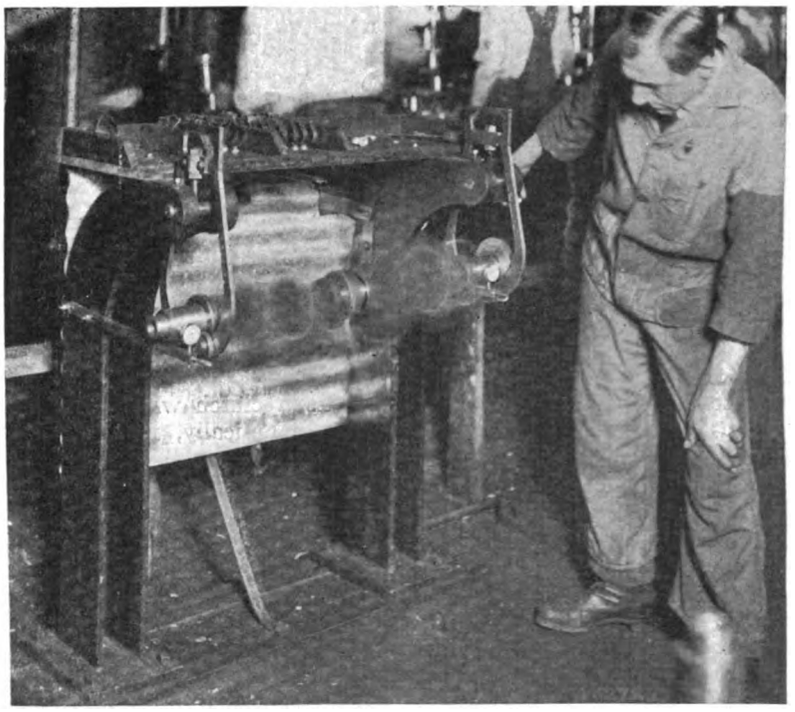
The Hudson crankshaft is so well known that it needs no further discussion. It is built in accordance with the disclosure contained in the Fekete re-issue patent No. 14,292, and its balance is a matter of design and not of any special procedure in the course of its manufacture. On production jobs the Hudson company tests the crankshaft for static balance by balancing it on knife edges, but otherwise does nothing in the way of special balancing procedure. It is claimed that dynamic balance is maintained beyond the range of speeds of which the engine is capable.

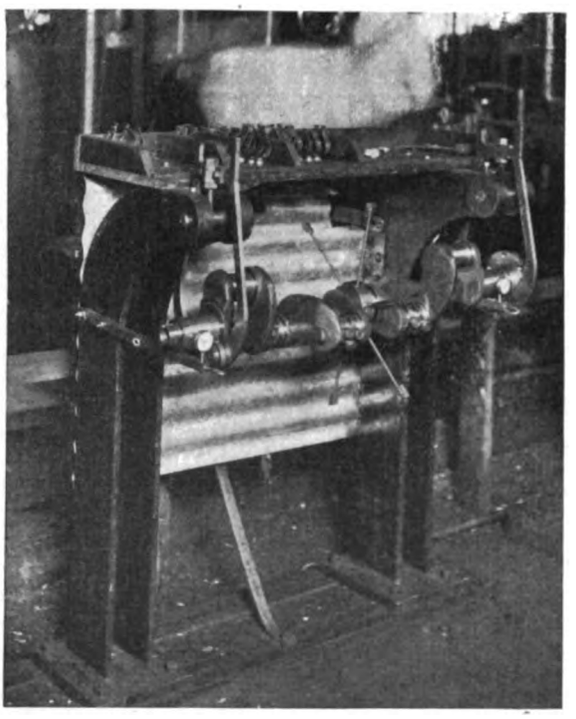




Left — Drawing of the Willys-Overland crankshaft, showing how the bosses are left upon the shaft for balancing purposes. Above—Willys-Overland shaft placed in the Norton balancing machine being marked for excess metal

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Left—Shaft being rotated in the Continental air-operated balancing machine. Right—Shaft in position in the Continental air-operated machine before air is turned on. The shaft is rotated by attaching a small paddle wheel on which a jet of air is played

Other manufacturers use machines in this work. The Studebaker Corp., for instance, uses a mechanical balancing method commonly known in the manufacturing field, the machine being the standard Norton balancing outfit. The Studebaker crankshafts, after forging, machining and grinding, are checked for alignment of bearings. They are then placed on the Norton machine and tried out for rotating or dynamic balance. The crankshafts are then marked as to where excess material should be removed, and upon taking off the desired amount of material, are again tested, the operation being repeated until the crankshaft is in balance. This method is stated by the Studebaker Corp. to be entirely satisfactory from both an engineering and production standpoint.

Very much the same method is used by Willys-Overland. The illustration herewith shows the application of the Norton machine in the Willys-Overland factory, with the workmen in charge marking on the shaft the place at which it is necessary to take off metal. The accompanying drawing of the Overland crankshaft shows the bosses which are left upon the shaft for balancing purposes. The desired amount of metal can be trimmed off these bosses without in any way impairing the strength of the shaft. They are ground down until the proper balance is secured.

The Oakland Motor Car Co. is using the Norton machine at the present time, but is experimenting on a new and original method of balancing, which will be described in an early issue of AUTOMOTIVE INDUSTRIES.

The method used by the Chevrolet Motor Co. is somewhat different. This concern has a fixture with four hardened and ground steel disks, which are about ⅛ in. thick on the outer edge and 5¾ in. in diameter. These disks are used as rollers on which the crankshaft is rotated while balancing. They are pivoted in pairs with center-to-center distance of pivots 3⅝ in., giving a pressure angle or contact point between the shaft bearing and the roller of about 45 deg. These two pairs of rollers are a proper distance apart to bring them in the center of the front and rear bearings when the crankshaft is placed upon them.

The shaft is thus tested for static balance, which must be within a limit of 1½ oz. This is obtained by means of a 1½-oz. weight which is held by spring-steel clips, the clip being sprung over the center bearing, bringing the weight 2 in. from the center line of the shaft, or in line with the center of the wrist pins, as on this particular design the crank has a 4-in. stroke.

The forgings are made with small bosses forged on either side of web or section of shaft between wrist pins, and when the shaft does not balance within the specified limit these bosses are ground off until the balance is restored.

An ingenious method used by the Le Roi Motor Co. is to suspend the crankshaft at one end by a flexible cord. The shaft is then rotated rapidly, and if it rotates accurately about its own axis, it is in dynamic balance. On the other hand, if it wobbles from side to side the ends are heavier than the center. If it tends to rotate so that its axis generates a cone about the point of suspension, it is heavier at the bottom, and if it tends to generate an inverted cone, it is heavier at the top. This method is cheaply installed and forms a good way of commercially balancing crankshafts.

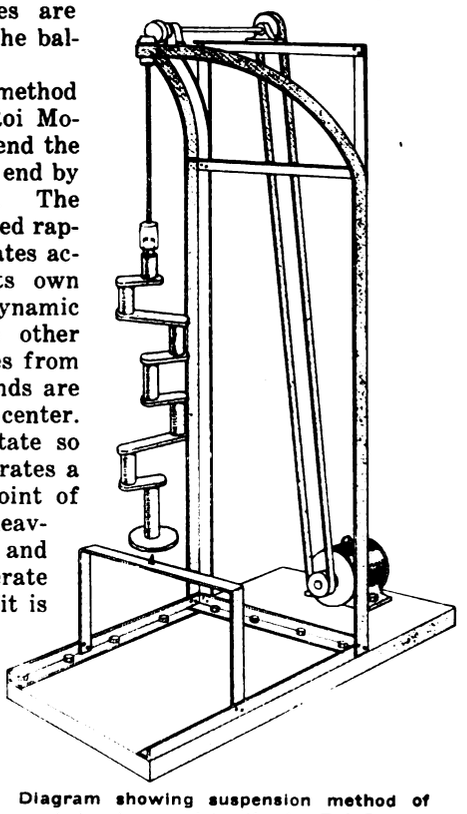


Diagram showing suspension method of balancing used by the Le Roi Co.

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Impulse Starters for Tractors

Enable a Starting Spark to Be Obtained Without Spinning Engine—A Number of Designs Offered, Differing in Type of Spring Used and in the Form of the Detent Mechanism

AT the present time magneto ignition is the accepted practice in tractor engineering. Tractor engines run up to very large sizes, which it is entirely impossible to spin by hand. A set of dry cells with some auxiliary mechanism would serve to give a hot spark even if the engine were cranked over very slowly, but ignition engineers familiar with the conditions under which tractors are operated prefer to do without dry cells. The inability of the ordinary magneto to furnish the one spark required for starting was certainly a great handicap in the field of slow speed engines, but magneto engineers did not let the difficulties attached to the solution of the problem involved stand in their way and produced magnetos which will generate firing sparks no matter how low the cranking speed.

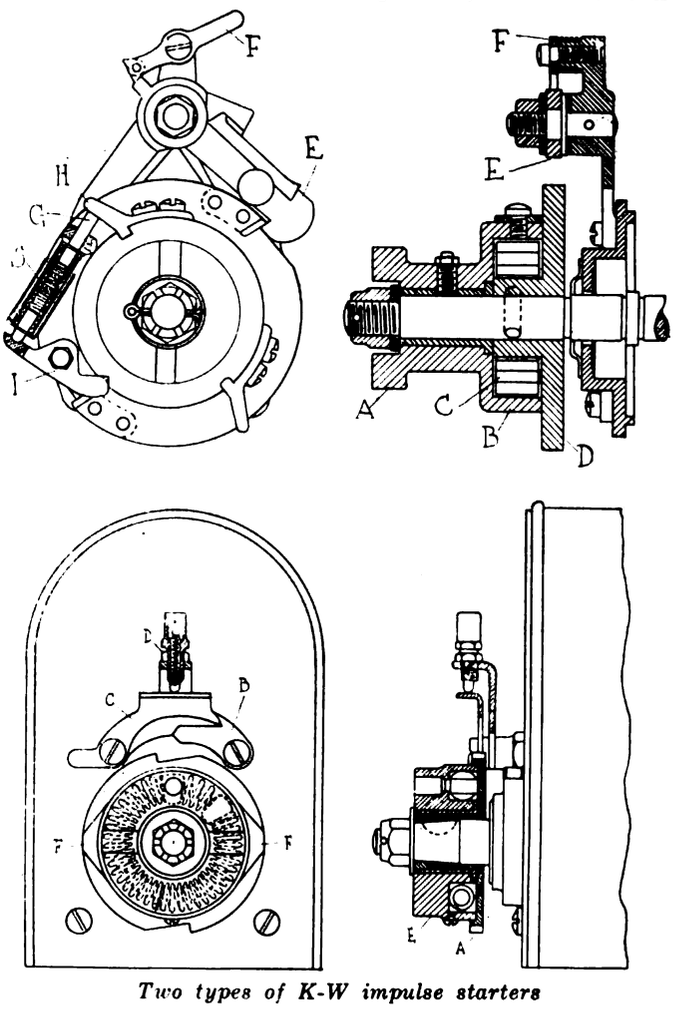
Originally the alternating current ignition magneto was developed for automobile service, and an automobile engine can be cranked sufficiently fast to cause the magneto to generate a firing spark. Even so, it was much easier to start the engine on battery current, as this required merely turning the engine over the dead center, and in this country it became customary to use dual or double ignition, which combined the use of battery current for starting with magneto current for regular running.

The problem of devising some means for obtaining a hot spark from a magneto at low speed first presented itself when this device was applied to stationary engines. These engines often run at such low speeds that a magneto geared to them in such a way as to produce no more than the number of current impulses per unit of time required to fire the charge would be operating at very low efficiency. The ordinary revolving armature magneto produces two impulses per revolution of its armature, and a single cylinder, four stroke engine requires only one spark every two revolutions of its crankshaft. Hence the proper gear ratio would be such that the magneto armature made one revolution to every four of the engine crankshaft. The impracticability of operating a magneto armature only a couple of inches in diameter at, say, 50 r.p.m. is quite apparent. It is, of course, the speed of the armature at the moment the circuit is broken that really counts, and not the average speed in driving the armature from the engine crankshaft at a uniform speed. The expedient was resorted to of partly rotating the armature in its bearings against the tension of a coiled spring, then suddenly releasing it by means of a tripping device and allowing the armature to flop back under the tension of the spring. In this way very considerable momentary armature speeds were obtained. The principle is made use of not only for starting but in regular operation as well.

For use in engines which in regular operation run at considerable speeds such a tripping mechanism would hardly be considered, because at higher speeds inertia begins to play an important part, and there are, of course, no inertia forces to be taken account of in a machine rotating at uniform speed. This applies to tractor work. The normal speed of tractor engines is quite sufficient to make it practical to drive a magneto directly, but the difficulty of cranking these engines by hand calls for a device whereby the armature speed can be momentarily accelerated when cranking. Such a device is known as an impulse starter and at present all of the magneto manufacturers catering to the tractor trade either offer such a starter or are working out the details of one.

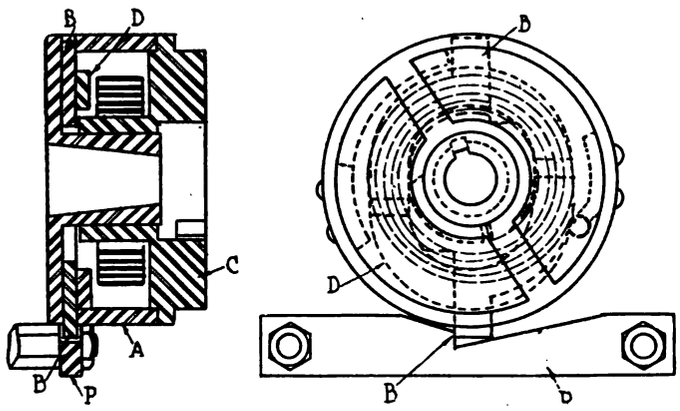
An impulse starter is a device whereby the magneto armature can be held stationary in a certain position while a spring is being wound up or compressed by the motion of the engine; when the spring has been put under the proper pressure a detent operates and causes the armature to be accelerated by energy stored in the spring. This insures the necessary hot spark for starting. The detent device must be so designed that when the engine runs at normal speed it does not catch and the magneto is driven without change in the timing.

While at present impulse starters are used mainly on tractor engines, the first starter of this type, it seems, was designed for use on automobiles. At least some 10 years ago J. S. Bretz & Co. of New York imported a magneto known as the U. & H. which embodied this feature. Two views of this starter are shown herewith. The driving shaft *A* is formed with an integral disk *B* which at one point of its circumference carries a pin *C* to which one end of the coiled spring *E* is anchored. The other end of this spring is attached to a brass disk *F* secured to the magneto armature. Disk *F* is of irregular shape and is provided with a radial slot containing a steel ball *G*. When disk *F* turns right-handedly the steel ball *G* abuts against a projection *H* on the stationary armature housing. The result is that when shaft *A* is rotated, spring *E* is wound up, and this continues until a conical depression *I* in disk *B* comes opposite the steel ball. Then the ball drops into this depression, the armature is

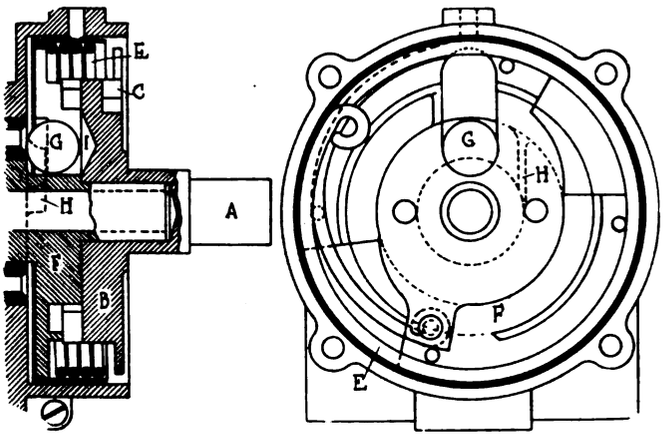


Two types of K-W impulse starters

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Kingston impulse starter



The U & H, pioneer of impulse starters

suddenly released, the spring unwinds and gives the armature a considerable speed, thus producing a relatively hot spark. The projection or cam *H* is so arranged on the circumference of the field pole circle that the unwinding of the spring begins when the armature comes into the arc of the greatest inductive effect. When the engine attains its normal speed the steel ball is carried to the outer end of the slot in disk *F* by centrifugal force and does not strike projection *H* in its rotation.

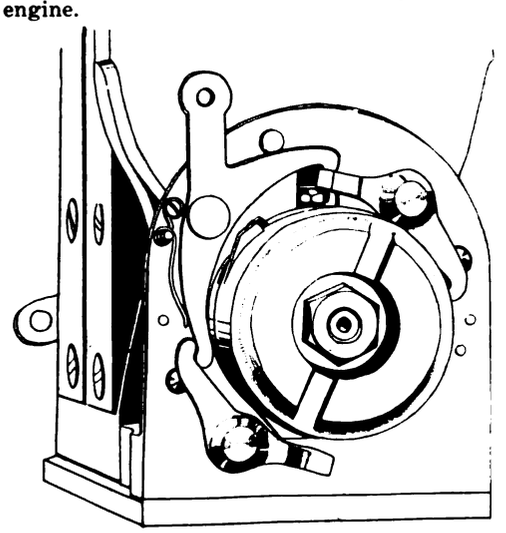
Probably the first American firm to get out an impulse starter was the K.W. Ignition Co. of Cleveland. The original K.W. impulse starter is shown on page 23. Combined with the clutch member *A* is a spring case *B* in which there is a spiral spring *C* whose ends are fastened to the spring case and to the ratchet disk *D* respectively. The latter is solid with the armature shaft, to which it is pinned. A pawl *E* pivoted on the magneto frame is adapted to engage into the notches on the ratchet disk *D*. On the circumference of the spring case *B* there are two knock-off cams *G* which when the spring case is turned while the ratchet disk is being held stationary will force the pawl out of the notch on the ratchet disk and release the latter. When once released the pawl is held out of contact with the ratchet disk by the lock F. As soon as the ratchet disk is released, it and the armature are spun rapidly by the spiral spring. As the engine is being cranked the clutch member *A* and spring case *B* are turning at a certain speed, but the ratchet disk *D* jumps ahead of the case *B* with the result that the knock-off cam abuts against a plunger *G* mounted on a cushion spring *S* on the ratchet disk. This same spring *H* serves to press the dog *I* into a notch in the outer surface of the spring case *B*. Before starting an engine fitted with this impulse starter the lock *F* must be pressed down so as to release pawl *E*. The reason for the double hook on pawl *E* and for two knock-off cams *H* turned in opposite directions is to adapt the starter for both right hand and left hand magnetos. The ratchet holds the armature back for a motion of the driving coupling of about 80 deg.

A somewhat different design of starter, in which a coiled spring is used to store up the energy for giving the impulse to the armature, is used by the K. W. Ignition Co. on its model T. K. magneto (page 23). In this model the ratchet disk *A* is held from rotating by pawl *B*, which can be held out of contact with the ratchet disk by catch *C*. A spring pressed plunger *D* normally holds the catch in engagement with the pawl. As in the previously described model, the coupling members and spring case are formed in one unit *E*, which is turned with a groove in its face in which the coiled spring lies. The spring is located between two stops, of which one is secured to the ratchet disk and the other to the spring case. There is a second small spring, acting as a buffer spring, which fills the rest of the channel in the spring case not occupied by the main spring. This buffer spring takes up the reaction when the ratchet wheel is released and the armature snaps forward. Disengagement of pawl *B* is effected by means of cam lobes *FF* on the outer surface of part *E*. The pawl is made of sufficient width so that its nose may engage both the ratchet wheel and the cams.

Another impulse starter is the Kingston made by the Kokomo Electric Co. Referring to this design the ratchet or slotted part is stationary and the pawl revolves. The sectional view shows the spring to be of the flat spiral type. The hub of the spring housing *A* is turned out to a taper to fit the magneto shaft. There is a double pawl, the teeth *BB* of which pass through slots in the outer wall of the spring housing. One end of the spring is secured to the housing and the other to the clutch member *C*, which latter has a hub telescoping the hub of the housing. Secured to the pawl is a cam *D* which is acted upon by a detent device carried by the coupling member. When the coupling member begins to turn, the spring housing being held from rotation by the pawl, the spring is wound up. Gradually the detent device works up the slope of the cam, and when it reaches a certain position the pawl is withdrawn from the notch in the catch plate *P* and the armature jumps ahead.

The Swiss Magneto Co., Monroe, Mich., manufactures an impulse starter which gives two impulses per revolution of the magneto if desired. In this device use is made of a flat helical spring. There are two main parts to the coupling, one keyed to the magneto shaft and the other telescoped over the hub of the former. A bracket screwed to an extension of the magneto base carries the detents and the lever for settling same. When power is applied to the Oldham coupling member while the detents are set, the spring is wound up until the cam on the coupling member releases the detents. Then the armature is spun forward. This causes a post on the coupling member to be engaged between a stop and a dog on the ratchet wheel, so that the timing cannot vary when the engine is running at normal speed.

From the detent lever connections can be made to any part of the machine, so the operator need not raise the hood to set the detents. As long as the driver pulls on this lever the impulse effect is obtained; hence the detents must be released as soon as the engine is started, as unnecessary use of the impulse device simply wears it and reduces the power of the engine.



General view of Swiss impulse starter

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The War's Effect on the Industry

Economy Will Be the Keynote of Design—Miles-Per-Gallon a Greater Criterion Than Miles-Per-Hour—Excessive Flexibility Demands Must Be Dropped—Cheaper Grades of Fuel Will Have to Be Used

By A. Ludlow Clayden

War's influence on automobile design and on automobile merchandising was the general topic of discussion at the December meeting of the S. A. E. Metropolitan Section held at the Automobile Club of America on Thursday evening, Dec. 27. Of the two papers of the meeting, one, by A. Ludlow Clayden, engineering editor of AUTOMOTIVE INDUSTRIES, *is reprinted herewith. The other paper, How the War Will Affect the Automobile Dealer, was by Ray W. Sherman, editor of Motor World. A number of prominent New York dealers were present and took part in the discussion.*—EDITOR.

THERE are hardly any prophets left who will venture to predict the duration of the war. Lacking any definite ideas on this subject it is hard to anticipate the effect of the war on the American automobile industry in the ultimate. To make any sort of an analysis it is necessary to assume that the war will last a substantial time, a year or more at least.

If the war does not end before Dec. 27, 1918, the passenger car industry of this country will still be one of the greatest industries of the U. S. outside of munition making, which will be temporary. It will maintain its position because America is the world's automobile factory, just as China and India are the world's tea centers, just as Brazil is a coffee center. The United States is the logical place for the manufacture of the bulk of the world's supply of passenger cars, and as long as that is true, just so long will passenger car making be one of the mainstays of American trade.

War is having an effect upon every last detail of civilized life, and it is going to affect automobile design just as much as other things. We are to-day entering an era in which the highest ideal of a man or of a nation is the ideal of economy. Never before in history has economy been more admired than extravagance, never before has a change in public sentiment been made so swiftly. The American nation, a leader in so many things, has for fifty years been proud of the fact that its resources permitted it to be a leader in extravagance. Like the wealthy man who demands the best of everything, America has been the wealthy nation able to pay for whatever it wanted.

Now this is all changed. The admired man to-day is he who, though able to spend on personal gratification, holds back and contents himself with something smaller, giving the balance to the vital needs of the day. This is not only a temporary condition to end with the war. It is a condition which will last long after the war is over, a condition which is being impressed so strongly on the minds of the now adolescent generation that it may well become the ruling spirit of the next hundred years.

If these premises are sound, then the American passenger car of the near future is going to be one in which economy is a strong feature. A car of which the first cost, plus the maintenance cost over a period of years, will make a good showing. We are about to exchange "what will she do on high?" for "what will she do to the gallon?"

IT IS A FACT THAT ALREADY THOSE CARS WHICH HAVE A REPUTATION FOR ECONOMICAL OPERATION HAVE SUFFERED FAR LESS THAN THOSE WHICH ARE KNOWN AS WONDERFUL PERFORMERS.

The volume of passenger car business being done today represents little more than the essential trade which supplies transportation to those who need it. The whole agricultural life of the whole United States and a good half of the business life of small towns and large cities depend today upon passenger car transportation. The farmer's timetable of his week's work is laid out on a schedule that necessitates a car to get him from point to point. And on the city side, just imagine, say, Philadelphia bereft of passenger cars. Think of the utter impossibility of living in Philadelphia's residential districts without road transportation.

THE LAST TEN YEARS OF AMERICAN TOWN PLANNING HAS BEEN ON AN AUTOMOBILE BASIS.

THE AMAZING INCREASE IN AMERICA'S AGRICULTURAL OUTPUT IS DUE TO THE RAPIDITY OF GROUND COVERING PROVIDED BY THE AUTOMOBILE.

But the average American car has exacted too high a price for the service it rendered. Not too high a first price, but too high a maintenance price. It has been too big, too heavy, too powerful; too extravagant of fuel, of oil and of tires; too frequently in need of repair.

To take just one instance: it is absurd to utilize two tons of machinery to carry a man ten miles from his home to his office. It is equally absurd to provide his car with an engine which normally has a fuel efficiency of 10 per cent, when it could have a 20 per cent efficiency by sacrificing the ability to crawl on high gear.

I do not wish to quote the European example as in any sense a criticism; but it is true that European cars have been much less costly to operate. They have to be because of the much smaller average wealth. The English or French user simply had to consider running expense. He had to have an economical car or none. This is the reason why motor cycles have had such an immense vogue on the other side of the Atlantic. The average American says "*I* can't ride a motor cycle." "It isn't in keeping with my position; my friends would roast the hide off me." True enough last year—but will it be true next year?

Similarly it has been an ideal to have a huge car, an ideal fostered by advertising and by salesmen everywhere. Without doubt the big car has its comforts, but the little car has conveniences which more than counterbalance. Nobody who has tried both would ever choose a 140-inch wheelbase car for shopping in preference to a 110-inch one, provided both were of the same standard of engineering. At present engineers then have two ways to work—one towards a car which is more economical because it is smaller; another towards a car which is more economical because it is inherently better.

It is just a personal opinion, perhaps worth quoting in passing, that the greatest trade open to a magnetic system of transmission is in a car with about 110-inch wheelbase, a 200-cubic inch engine and made in a quality which will make its fair price around $2,000.

There is another thing. We are nearly at the end of gasoline as we know it. No doubt the fuel ten years hence will still be called gasoline, but it will not operate a 1918 gasoline car. We have got to learn to sacrifice the absurdities of "flexibility" existing in the modern engine in order to use a fuel which we will be able to buy for a third the present price. There is nothing to prevent a man lighting cigars with dollar bills if he wants to, but the world at large thinks it silly when matches are so cheap. At present the automobile is running on dollar bills instead of dimes, with little more real reason.

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Scotland Favors Light Farm Tractors

Demonstrations Show That This Newer Type Machine Is More Suitable for Routine Farm Work Than Heavier Ones

EDINBURGH, SCOTLAND, Dec. 11—The following is practically the complete report of the special committee in conjunction with the three tractor demonstrations held in Scotland last October. The first of these demonstrations was held in Edinburgh, Oct. 17 and 18, the second at Glasgow, Oct. 22 and 23, and the third at Perth, Oct. 26 and 27. The following report is based on conclusions arrived at by the committee in conjunction with all three of these tests. In reading the report it should be borne in mind that relatively small areas were plowed due to the difficulty of securing large areas. The conclusions of the committee were published in a recent issue of AUTOMOTIVE INDUSTRIES.

The following is the report:

The committee was instructed, in preparing the official report on the demonstration, to give special attention to the following points:

a—Weight of machine.
b—Mechanical design and construction.
c—Quality of work.
d—Time taken and attendance required.
e—Adaptability for plowing different widths and depths.
f—Adaptability to various kinds of work, such as cultivating, harvesting, road haulage, and the like.
g—Ease and safety of handling.
h—Ease of turning, and space and time required for same, and uniformity of furrow ends in plowing.
i—Facility and efficiency of attachment of tractor to plow other farm implements.
j—Price.

Nature of Ground

The ground at the first demonstration consisted of a deep free loam, with occasional earth-fast stones. Part was in lea, part in stubble, and from part a potato crop had been taken. On the two larger fields, one of stubble and one of lea, there was a gradient, reaching at its steepest part 1 in 7. This gradient, which averaged about 1 in 12, occurred nearly equally throughout all the plots.

At the second test both stubble and lea were provided, but on account of extremely wet weather before and on the days of the demonstration it was found impracticable to attempt plowing of stubble. The lea field consisted of tough old grass land, which when last plowed had been set up in ridges, thus increasing the difficulty for multiple plows carried on frames which are adjusted by wheels. The gradients were not severe.

The ground at the third test consisted of a free loam overlying a clay subsoil, and was somewhat shallow on part of the rising ground. Both lea and stubble were provided. The lea field was practically level, as was also one of the stubble fields, although on this latter the conditions were rendered somewhat more severe through dung being spread on the surface. On two other stubble fields there were stiff gradients, averaging about 1 in 9, and reaching a maximum in places, and for short distances, of 1 in 5.2.

As there was a large number of entries, and it was desirable, for the convenience of visitors, that the machines should be seen at work within as small an area as possible, the plots laid off were smaller than might otherwise have been considered desirable. These varied in extent from about three-quarters of an acre to about two acres.

Prior to the demonstration, feerings were drawn by horse plows, and headlands were marked off twelve yards in width. At Edinburgh and Perth the system of plowing was entirely winding or scaling—*i.e.*, the tractor was required to plow out the land which lay between the feerings which bounded its plot. At Glasgow the machines were required to gather to the feering, which was in the center of each plot.

Conditions and Regulations

Exhibitors were left as free as possible to demonstrate the capabilities of their machines in the manner they considered most suitable. No restrictions were imposed as to the plow to be used, the number of furrows taken, or the speed of the tractor. The depth of plowing was, however, prescribed, and varied at the different centers from 6 in. to 8 in. for lea, and from 7 in. to 9 in. for stubble. Any machine which failed to plow to the required depth, or which was unable to perform the work to the satisfaction of the stewards and committee, was prevented from proceeding until the fault had been remedied.

Twenty-nine tractors took part in the demonstration. The number of plows was considerably greater, as several tractor exhibitors sent more than one plow, and a number of plow-makers entered plows independently. The report gives a detailed description of the machines, alphabetically arranged according to the names of the exhibitors, and then states:

Classification of Machines

The twenty-nine machines which took part in the demonstration may be grouped according to the following classification:

Wheels—
15 ran on 4 wheels.
6 " " 3 "
4 " " creeper tracks.
4 were single-unit machines (1 with creeper).
—
29

Attendance—
11 were handled by 2 men.
18 " " " 1 man.
—
29

Fuel—
25 were driven by paraffin.
3 " " " gasoline.
1 was " " steam.
—
29

Weight—
2 weighed 8960 lb. and over.
3 " 6720 " " "
6 " 5600 " " "
7 " 4480 " " "
3 " 3360 " " "
8 " under 3360 lb.
—
29

Report by Official Observers

The decision of the directors that the demonstration should not be regarded as a competitive trial precludes the Reporting Committee from making any attempt to arrange the vari-

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ous tractors exhibited in any order of merit. Even apart from this, however, they do not believe that the circumstances and conditions of any such demonstration would make possible any final judgment on the merits of various types of machines, since very important considerations could only be determined in a much more extended period than that which was available.

But while the committee cannot properly make such a report as would definitely advise intending purchasers in the choice of a tractor, they believe that the observations which follow may be useful in this direction, as well as in suggesting to engineers important respects in which agricultural tractors and plows may be made more useful in tillage operation.

Weight

With regard to weight, it will at once be apparent that, in many cases, the tractors shown have been evolved on the lines of the heavy steam tractor. The most noteworthy feature of the present demonstration was the appearance of the light land tractor constructed on new lines. Several manufacturers appear to have departed from the idea that great weight is necessary for a tractor to do efficient work on the land. It was clearly shown at the demonstration that light machines, adequately provided with spuds, grip the ground and perform the work better than the heavier machines. Every drawback, such as slipping in soft land and inability to climb gradients, was aggravated by increase of weight above a certain limit. Extra weight also increases the risk of breakages where stones are encountered, and the danger of injury to the land through compression, this being very noticeable during the demonstration, especially when the driving wheel on the land traveled within a few inches of the previous furrow. Besides this, a heavy tractor is at a distinct disadvantage for the other and lighter forms of cultivation, such as grubbing, cultivating, seeding, and harrowing, and also for harvesting, especially where the land is sown out with grass seeds.

The light tractor is quite suitable, not only for plowing, but for these other farming operations, and therefore embraces all the usual requirements of a farm tractor, including the driving of a threshing-mill and other farm machinery. It should be kept in view that for heavy stationary work proper anchorage must be provided. The only class of work for which the light tractor does not appear to be suited is road haulage. For road haulage weight is a necessity, as spuds cannot be used to give the necessary gripping power.

This leads the committee to the conclusion that field work and road work are more or less incompatible, and that a light tractor, such as is suitable for land work, is not so useful for road haulage. In addition, for road work, a tractor should be sprung to minimize the vibration, while for field work springs are undesirable, and only entail extra weight.

The committee have come to the conclusion that, to suit conditions in Scotland, an efficient land tractor need not exceed 3360 lb. in weight. In point of fact, several of the tractors which did excellent work at the demonstration were well within that weight.

Horsepower

While, at the demonstration, the machines were shown in the hands of experts, it is generally recognized that under ordinary farm conditions the driver of the tractor may not be able to obtain the maximum output of power, and that for this reason a substantial reserve of power is highly desirable. It must be kept in view that under unfavorable weather conditions considerable waste of power will occur through the softness of the ground and extra friction due to the clogging of the wheels and moving parts with mud, stubble, and manure.

For these reasons the committee is of opinion that for general farm work a tractor should have ample engine power, and they consider that to give the necessary margin of safety 20 B.hp. is the minimum.

In arriving at this conclusion they have in view that the tractor should be capable of hauling a plow taking two full furrows under the worst conditions, and three furrows under favorable conditions, and should also be capable of driving a 4 ft. 6 in. threshing mill.

As stated above, five tractors, embodying a caterpillar track arrangement, were shown.

While this arrangement undoubtedly distributes the actual dead weight, and thus reduces the intensity of pressure on the land, it appears certain that there must be excessive wear and tear on the creeper.

As far as the committee was able to observe, the creeper machine has not been shown to have any advantage in gripping power over the best type of wheel machine, and when it has to encounter a stiff gradient on greasy land it is very liable to slip.

Spikes, Bars and Spuds

The various devices used for giving the wheels the necessary grip of the land may be classified into three groups:

1. Spikes—either round or square in sections.
2. Bars—varying in length and in the angle at which they are placed on the rim of the wheel.
3. Spuds—mostly rectangular in section, and about 3 in. or 4 in. in width.

With regard to spikes, the committee is of opinion that on soft land these do not give sufficient gripping power, and they are also liable to bend or break. Bars, on the other hand, are open to the serious objection that when their width approaches the width of the furrow they cut the turf into sections, and thus seriously interfere with the proper turning of the furrow. Where very long bars are used this drawback is particularly noticeable, and the effect is greatly to impair the quality of the work done. On the whole a stout spud 3 in. to 4 in. in width and from 4 in. to 5 in. in length appears to be the most satisfactory, especially when these spuds are so arranged, in relation to the circumference of the wheel, that the full gripping power of one spud, or its equivalent, is always in operation.

Accessibility and Protection

The committee noted that considerable attention had been given to rendering the vital parts of the machinery more accessible, and also to providing protection from the effects of bad weather. It should be kept in view that tractors require to be left in the fields, where they are exposed to the weather and to the danger of being tampered with by the public, especially in populous districts, and makers should therefore aim at the provision of complete protection. It would also be an advantage to provide some protection for the driver.

Brakes Are Needed

It is desirable, especially for transport purposes, that all tractors should be provided with adequate brakes.

Reliability and Durability

In a demonstration such as the present little opportunity is afforded of forming any definite opinion as to reliability and wearing qualities of the machines. The fact that only one tractor of those which started failed to complete the six days' work seems to indicate that a fair degree of reliability has been obtained, especially considering the amount of shifting and railway transport which the machines had to undergo. In this connection it should be kept in view that the demonstration was a fairly severe test. At the demonstrations there were few machines which did not encounter earth-fast stones on some part of the ground, and that without incurring any serious injury. At the second demonstration the weather was of the severest kind, and the ground was consequently in a very bad state. At the third test a feature of the trials was the gradient on the stubble fields, which was as steep as 1 in 5.2 for short distances in one or two places, and a considerable part of which averaged 1 in 8 or 9. These gradients were successfully negotiated by several of the tractors, even although the ground was in a soft condition.

Two defects may be mentioned as tending to impair durability. These are the exposed gear drives on some of the wheel tractors, which fill with mud and grit, and the already mentioned excessive wear associated with the caterpillar arrangement.

Spring and Other Connections

The committee observed that many makers now recognize the necessity of making some provision for minimizing the

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effect on the plow of striking an earth-fast stone. This took the form, in most cases, of a device embodying a wooden peg, which shears on being subjected to undue tension, thus carrying out the principle of the weakest link. This appears to be a somewhat crude arrangement, particularly as it fails to act as an absorber of minor shocks. The committee is of opinion that the drawbar should be provided with some spring appliance, which would relieve the strain on the plow in the case of encountering minor obstacles. With this might be incorporated a release device, which would completely detach the plow under the strain of a heavy shock. The committee suggests that this attachment should be an integral part of the tractor, and not merely a casual device inserted in the draught connections.

It was also observed that while sufficient provision was made for alteration, in a horizontal direction, of the point of attachment of the plow to the tractor, in few cases was provision made for shifting this point in the vertical direction. This is of importance, as for different implements different heights of attachment are required, and even for plowing it was observed that, in some cases, the point of attachment was too low, and there was no means of raising it.

Best Speeds

On the whole, the speeds provided by the makers of the various tractors appeared to be suitable. Most were provided with at least two speeds forward and a reverse. For consistent good work in plowing, any speed exceeding 2½ cr 3 miles an hour is excessive. This would also apply to mowing and reaping. For spring cultivation a higher speed is desirable. The committee therefore suggests that speeds of 2½ and 4 miles per hour should meet the requirements of a tractor for use on the land.

The Fuel Situation

It is to be regretted that it was found impossible to carry out any test of fuel consumption in connection with the demonstration. As the question of fuel consumption is of great importance, it should be explained why this was not done. There are two ways in which fuel consumption may be measured:

1. By emptying the tank of the tractor, filling in a definite amount of fuel and noting the work accomplished on that amount.

2. By completely filling the tank, and, after a definite amount of work has been accomplished, refilling and noting the amount of fuel required to refill, which will give the measure of the amount consumed. Both of these plans presented serious difficulties. In the case of the first there was the difficulty that many of the tractor tanks could not be completely emptied. In that of the second the amount of fuel required to fill completely all the tanks, some of which had a capacity of 20 or 30 gal., was such that, under present conditions of fuel supply, it could not be undertaken. In addition to these, there was the difficulty at this time of providing a sufficient number of trained observers to accompany each machine throughout the duration of the test.

Other factors which would tend to render such a test unreliable were the variations in the character of the soil and in the type of plow used, together with the fact that the duration of the demonstration was not sufficiently long to provide time for a reliable consumption test.

The committee formed the opinion that the carbureters on many of the tractors were not capable of thoroughly and completely vaporizing kerosene, and that consequently the combustion in many cases was defective, and the haulage power of the tractor seriously impaired. It may be found, when normal conditions return, more satisfactory to use gasoline rather than kerosene, as being more efficient, even although the price be somewhat higher.

Plow Defects

While some of the plows did excellent work, speaking generally, the work of the plows was much less satisfactory than the work of the tractors. Where a plow expert was in attendance, the plows were soon adjusted to suit the land conditions; but in most cases the man in charge of the tractor, not being a plow expert, was content to devote his attention to the tractor, with the result that the work done was far from satisfactory. Many of the plows, and especially those of foreign construction, were unsuited to perform the work as required in this country. The lack of means of adjustment to varying widths, so as to suit the depths and the class of work, was a conspicuous defect. The furrow slice turned by some of the plows was too wide for work on lea, and perhaps too wide also for early stubble plowing on stiff clay soils. Makers should note that merely turning over the land will not suit Scottish conditions for autumn and winter plowing.

It was further noted that many of the plows which did good work on stubble did unsatisfactory work on lea. If the same plow is to be used for both lea and stubble, it must be made adjustable as regards width of furrow from, say, 8 in. to 12 in.

It may, however, be found more advantageous to have two plows, and that for the following reasons:

1. The provision of means of adjustment may be found to affect the rigidity of the plow, while only providing to a limited extent for the double operation; and

2. The power-drawn plow, being an important farm implement, its breakdown is a serious inconvenience, and therefore it is desirable to have an extra plow in case of emergency.

Many Automatic Lift Plows

For plowing lea, with rough grass on the surface, the plow should be fitted with a disk coulter and skimmer to cut and turn in the grass.

Many of the plows were fitted with automatic lifts, which had the effect of making the tractor and plow a one-man outfit. This is a matter of prime importance, and demands the attention of all plow-makers.

One defect of the automatic lift as seen in operation—where the raising mechanism is operated from the plow wheels, and therefore depends on the forward motion of the plow—is that a plow cannot be lifted while the machine is stationary. That defect is overcome by the power-lift shown on one of the tractors, where the plow is lifted bodily out of the ground by a crane-like mechanism operated direct from the engine.

Another defect noted in some of the plows of foreign make was the absence of any device for regulating the width of the leading furrow, with the result that the position of the tractor affected the size of this furrow, and consequently, where steering of the tractor was not carried out with care and precision, the size of the leading furrow varied to such an extent as completely to spoil the appearance of the plowing. Tractors which had the guidance of one or more wheels in the furrow had an advantage in this connection. Plows with a guide-wheel in the furrow entirely overcome the difficulty, as the width of the leading furrow can be regulated to the same size as the following furrows.

Two suggestions with regard to tractor plows occur to the committee:

1. If the last unit of the plow could be made so that it could be thrown out of action by being raised by means of a lever or otherwise, it would give the option of plowing, say, two furrows on an up gradient and three on a down.

2. The introduction of a one-way plow would obviate the necessity of having feerings and finishes, most of which, under present circumstances, must be performed by horses.

Handling and Turning

At the demonstration all the machines were cleverly handled. The demonstrators were, of course, experts, but it did not appear that the management of the tractors presented any great difficulty to an intelligent man. There also did not appear to be any danger of personal injury associated with their use, provided reasonable care is taken.

The single unit machines had the advantage that the implement operated was directly under the observation of the driver; and the principle is worthy of commendation, especially having regard to its usefulness in other farming operations.

Ample headlands, measuring 12 yards in width, were provided for turning. Some of the larger outfits took the whole

(*Continued on page* 32)

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Special Spark Plugs Needed for Airplane Engines

1 Usual Insulating Materials Seldom Withstand Heat
2 Electrode Must Be Specially Cooled
3 Oil Must Not Reach Insulation or Must Be Burned
4 Plug Must Have Good Mechanical Strength

THE writer of this article has been engaged in spark-plug investigation for one of the allied governments. His experience is exceptional, and the ideas in the following are based on much practical work in conjunction with spark-plug testing.—Editor

THE question of producing spark plugs of a quality satisfactory for the severe conditions to which these are subject on the modern highly developed aviation engine, is getting more imperative as the engine development progresses.

In spite of the response from manufacturers in this country and abroad and in spite of the large amount of development work that has been made, indications seem to prove that the spark-plug development has fallen behind rather than followed the engines.

The problem is unfortunately not solved by producing a spark plug that is satisfactory for all engines in production to-day, as a new engine development may come along at any time which may call for still higher qualities in the spark plugs. The fact that the engine must be constructed first, before the spark-plug requirements can be studied, is the natural cause for the lag in the spark-plug development. As, however, the speed of development and progress is accelerating for every day that goes, the lag in the spark-plug development is felt more keenly and the necessity of following up with this cannot be sufficiently emphasized. The deciding factors which determine the construction of the spark plug are heat, oil conditions and gas tightness, in addition to which comes insulation qualities under heat of the insulating material used.

Why the Service Is Severe

It is not always evident to the layman why the service of the spark plugs on aviation engines is so much more severe than on automobile engines. Nevertheless, there is to-day not a single automobile spark plug in use in the air service which has not undergone considerable changes in material or design. The difference can, however, easily be comprehended when a rough comparison is made.

The average automobile spark plug has proved entirely satisfactory on the average automobile and the life of a well-made spark plug has been practically unlimited. The average speed of a touring car is probably not over twenty miles an hour and the corresponding engine speed averages approximately 1000 r.p.m. This is furthermore intermittent service. A touring car will hardly ever travel at the rate of 40 m.p.h. for a period of over four or five minutes without slowing down, passing other vehicles, curves, etc. On the aviation engines the spark plugs are called upon to operate hour after hour at an engine speed of 1800 to 2200 r.p.m., without a minute's let up—without a drop of as much as 20-30 revolutions. The effect of this continuous high speed can hardly be understood if it has not been seen in practice.

However, experience has proven that a drop of 10-20 per cent in engine speed for a few minutes will allow the spark plugs to overcome some of the fatigue to which they are exposed and prolong their life for a time period many times as long as the period of rest that was given them. On engines where the spark plugs are subject to severe conditions, their life may be a few hours on continuous run under full load, while it may be ten times as long if the engine is run at 75-80 per cent full power. From this it is better possible to understand the excellent service obtained in automobile practise from a number of different makes of spark plugs. Even in racing practise we find that the least retardation while turning the curves of the track is sufficient to offer the spark plugs a period of rest that materially increases the length of their life. This is only one factor in the spark-plug service, which, however, in itself proves the distinctive difference in the operating conditions. Other factors such as compression and heat must also be taken into consideration.

Compression Conditions Differ

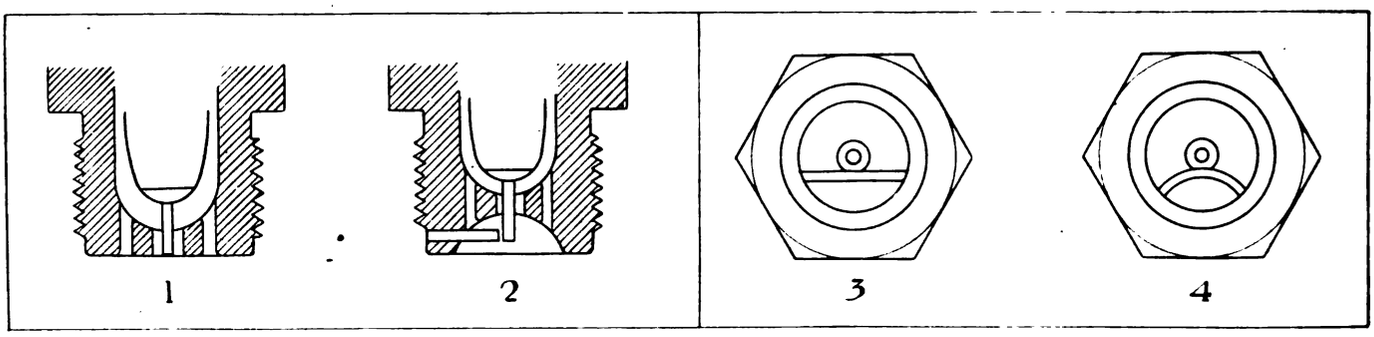
The compression on the average car is 70-80 lb. per sq. in. when the engine is new, but in most cases this falls rapidly when the engine is slightly worn and 50-60 lb. is undoubtedly nearer the average of cars in actual use. The compression of the aviation engine has steadily been increased during the past few years and goes now as high as 120-130 lb., and it must be kept in mind that this compression is practically maintained throughout the life of the engine, as this is ordinarily overhauled for every 50 hours of actual service, and all worn parts replaced.

The local heat in the insulation body of aviation spark plugs is high, due to the increased number of explosions and the high mean effective pressure in connection with the poor heat-conducting qualities of most of the insulation materials which are adaptable for spark-plug construction.

In studying the construction of the spark plugs we find that there is a number of different conditions that must be met, and which again largely depend on the material used for the insulation bodies. The main requirements will be stated first followed by a brief discussion of the ways and means of meeting these.

The requirements are:

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Some of the different constructions commonly used in airplane engine spark plugs

(1) Gas tightness.
(2) Mechanical strength.
(3) Self-cleaning qualities.
(4) Minimum electrical leakage.
(5) Temperature resistance.
(6) Absence of preignition.

Perfect gas tightness is very difficult to obtain, on account of the different temperatures to which a spark plug is subject; temperatures which are not uniform throughout the various parts of the plug. Where different parts are assembled by means of mechanical joints such as compression nuts or spinning operations, it is evident that different temperatures cause different expansion of the various parts and tend to produce gas leaks. To overcome this it is necessary that the joints are compressed to such a degree that there is danger of setting up stresses on the insulating body, which may prove fatal to this and cause mechanical breakdown.

Obtaining a Gas-Tight Joint

A more satisfactory way of producing a gas-tight plug is to use an insulation body that can be brought into chemical connection with the metal parts. Such has been done by "welding" a glass body into the steel shell. A joint of this kind will stay tight under all temperatures encountered in actual service. The success of such a construction depends, however, entirely upon the characteristics of the glass composition. The spark plug must, unless the melting temperature of the glass is high, be designed so that the glass will remain very cool under operating conditions. This, however, allows oil and carbon to collect on the surface of the glass without burning it off and thus destroys the self-cleaning properties of the plug.

The cemented joint, which appears around the center electrode in the conventional design of porcelain plugs must be made with great care. Some cements that have been used successfully for a number of years in automobile practise have proved to soften and melt when exposed to the high temperatures of an aviation engine. Others seem to loose their body and drop out as a powder, thereby exposing cavities inside of the porcelain. The pressure in these cavities will increase with every compression and explosion stroke, and will again decrease with the intake stroke, thus causing hot gases to flow back and forth and produce excessive local heating of the porcelain. This will result in an uneven expansion and crack the porcelain in a very short time. Local heating, caused by leakage or cavities, is the main reason for the strict requirement of absolute gas tightness, as the effect is the same if a leak occurs at any place around the gasket seat of the insulation body. The loss in compression, due to a small leak in the spark plugs, is negligible and not in any way to be compared to the importance of the effect on the insulation body.

Mechanical strength of the insulation body plays an important part, as a great mechanical strength will allow a high pressure to be used in the joints and consequently resulting in a tighter spark plug. The location of the spark plugs on the engine is oftentimes such that mounting and dismantling is difficult and special wrenches necessary. The spark plugs are, therefore, subject to more or less severe treatment and satisfactory mechanical strength is required.

Plugs Can Be Self-Cleaning

Some reference has been made to the self-cleaning properties above, where mentioning was made of glass as insulation body. There are two ways of obtaining satisfactory performance. One is to construct the spark plug in such a way that the insulation body is protected from oil and carbon. The other is to expose the insulation body to the heat of the explosion to such a degree that any oil and carbon that may collect on the surface will burn off. Which of the two constructions to select depends entirely on the heat-resisting qualities of the insulation body used. The two materials used most successfully at the present time are mica and porcelain. A mica spark plug must always be constructed so as to protect the mica core from heat, oil and carbon, as oil will penetrate between the layers of mica no matter how tightly these are compressed, and in time form a conductive carbon deposit.

A great variety of different constructions have been brought out, most of which have a closed bottom at the lower end of the shell with a small central hole through which the center electrode extends. For a construction of this kind special precautions must be taken to avoid preignition, as will be mentioned below. The sparks jump from the center electrode to the edges of the hole in the bottom which forms a ring-shaped electrode. This construction will cause somewhat harder starting of the engine and poor throttling ability at very low speeds due to the fact that the sparks are divided over a ring-shaped area and will separate in a number of tiny streaks rather than condense into one strong spark. The sparks are, furthermore, not exposed to the fresh gases in such a favorable way as when jumping between two pointed electrodes extended free of the shell.

A better construction is secured by providing a recess inside of the shell that will act as a baffle plate instead of closing the bottom. This baffle must be located slightly inside of the shell and the center electrode extend through it to the lower part of the shell, where a connectional ground wire electrode is used.

A few different constructions commonly used are demonstrated in Figs. 1, 2, 3, 4. The semi-circular bend of the ground wire in Fig. 1 is claimed to minimize warpage of the wire and change in the size of the spark gap when the wire becomes hot and expands. Other types of closed bottom spark plugs use a disk-shaped center electrode closing up practically all the space between the wall of

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the shell, leaving only a gap of 0.02 in., which acts as the spark-plug gap. This type offers the same inherent disadvantage in starting and throttling as the type shown in Fig. 1.

With porcelain as insulator, the open-end plug has proved most successful hitherto. The quality of the various porcelains has been much improved, and it is possible to use a plug where the lower end of the porcelain extends almost to the lower end of the shell and is exposed directly to the heat of the flame. The temperature of the lower end of the porcelain becomes so high that oil and carbon are immediately burned off and the surface remains clean.

Great Strength Is Needed

It was necessary to develop porcelain compositions of great mechanical strength at high temperatures to obtain this, and, furthermore, to compound the glaze so that the expansion coefficient of both materials is practically alike. Difference in expansion coefficient will cause blistering of the glaze after a few hours run of the engine. This has especially been found where materials of the soapstone variety have been used as insulators and has prevented the further use of these materials, which in other ways offers several advantages and which has proved extremely successful for automobile practice. The closed-end porcelain plug has been used to some extent, as it offers certain advantages which will be indicated later.

All insulation materials used in spark-plug construction decrease in electrical resistance with increasing temperature. While the temperature at which this commences is far above the temperature reached in the average automobile spark plug, the temperature of the aviation engines approaches so much to the critical point of insulation material that improvement and development was necessary. A great variation in the different porcelain compositions existed and a thorough research of a large number of compositions resulted in a far better grade of porcelain being used to-day than a year ago.

Insulation Resistance Important

A material decrease in insulation resistance will cause an electrical leakage from the center electrode to the shell and result at first in a weakening of the spark which under unfavorable carburetion and distribution of the charge may cause failure in ignition. This is so much more the case with aviation engines as these are commonly of the multicylinder types, which puts a greater demand on the ignition apparatus on account of the higher speed and the greater number of sparks required. It becomes, therefore, of vital importance to preserve every atom of heat and energy in the ignition sparks.

So far, the largest amount of difficulties encountered has undoubtedly been due to breakage of the porcelain on account of heat and uneven expansion. The breakage occurs on the lower part of the porcelain which extends free inside of the shell. The causes are various. The uneven heat of the porcelain will set up internal stresses, the difference in expansion between the metal of the center electrode and the porcelain will, if too large, cause tension between these two parts sufficient to crack the unsupported porcelain; the continuous impact of the explosions and the great change in temperature when the engine is started or stopped tends to shatter the structure and to destroy the mechanical strength of the porcelain.

A breaking or chipping of the porcelain inside of the spark-plug shell is liable to cause serious damage to the engine itself, in addition to the disturbance in the performance, as porcelain pieces may be wedged in between the piston and the cylinder wall and score the latter. To avoid this, several constructions of porcelain plugs with closed bottom, similar as shown for mica plugs in Fig. 1, have been brought out. The porcelain chips will be caught by the bottom wall and prevented from entering into the cylinder. It has, however, been found rather difficult with this construction to maintain a clean porcelain and prevent fouling, although further and more satisfactory development of this design is to be hoped for.

Closed Ends Cause Preignition

As mentioned above, the closed-end plug is liable to cause preignition. This is caused by the hot gases passing up and down through the space around the center electrode into the inner chamber. In order to reduce this effect it is necessary to provide additional holes in the bottom so as to divert part of the hot gases through these holes and away from the center electrode. The center electrode is the member that causes the preignition, as it is the hardest part to cool, due to the fact that it extends through the insulation body, which also acts as a perfect heat insulator and tends to retain the heat in the electrode. The only point of the electrode that is exposed to any cooling effect is the upper end that extends above the porcelain, and this end is in many cases covered with a brass cap which the electrode merely touches lightly, a joint that has practically no value as a heat-carrying point.

The diameter of the center electrode should be as large as it is possible to use without getting into difficulties from expansion and the upper end should form a good contact with the brass cap, which in turn may be provided with cooling fins. The lower end, which extends beyond the porcelain, must be as short as possible and eventually of a smaller diameter than the rest of the electrode, so that it will collect as little heat as possible. The ground electrode is not very likely to cause preignition unless it is excessively long. The material for the center electrode should be as good a heat conductor as possible.

A good practise has been to make the lower part of nickel alloy wire and the upper part of copper. In this case precautions must be taken to see that the joint between the two wires is such as to form a good heat carrier.

Different Mica Constructions

In a mica plug two different constructions are prevalent; both are giving about the same result in service. In the first construction the mica layers are mounted horizontally as washers around the center electrode. These washers are held at the bottom by means of a flange on the electrode and at the top by a nut or by riveting a small disk to the electrode. The pressure which the nut or the disk exerts upon the mica washers must be great so as to hold them tightly together and form a compact core.

It is necessary, therefore, that the electrode possesses sufficient mechanical strength to withstand the reaction of these forces, and it must be especially borne in mind that this electrode is exposed to heat which will cause expansion and reduce the pressure upon the mica washers. A material should, therefore, be chosen which has a small coefficient of expansion, great tensile strength and good heat-conducting qualties. The electrode should, furthermore, be provided with cooling fins on the upper end to reduce the temperature throughout its length.

For the other construction of mica plugs, the mica is wound axially around the center electrode. While in this case the expansion of the center electrode has no harmful effect on the insulation core, special provisions must be made so as to protect the lower end of the mica from splitting, and the core should, furthermore, be subjected

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to some sort of an impregnation that will prevent leakage taking place between the mica layers.

In order to resume the various requirements as stated above, it may be said that a satisfactory spark plug must fulfill the following conditions: All materials used for the main parts of a spark plug shall have a low coefficient of expansion. This coefficient shall not be the same for all parts but invertly proportional to their heat-conducting quality. For instance, the expansion coefficient of the center electrode shall be lower than that of the porcelain, due to the higher temperature of the electrode. In cases where it is impossible to fulfill this condition it will be necessary to make such provisions as will allow the expansion of a certain part to take place without causing any disturbing effect on other parts of the spark plug.

The center electrode must be well cooled, preferably with fins on the upper end, and only a small part of the electrode shall be exposed to the heat of the engine, *i.e.*, the extension beyond the lower end of the insulation core shall be very short and of small diameter, sufficient only to prevent warpage under heat. All points in the center electrode should be welded or of a similar construction that will insure heat conductivity. The ground electrode must be short and rigidly held, and preferably consist of a single-point electrode. The lower end of the shell must be given such a shape as will protect the insulation body from oil and carbon unless the material used is of sufficient heat-resisting quality to withstand the heat of the explosion and permit the carbon to be burned off. If cement is used this must not soften or deteriorate at temperatures somewhat above service temperature.

Scotland Favors Light Farm Tractors

(*Continued from page* 28)

of this space, but, on the other hand, many others, including the single-unit machines, were able to turn in half this space, or even less. These smaller outfits also occupied less time in turning, being in many cases able to go out, turn, and reenter without any stoppage or slackening of speed. Some of the larger outfits required a considerable amount of maneuvering before the tractor and plow could be got into position to commence the next furrow, especially when called upon to make a close turning. The furrow ends were in some cases irregular, but this may have been due to lack of proper care on the part of the driver.

Best Price

The question of price is a difficult one under the present abnormal conditions. Makers should, however, aim at putting a tractor on the market at a price not exceeding $1,500.

As at the demonstration at Stirling two years ago, it is again matter for regret that British makers of agricultural tractors were not more adequately represented. The same causes which operated against their taking fuller part then are still, unfortunately, in operation. Only about one-fourth of the machines entered were of British construction.

Demonstration Valuable

Regarding the demonstration as a whole, the committee feels that it has served a useful purpose in providing an opportunity for all interested in agriculture to form an estimate of the capabilities of the machines exhibited, and it is hoped that the effect may be to make mechanical cultivation more popular in Scotland than it has been hitherto. In this way the interests of increased food production may be served. At the same time it is obvious that such a demonstration must be of great value to manufacturers in demonstrating the points in which their machines are defective and the directions in which improvement should be sought.

The committee is glad to be able to record that the result of the demonstration has been to show that extraordinary progress has been made within the past two years, and for this advance great credit is due to agricultural engineers and manufacturers.

Condensed Tractor Specifications

BELOW is given the blank for condensed tractor specifications as adopted at the recent Minneapolis meeting of the Tractor Division, S. A. E. Standards Committee. It is intended for use in tractor catalogs.

1. Firm name and address.....
2. Tractor trade name or model number.....
3. Drawbar hp. .....
   (*Old trade rating and S. A. E. rating.*)
4. Belt hp. .....
   (*Old trade rating and S. A. E. rating.*)
5. Motor make—bore and stroke.....
6. Number of cylinders and cycle.....
7. Normal speed, r.p.m.....
8. Lubrication system or type.....
9. Ignition .....
10. Carbureter and fuel system.....
11. Cooling system, type.....
12. Belt pulley diameter, face and r.p.m.....
13. Transmission type or make.....
14. Number speeds forward.....
15. Rate m.p.h.: Low..... Plowing..... High.....
    (*At normal engine speed.*)
16. Number of wheels and arrangement.....
17. Number, diameter and face of drive wheels.....
    (*If track type give number, track, length and width.*)
18. Number, diameter and width of non-drive wheels.....
19. Frame construction .....
20. Wheelbase and tread.....
21. Total width overall.....
22. Total length overall
23. Turning radius .....
    (*One-half diameter largest track circle.*)
24. Total weight, less fuel, water, oil and lugs.....
25. Shipping weight, including standard equipment and stays .....

A New Aluminum Solder

A SOLDER for aluminum is being marketed my the Sterling Aluminum Solder Company, Inc., Brooklyn, N. Y. Repairs of broken aluminum parts by the use of this solder are said to be cheaper and quicker than repairs by other methods. One of the special advantages of the solder is that it requires only a low temperature (300-350 deg. Fahr.) to melt it, and that no flux or acids of any kind are required. It is applied with the aid of the gasoline torch. The surfaces to be soldered are first thoroughly cleaned with a steel brush; then a thin coating of the solder is applied, which is also brushed with the steel brush, and finally another coat is applied for the purpose of joining the parts. It is claimed that this solder protects the metallic aluminum against oxidation. Greater strength is claimed for the solder than that of the aluminum itself. Owing to the low temperature used in melting the solder there is no danger of warping or distorting the parts, and the aluminum will not be deteriorated by excessive heat. One of the most important automobile repairs to which this solder has been applied is that of a broken crankcase.

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Truck Efficiency Graphically Shown

1—Need for Rapid Loading Not Realized
2—Short Hauls Suit Heavy Truck Service
3—Saving Minutes Adds Miles, Cuts Costs
4—Charts Eliminate Need for Calculation

By Francis W. Davis
Assistant Chief Engineer, Motor Trucks, Pierce-Arrow Motor Car Co.

THE problem of analyzing motor-truck transportation is fundamentally different from other so-called modes of transportation in that we have to do with a factor of far-reaching importance in determining the capacity or ability of motor trucks to perform a given amount of work. This factor is the so-called loading and unloading time.

At first sight, it appears to be of little importance, as when considering horse team haulage very little attention is given to it. This is quite natural when we consider the fact that a team of horses can only cover a relatively small mileage in a day, and their average speed is of sufficient magnitude to cover this limiting daily mileage in a few hours, consequently the necessity for quick loading and unloading can be almost disregarded when dealing with team haulage.

With a motor truck we are face to face with entirely changed conditions. The capacity of the truck is only limited by the number of hours it is in operation, and by operation we mean actual *running* time and not merely the time the truck is in commission.

It is true that the facts as outlined above are instinctively understood by truck operators, and more and more time and effort is put into devising ways and means for reducing the so-called loading and unloading time of motor trucks. We hear of overhead hoppers, demountable bodies, loading cranes, winches, mechanical dump bodies, and innumerable other devices for saving time. This is all done for a very definite purpose, and it is strange that up till very recently little effort has been given to the important study of the absolute necessity for reducing this loading and unloading time and showing the relative amount of work that can be produced where efficient loading and unloading appliances are considered as compared with old out-of-date horse methods.

In approaching a problem to determine whether motor trucks can be used to advantage in a given transportation problem or to study means for increasing the efficiency of a motor-truck installation, it is customary to carefully investigate the loading and unloading conditions, nature, and distance of routes traveled, and other facts of more or less importance in order to draw up a report covering the capacity of a given truck under certain conditions.

In addition to this, it is also customary to investigate the problem from a cost standpoint to determine the fixed charges per day and so-called operating expense per day, the latter usually worked down to a cost-per-mile basis.

Calculating Truck's Working Capacity

In calculating the working capacity of a truck, we determine the round-trip distance of the haul, which we will call D. The loading plus the unloading time for each trip we will designate by L. Then, with an assumed ten-hour working day, the one remaining factor which we are in need of is the operating speed in miles per hour which we expect the truck to maintain during its period of operation.

Experience indicates that while a truck is in motion it averages approximately 75 per cent of the full governed

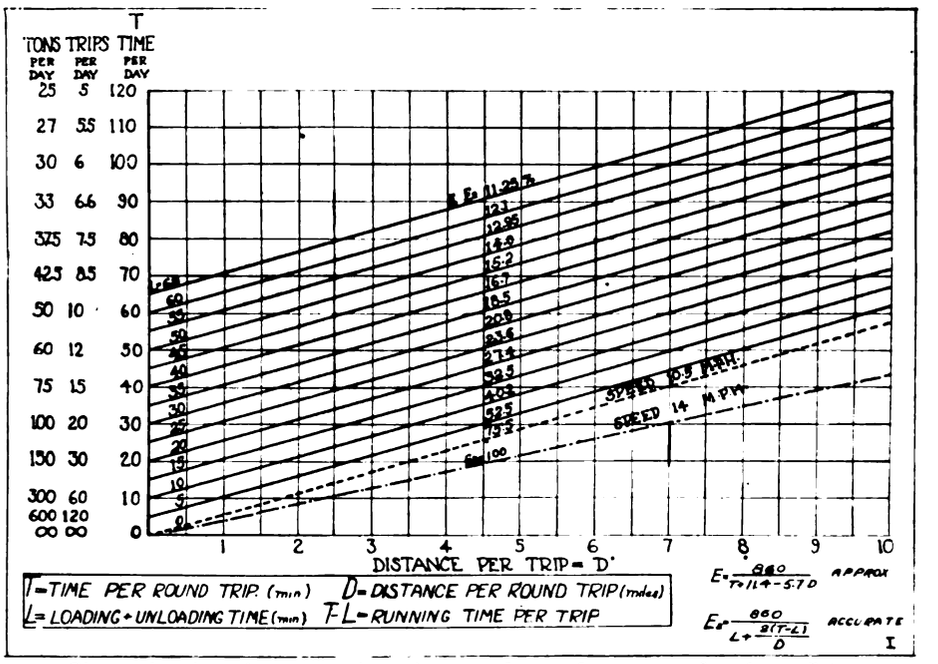
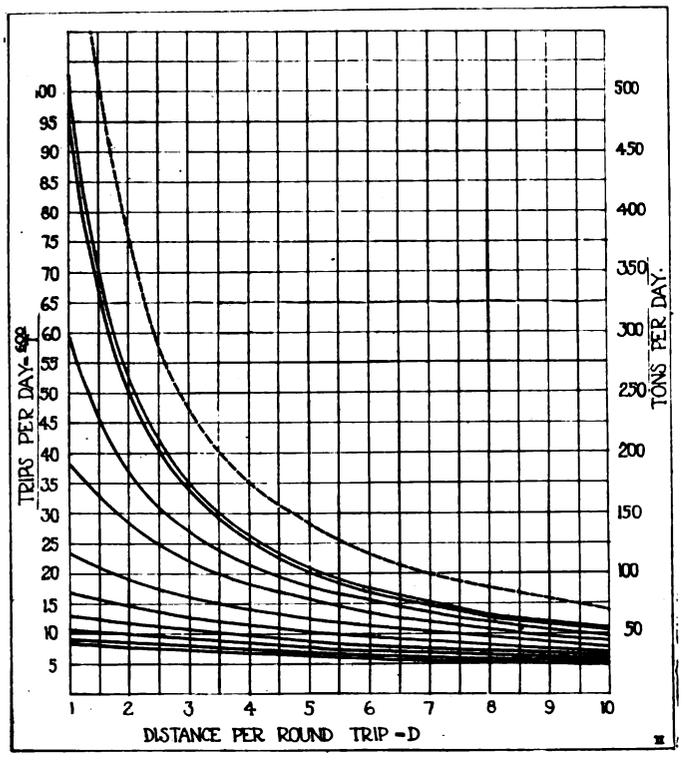


Chart showing time per trip, trips per day and tons per day for a 5-ton truck of 10.5 m.p.h. running speed, different round trip lengths and loading times.

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Tons per day and trips per day for different round-trip distances

speed. The loss of 25 per cent is occasioned through traffic delays, varied road conditions, and other factors which are quite beyond control. With the 5-ton truck governed to 14 m.p.h., the 75 per cent figure amounts to an average rate of 10½ m.p.h.; therefore, while in operation we say the 5-ton truck will cover a mile in 5.7 minutes' running time.

With this information at hand, we are in position to proceed further, and in order determine the time per round trip, which we will call T, it is necessary to multiply the distance D by 5.7 and add this figure to the loading and unloading time L per trip.

To determine the number of trips per day, it is then necessary to divide 600 (the number of minutes in a day) by the time per round trip T in minutes.

The above is an extremely simple operation, and yet it is the basis for estimating truck work, and is invaluable in arriving at a working basis for considering the cost figures.

The following symbols will be of assistance in following this analysis:

D—Distance per round trip in miles.
L—Loading plus unloading time per trip in minutes.
R—Running time per round trip in minutes.
T—Total time per round trip in minutes.
M—Maximum speed in miles per hour.

75 per cent of M = running speed.

$$T = L + R$$

$$R = \frac{60\ D}{0.75\ M}$$

$$T = \left(L + \frac{60\ D}{0.75\ M}\right)$$

M = 14 m.p.h. (for Pierce-Arrow 5-ton truck)

$$T = (L + 5.7\ D)$$

10-hr. working day = 600 minutes.

$$\text{Trips per day} = \frac{600}{T} = \left(\frac{600}{L + 5.7\ D}\right)$$

Truck carries out 5 tons; returns empty

$$\text{Tons per day} = 5 \times (\text{trips per day}) = \left(\frac{3000}{L + 5.7\ D}\right)$$

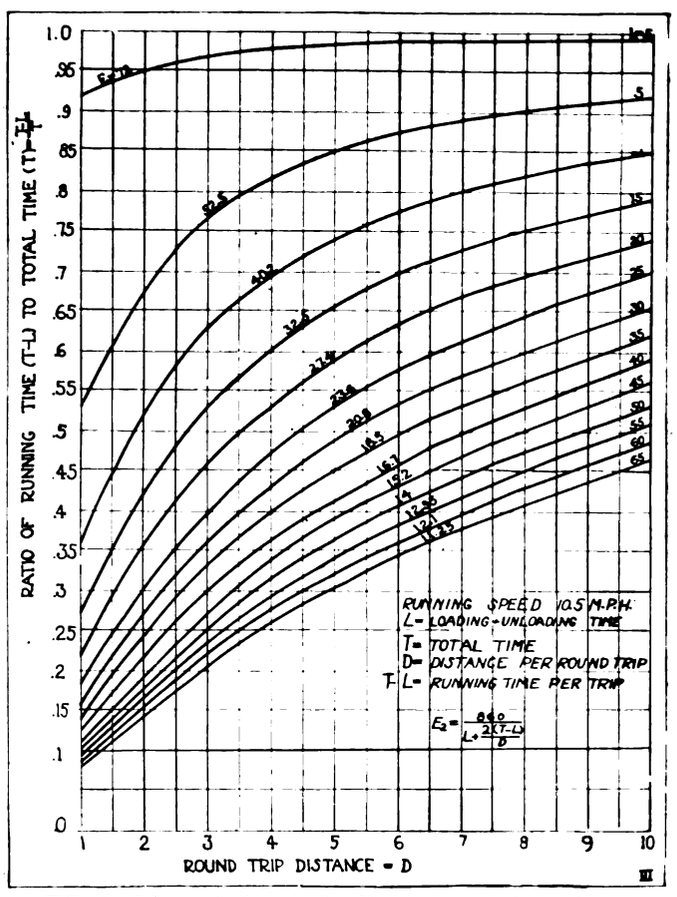
$$\text{Miles per day} = D \times (\text{trips per day}) = \left(\frac{600\ D}{L + 5.7\ D}\right)$$

$$\text{Ratio running time to total time} = \frac{R}{T} = \left(\frac{T - L}{T}\right)$$

Let us carry this line of thought a little farther. The above method of figuring gives us a rapid and accurate method of determining the capacity of a motor truck under any given conditions. However, very often in discussing the usage of motor trucks with a prospective owner the item of loading and unloading time is not only difficult to estimate but often is subject to considerable revision through the consideration of some simple auxiliary equipment. The prospective owner is usually quick to raise objections against this, due to the cost of the equipment. Then the figures showing the capacity of the truck must be corrected to show its increased capacity due to the addition of this extra equipment.

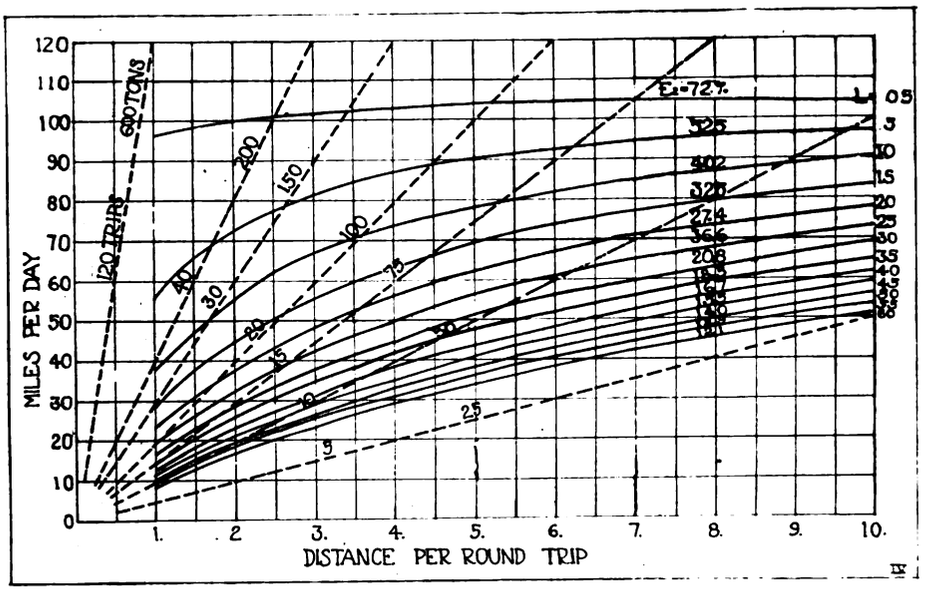
This process can be repeated a number of times, and if done rapidly and accurately will give the truck owner a good idea of the increased capacity of his equipment due to quick loading and unloading.

With a view to showing this graphically, and in such a way as to admit of instantaneous comparisons, the accompanying charts, with the above facts incorporated, obviate the necessity for actually putting down figures, and permit of comparisons, one truck with another, under varying conditions. The charts also answer in a remarkable manner the old-time fallacy that motor trucks cannot compete with teams in short hauls. The short



Effect of loss of time in loading upon work performed by truck

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Effect of time lost in loading and unloading on daily mileage

haul is the "bonanza" of motor-truck haulage where the conditions are right.

Chart 1 is drawn up for the Pierce-Arrow 5-ton truck, on the assumed running speed of 10.5 m.p.h. The distance per round trip *D* is shown on the base line up to 10 miles. The time per round trip *T* is shown on the vertical line at the left of the chart, and runs up to 120 minutes. The loading and unloading times are indicated by *L*, and vary from zero up to 65 minutes per trip. Two other vertical scales are included, namely, the trips per day and tons per day, the tons per day bearing the relation of five times the number of trips per day, inasmuch as we are concerned with a 5-ton truck and assume a load of 5 tons carried out.

The chart is read by:

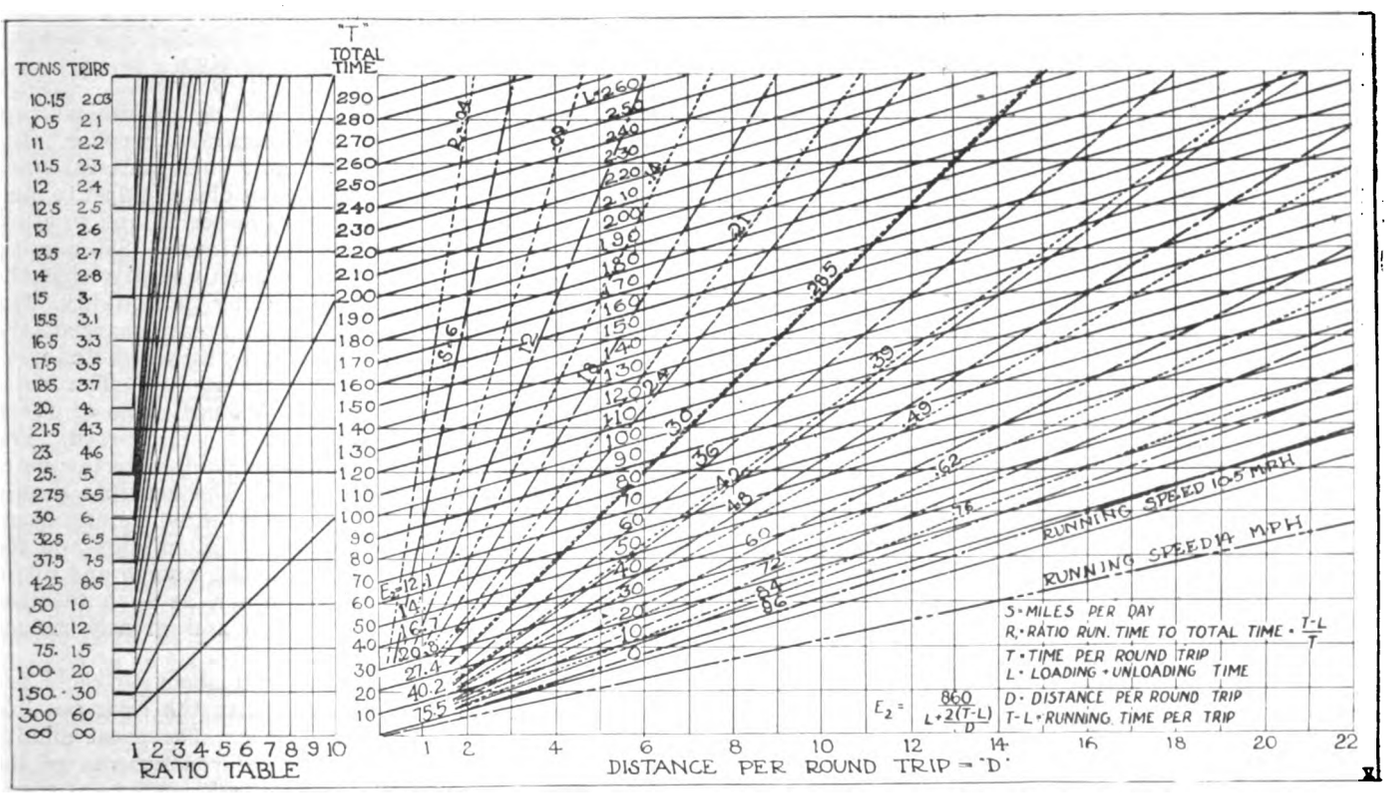
1. *Running out the base line to the distance per round trip.*
2. *Then vertically to the intersection with the L line.*
3. *Then follow horizontally to the left to the intersection with the three vertical scales, giving the time per round trip, trips per day, and the tons per day.*

By using the same distance per round trip, and dropping down to a lower *L* figure, we arrive at the time per round trip, trips per day, and tons per day with the new loading and unloading condition. This can be done rapidly, and gives surprising results when dealing with reasonably short hauls and small values for *L*.

The other figures of *E* and *E*2 represent efficiency figures which the writer has worked out at considerable length, starting from quite different grounds of reasoning, and yet the lines representing values of *L* are constant efficiency lines, and the formulæ *E* and *E*2 give equal values for truck efficiency on these lines.

Chart 2 uses the same base line as 1, with altered scale of trips per day and tons per day, so as to show the enormous increase in capacity of the truck when operating on short hauls under efficient conditions of loading and unloading, and it furnishes a graphical proof of the often repeated assertion that quick loading and unloading time is much more essential in short hauls than in long hauls.

This statement is true, and with this chart it is brought out to an astonishing degree. For instance, it shows that in a round-trip haul of one mile, with loading and unloading time *L* of 60 minutes, the 5-ton truck can make approximately nine trips per day, carrying a total of 45 tons. When reducing *L* to five minutes per round trip,



Master chart showing the relation between all factors involved in motor truck operation

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the truck will make approximately sixty trips per day carrying 300 tons. This represents an increase in capacity of over 600 per cent. Further, if we consider this same haul with a loading and unloading time of ½ minute, which has been reached in certain installations, the truck has a capacity of 96 trips per day of 480 tons. This represents an increase over the first condition of approximately 1000 per cent. These are the facts that must be brought home to the truck user in order for him to get the full benefit of his equipment.

Operating Only One-Fifth of Time

How often do we hear that a truck is on the road only one-fifth of the day? This is the condition under which a great many trucks operate, and also a great many do not equal this figure. Chart 3 gives graphically a picture which shows that when a truck operates under this condition the owner should be indicted for criminal misuse of his equipment. On Chart 3 the point two-tenths of the way up on the left-hand scale—*i.e.*, representing the condition of one-fifth running time—shows that the operator in this case is operating his truck only up to this level. Above that is the region which he knows nothing about, and in which he denies the truck the opportunity of working. The limiting capacity of the truck, of course, is that it may be on the road the *entire time.* Figures of *E*2, given both on Charts 2 and 3, represent constant efficiency lines the same as on Chart 1.

There is another figure of importance, namely, the number of miles per day the truck will cover. Chart 4 is drawn up with the same base line as the other charts, and indicates the miles per day as related to the loading and unloading time, and also the relation of the trips per day and tons carried, as related to the miles per day. This chart again shows that when we reduce the loading and unloading time we increase the capacity of the truck, and on short hauls this increase goes up to an amazing figure.

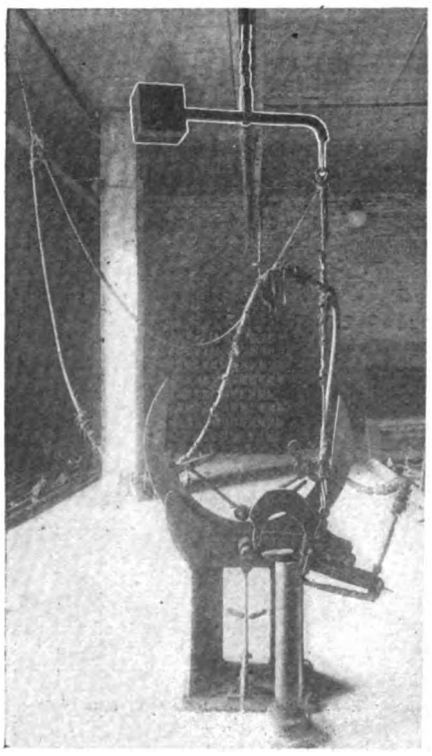
Chart 5 is a master chart of the others shown before, and includes all of the information contained on the foregoing charts. In addition, the base line is extended up to 22 miles and the time per round trip extended up to 300 minutes. The vertical scale for the total time per trip is marked T. A ratio table will be noted at the left end of the chart. This is useful where making comparisons so as to show the ratio of increase in the number of trips per day and tonnage hauled under conditions where quick loading and unloading are considered, as against one where slow loading and unloading are considered.

Determining Increase

The procedure is to locate the number of trips per day on the vertical scale corresponding to the slow-loading figure, and, by tracing out to the diagonal line, reaching down to the greater number of trips, the vertical line from that point to the ratio table indicates the ratio of increase. This is somewhat difficult to explain in wording, yet a short study of the chart will show how easily and quickly it can be done.

The foregoing charts should prove not only of great value in analyzing new transportation problems, but should place in the hands of traffic managers means whereby trucks can be distributed for a given day's work so as to utilize the transportation equipment to the best possible advantage.

Guards for Riveting Frames



Weight used to counterbalance riveting hammers mounted on a standard Palmer-Bee track and trolley

AIR riveters used for riveting frames in automobile shops are often suspended on trolleys or cables, with a counterweight to balance the riveter. The Reo Motor Car Co. had many of the weights become detached and drop down, and this trouble was overcome by putting a yoke on the trolley with a balance weight on one end and only running a cable down. If that breaks the only thing that can come down is the hammer.

In the Packard shops use is made of a stand constructed of pipe fittings. It is adjustable for height and can be clamped into position. This stand has given fairly satisfactory results. One of the men at the Packard plant is working on a drum with a spring control so that when the hose is moved away from the connection it is automatically released. This was found to be the only solution of the problem of getting around the truck frames to rivet them together.

Melting Aluminum Scrap

THE fluxes commonly used in melting aluminum scrap, says *Brass World,* are fluorspar, cryolite, and salt. An excellent way of utilizing such material when a part of the scrap is small and not clean is first to melt a bath of aluminium, using solid material, and to allow it to reach a temperature of approximately 850 deg. C., then add the sweepings, etc., in such quantity that the bath will absorb them without losing its liquidity. The bath is then reheated and more scrap charged, the process of charging and reheating being alternated until the crucible is as full of metal as desired. The metal will most likely be pasty, and a small piece of fused zinc chloride is added and the bath well stirred. The resulting action will free the mixed oxides and the metal will assume its natural fluidity. The crucible should be immediately emptied of aluminium before any reaction can occur between the metallic aluminium and the heated oxide on the one hand and the oxygen and nitrogen of the atmosphere on the other, as such reaction will consume metallic aluminium and greatly reduce the percentage recovered.

Now that aluminum is quoted at about 60 cents per pound the recovery of all scrap with the least possible loss has assumed great importance. The great affinity of the molten metal for the chief constituents of the atmosphere renders the process difficult.

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Probable Advances in Motorcycle Design

New Types of Engines That May Come to the Front—Simplification of Equipment —Changes in Frame Construction Likely

IF the next few years should see a great increase in the demand for motorcycles, as is confidently expected, we may hope to see also a great deal of improvement in design, partly to render the machine more serviceable as a conveyance and partly to facilitate its production on a large scale—in other words, to make it a better manufacturing proposition. It is true that the present standard makes of motorcycles are very serviceable machines, but not even the designers themselves would contend that the zenith in engineering development has been approached within measurable distance. A widening market naturally encourages development work, for the greater the prize the greater the stakes that capitalists and engineers are willing to put up.

In regard to engines the situation in the motorcycle field is at present somewhat unsettled. Engines from one to four cylinders are used, though the two cylinder Vee type is distinctly in the lead. The selection of this type must be regarded as a compromise. Having two cylinders it is somewhat smoother running than a single cylinder, and it obviates some of the complication of the four cylinder. What undoubtedly decided the question in favor of this type of engine is the fact that it fits well into the conventional frame. Since the angle of Vee is always considerably less than 90 deg. the engine is not well balanced, and, besides, its explosions are unequally spaced.

From the standpoints of balance and uniform spacing of impulses the best type of engine with only two cylinders is undoubtedly the horizontal opposed type. This engine was successfully used for automobile work for many years. The objection to it is that it is of unwieldy length and very difficult to accommodate on a car. This objection might seem even more potent on a motorcycle, but practically it does not work out that way. The motorcycle industry probably has seen a greater development in England than in any other country and one of the best known English motorcycles, the Douglas, has a double opposed engine.

What may be called the displacement efficiency of the motorcycle engine has been increased to such a degree that for a light machine an engine of very small piston displacement now suffices. On the heavier machines the piston displacement is always between 60 and 61 cu. in., that is, just inside the limit set for racing machines. But for ordinary service over moderately good roads an engine with between 35 and 40 cu. in. piston displacement should deliver all the power required. To keep the length of the engine within bounds a comparatively short stroke would be chosen, say very slightly greater than the bore. A bore of 2¾ in. with a stroke of 3 in., for instance, gives a piston displacement of about 36 cu. in. Such an engine can be built not to exceed 22 in. in length over all, and if the connecting rods are made short and the wristpins located as close to the top end of the pistons as possible—practices which do not conduce to long life of the engine—even this length can be materially cut. There is no difficulty in placing such an engine between the two wheels.

Light weight is certainly a desirable feature, and if it is advantageous to cast the cylinders of large touring cars of aluminum, the same practice applied to motorcycle engines should yield good results. There should be no need for liners of cast iron in an aluminum cylinder of this small size, for it stands to reason that if an aluminum piston in a cast iron cylinder has a satisfactory life, an aluminum cylinder having a cast iron piston working in it should leave little to be desired. In fact, the combination should be almost ideal because the lower coefficient of expansion of the cast iron would be compensated for by the higher temperature of the piston, so that a very slight clearance on the piston would suffice and the piston would be substantially the same fit in the cylinder whether the engine were hot or cold.

Minor advantages of the horizontal opposed engine are that it lowers the center of gravity of the whole machine, rendering it safer, and that it tends to equalize the cooling of the two cylinders.

Certainly one of the least satisfactory features of the present day motorcycle is the free chain drive. As long as the chain is clean and well lubricated it gives good service, but it is impossible to keep it so in regular service. When dirt accumulates upon the chain it soon gets into the numerous pin joints and the chain becomes squeaky, wears and "stretches." On the average motorcycle there is not only one chain for the final drive, but an additional chain for transmitting the engine power to the transmission. Some day no doubt we shall have a fully enclosed and effectively lubricated final drive on motorcycles, the same as we have on automobiles, but just how this is to be accomplished it is not so easy to say—whether by the elimination of the chain or by its enclosure. The problem of a satisfactory chain case is admittedly a very difficult one; if it were not, we should have had more motor trucks fitted with them. Of course, in a motorcycle there is no variation of sprocket centers.

Frames are at present invariably of tubular construction. The tubular section is very good from the standpoint of strength for a given weight. There are two inconveniences connected with the tubular frame, however, which may possibly induce motorcycle engineers some time in the future to follow the lead of automobile engineers and adopt pressed steel frames. The first is that tubular frames must be joined up by brazing, and the high heat required in this process tends to impair the quality of the steel in the tubes and in any case makes heat treatment of the frame impossible. The second inconvenience is that it is difficult to secure anything directly to the frame without the use of rather heavy brackets. From a tubular to a pressed steel frame would, of course, be a very radical change and would involve a complete redesign of the motorcycle.

There is a well founded impression that motorcycles are at present cluttered up with too many fitments that are not strictly necessary. A commendable step looking toward the simplification of the machines was made when, at a meeting of representative manufacturers, it was recommended to the Government that emergency brakes be left off the machines for the army.

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Studebaker Has an Entirely New Line

Two Sixes and a Four, with Engines of High Speed Type —Transmissions Separate and Located Amidships— Hotchkiss Drive and Fabric Universals Among Features

THREE entirely new cars will be marketed by the Studebaker Corp. for 1918. This marks an entire revision of the Studebaker line which consisted of two cars last year. The new cars are a large six on a 126-in. wheelbase, a smaller six on a 119-in. wheelbase and a four having a 112-in. wheelbase. On the larger six there is a seven-passenger touring body; on the smaller six a six-passenger, a four-passenger and a two-passenger body are offered, and on the four a five-passenger and a two-passenger.

The entire line is replete with engineering features new in Studebaker practice. Probably the most significant change is the abandonment of the rear axle gearbox which has distinguished the Studebaker line for some years. This has been replaced by an amidship type solidly mounted upon the frame, with a consequent important reduction in the unsprung weight. The engines are entirely new but do not incorporate any radical features. They are all L-head engines with block cylinders, the larger six having 3⅞ by 5-in. cylinders and the smaller six and four 3½ by 5 in. The respective horsepower ratings of the three types are 60, 50 and 35. The small six and four conform to each other quite closely and are solid head types, while on the larger six the cylinder heads are removable.

The 1918 cars being new throughout contain all the engineering features which have proved their merits during the past few years and are naturally thoroughly up-to-date. The hot spot intake with the corresponding type of manifolds is included in the design.

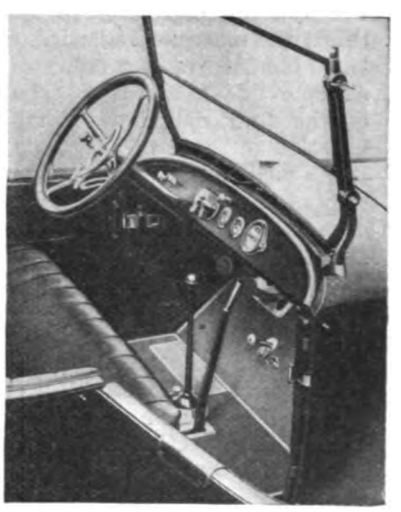
The oiling systems have been revised in detail to give the improved lubrication necessary with high speed engines. The engines are better from an upkeep standpoint owing to greater accessibility resulting from detail features in design. For instance, a change in the fan hub and bracket makes possible the removal of the fan without disturbing the radiator. The new oil level indicator can be readily read at night. A new oil throw ring has been added to the rear end of the crankshaft to prevent leakage through the main bearing. Careful study has been given to the question of external vibration due to loose parts and improper flange connections. The result is that in the new design the flanges on the lower half of the crankcase are much wider. The crankcase itself is stiffer, thus giving greater strength and eliminating the tendency to set up harmonic vibration at critical speeds.

In adopting the amidship gearbox, the transmission system has been entirely redesigned. The gearbox is placed immediately back of the flywheel and is connected with the latter by a flexible Thermoid-Hardy coupling. It is supported by a sub-frame which also carries the rear supporting arms of the engine casting. The gearset bearings are four adjustable Timkens, and instead of the four-jawed or dog coupling ordinarily used, the second speed gear is cut with internal teeth which act as a clutch member engaging with the main pinion when in high gear. There is a new clutch brake also, which tends to facilitate gear shifting. Two Spicer universals are now used in the propeller shaft, which by the use of the amidship gearbox has been considerably shortened, thus lessening the tendency to vibrate. The intermediate section of the shaft is tubular and is butt-welded to the joints at either end.

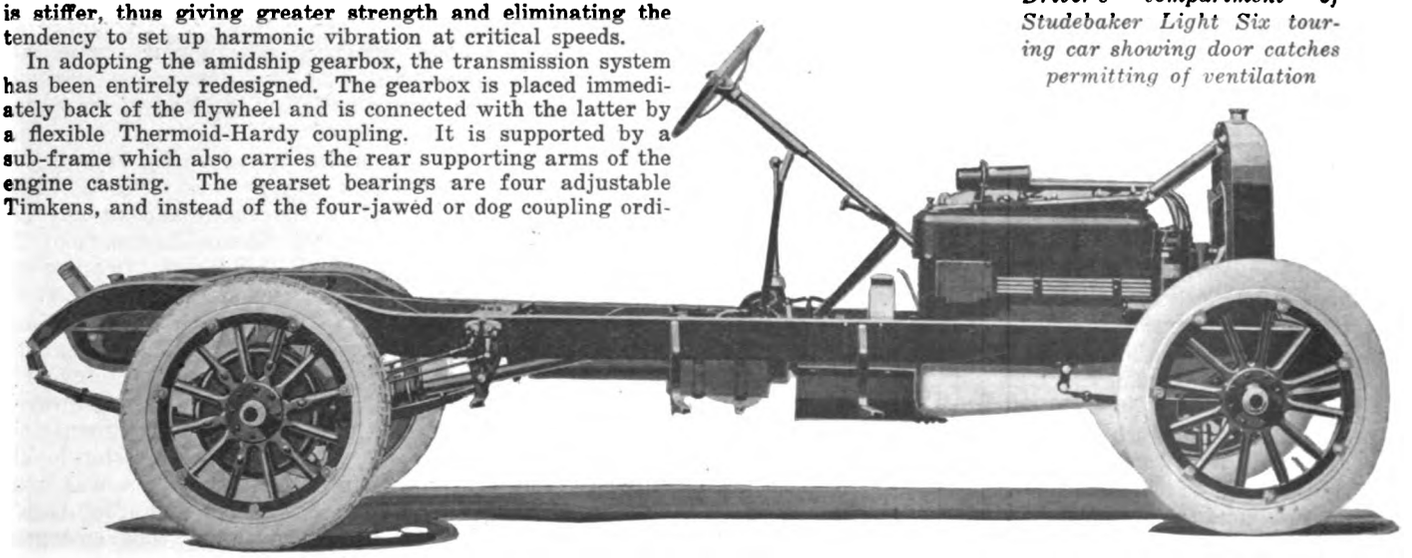
Studebaker is now using an aluminum clutch in place of the pressed steel one of former models. Advantages claimed for this type are lightness and a truer surface, thus giving the clutch leather a better seat. Between the flywheel and the flange couplings is a clutch-release mechanism which is designed with an equalizer which centers the effort when the clutch pedal is pressed, thus pulling the clutch directly back of the spline shaft and preventing it from binding.

Frames are made of heavy carbon steel stock. The four-cylinder model has a frame section of 4½ by 1¾ by 5/32 in., the Light Six cylinder model, 5 by 1¾ by 5/32 in. and the Big Six 5½ by 1¾ by 5/32 in. The new shape of frame which follows the lines of the body is of advantage since it gives a short turning radius, saves weight and gives the motor a better and closer support. In the new chassis designs exceptionally high factors of safety have been used in the frame and every other important part.

The rear kickup of the frame sidebars is sufficient to allow ample jounce space.



Driver's compartment of Studebaker Light Six touring car showing door catches permitting of ventilation



Chassis of the Studebaker Light Six for 1918. *Note central gearbox and short propeller shaft*

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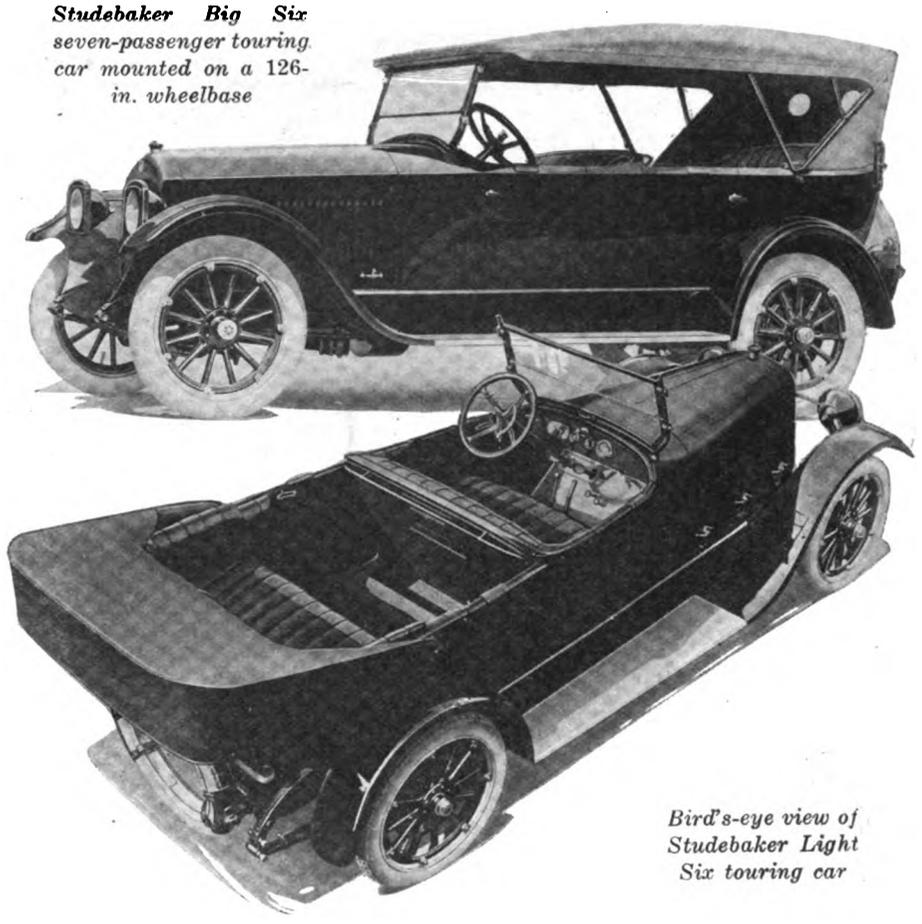
Five cross members and a cross tube connect the sidebars and distribute the load very nearly uniformly. The wide cross member near the rear is of channel section and is well gusseted to the sidebars to resist frame weave. Below this cross member are carried the brake cross shafts with equalizer. These shafts are bracketed to the sidebars, and all of their bearings are lined with oilless bushings. The rear portion of the frame sidebars follows the line of the body sills, and greatly stiffens them.

Two channels run lengthwise of the frame between the sidebars. They are secured at one end to the motor support brackets, the other end resting on center cross brackets. This sub-frame construction serves to carry the transmission case and the pedal shaft brackets.

The Hotchkiss drive is now used, in connection with semi-elliptic springs underslung at the rear. These are of chrome vanadium steel and have the spring eyes bushed with bronze. The bushings are claimed to be true to 1/1000 in. The front axle is drop forged from high carbon steel. The steering knuckle has two Timken bearings for each front wheel, and the knuckle pin, instead of being secured to the axle, is now secured to the knuckle and rotates in hardened and ground bushings pressed into the axle jaws. This design permits of a greater span between the bearings.

Another new feature of the chassis is that in place of the continuous dust pan beneath the engine there is a sectional pan fitting between the frame side bars and the crankcase. This results in greater accessibility of the motor oil pan and greater road clearance at this point.

Studebaker Big Six seven-passenger touring car mounted on a 126-in. wheelbase



Bird's-eye view of Studebaker Light Six touring car

The generator has been improved by the use of a pressed steel housing and is lighter and smaller than the former type. In other details the electrical equipment is the same.

The lighting switch provides two degrees of dimming, and on the Big Six there are silver dials on all registering devices. The battery terminals have been so designed as to fit practically any make of battery, as a convenience for the owner. The standard type furnished is the 100 amp.-hr. Willard. This is used in connection with a Remy ignition system which has been improved by the use of a waterproof distributer cap.

It is in the body line that the most distinctive changes have been made. The bodies are of low hung types with unbroken lines from radiator to the rear of the tonneau. They have the somewhat angular lines which have become popular in the last few months, and give a remarkably smooth and graceful appearance. In the new models all the doors swing from the rear, and the front doors are provided with catches permitting them to be held open for ventilating purposes. The front seats are continuous, providing increased body strength, and the seat backs are designed to give an improved double cowl effect. Increased room is provided in the forward compartment and there is also more room between the steering wheel and the back of the seat. The tonneau of the seven-passenger model is 2 in. longer than the old model. The slanting type of windshield has been adopted and the shroud and radiator are designed without recesses for the hood.

The Big Six is furnished regularly in options of Brewster green or Purple Lake maroon; the Light Six is dark blue and Purple Lake maroon, and the Four in black enamel. All are completely equipped with Warner speedometer, oil pressure gage, ammeter, gas and air carbureter controls, speedometer dial and dash lamp and Yale switch locks. The headlights are fitted with special diffusing lenses. The Big Six has also a Warner clock. In the rear compartment there is a combination robe and hand rail and the Big Six has a tonneau lamp with an extension cord to reach any part of the car. The foot rails on all three cars are 3½ in. wide and are covered over in limousine style.

The tire size is 33 x 4½ on the Big Six, 32 x 4 on the Little Six, 32 x 3½ on the Four.

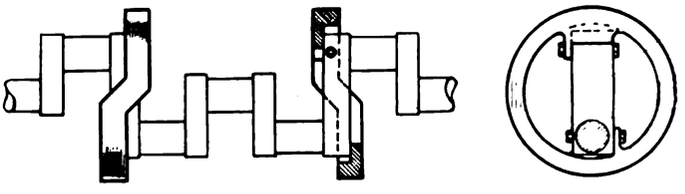
Prices of the new models are $895 for the Four; $1,295 for the Light Six; and $1,695 for the Big Six.

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New Crank Balance System

THE system of crankshaft balancing which is claimed to be much cheaper than the majority of other forms is the invention of Joseph W. Ridgway. Briefly Ridgway's idea is to attach to a conventional crankshaft rings either of cast iron or steel, the upper and lower halves of the rings being offset. The rings can be easily attached to the shaft and being, of course, produced under rotation and coupled creating a bending moment on the shaft.

The rings are so proportioned and so arranged on the shaft that the bending moment created is equal and opposite to the moment due to the crankshaft pins and webs. This method of balancing is particularly easy of application to a four-cylinder crankshaft and will be found on the Crow-Elkhart cars in the New York show.

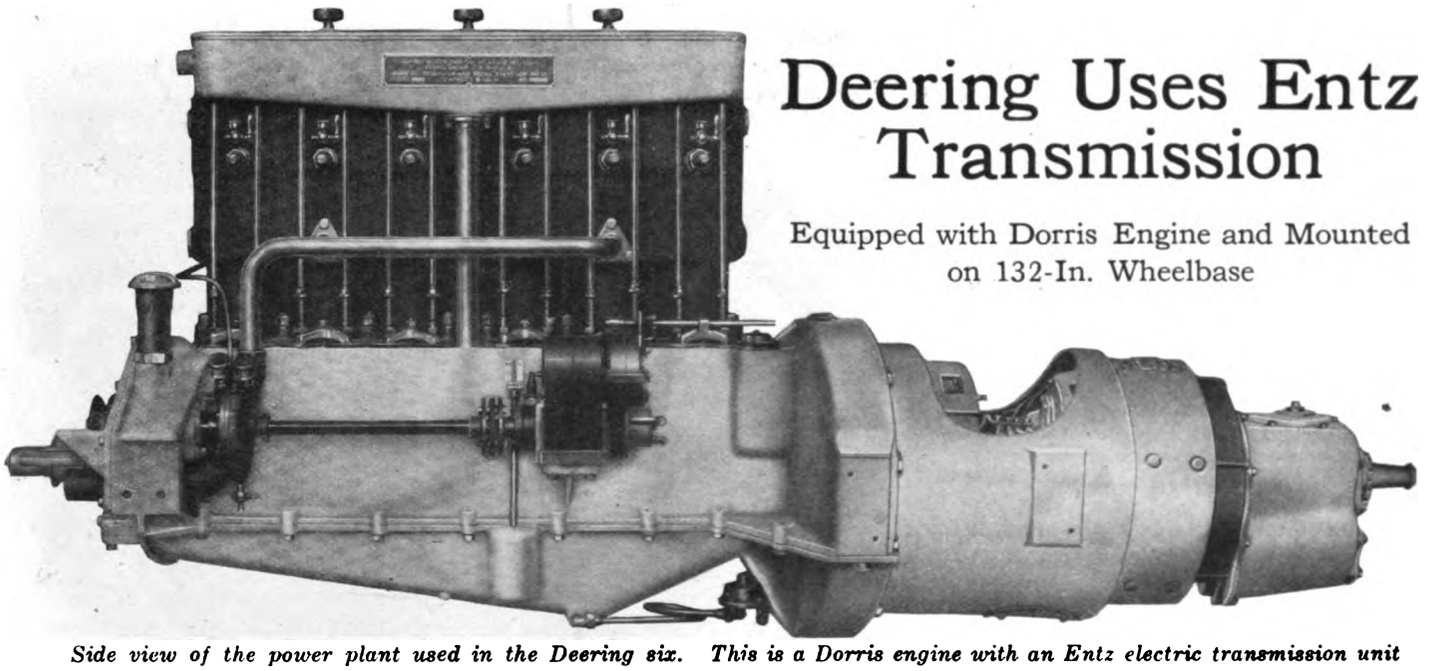


Ridgway crankshaft balancing system

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Deering Uses Entz Transmission

Equipped with Dorris Engine and Mounted on 132-In. Wheelbase



Side view of the power plant used in the Deering six. This is a Dorris engine with an Entz electric transmission unit

THE Deering Magnetic car, produced by the Magnetic Motors Corp., Chicago, will have the Entz electric transmission and the Dorris engine. The car is built on a wheelbase of 132 in., and in its other features follows the lines of up-to-date practice. The Dorris engine is a six-cylinder valve-in-head type with the cylinders in threes and dimensions of 4 x 5 in.

As has been explained in these columns previously, the Entz transmission eliminates and performs the functions of the electric starter, flywheel, clutch and gearbox. The engine is operated in the customary manner, but is started by the use of a small lever located on the steering wheel. This lever serves also as a speed control and operates the electric brake.

The Dorris engine has the rocker arms enclosed in an aluminum case with a removable top. This top can be taken off by turning two knurled screws and the housing also contains the upper water pipe, which takes the cooling liquid directly from the jackets above the exhaust ports. The purpose of the housing is chiefly as a dust cover for the rocker arms and valves and it also serves to keep the engine clean.

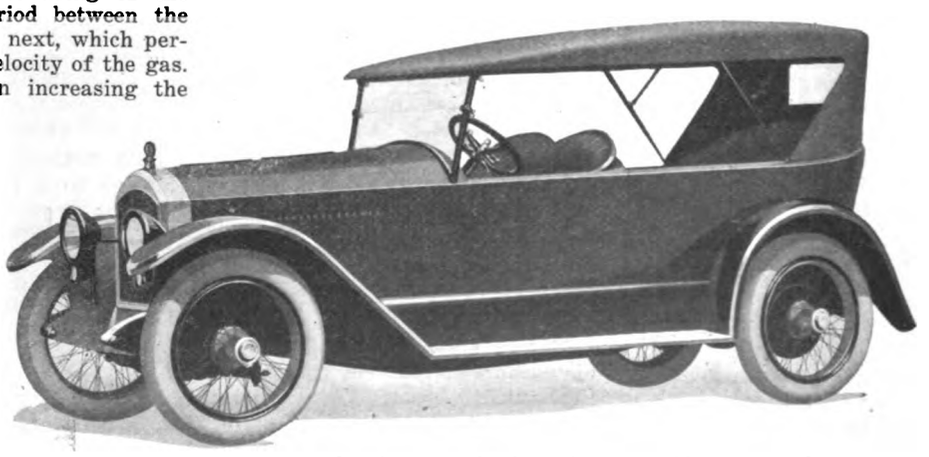
One of the features of the engine is the layout of the firing, so that the first and second sets of three cylinders operate alternately, thus eliminating back pressure and giving a smooth and continuous flow of gases from the carbureter through the two short manifolds to each set of cylinders with the avoidance of any reversal of gas flow. There is a sort of injector action set up in this way which tends to reduce back pressure rather than increase it. On the intake a ramming effect is created by the alternate firing of the two blocks of three due to the short period between the closing of one inlet and the opening of the next, which permits a pressure head to be formed by the velocity of the gas. This is an aid in filling and a factor in increasing the volumetric efficiency.

This layout of the manifolds is one of the chief features of the Dorris engine. It has resulted in a higher output from the engine both because of the better filling on the intake and from the decreased resistance to exhaust. The latter factor has been accentuated by partitioning the exhaust of the first three cylinders from that of the second three cylinders. This partition in the exhaust pipe also prevents any chance of the exhaust from the first three cylinders blowing back and refilling the exhausted cylinder of the second set. With the alternate firing, as explained, this would be the case if no partition were used, as the exhaust valves would then overlap each other to such an extent that when one valve was approaching the closing point another cylinder would open up and refill the first.

Pressure feed lubrication is used with a gear type of pump and an oil gage mounted on the side of the crankcase. Ignition is by Bosch magneto, while lighting and starting is provided by the Entz electric transmission unit. The rear axle is a floating Timken, with the Timken bearings at differential and wheels. The final drive is spiral bevel.

Bearings are used on each side of every crankpin, the purpose of this being to provide a crankshaft in which whip and vibration are eliminated. The main bearings are bronze backed and are lined with nickel babbitt. The camshaft bearings are unique in that seven of them are employed, so that there is a pair of cams operating between two bearings throughout the entire length of the shaft. This is of value not only to prevent vibration, but also in synchronizing the valve timing and to nullify the effects of springing or whipping of the camshaft. This is considered one of the points of the engine which will increase its life.

The Deering car is upholstered in black leather and the equipment includes a top and dust cover, rain-vision windshield with ventilating features at top and bottom, a 60-mile Warner speedometer with season and adjustable trip register, special tire carriers in rear, five Rudge-Whitworth wire wheels with 33 x 5 cord tires, two 10-in. headlights with double bulbs and dimmer, electric tail light and license carrier, electric horn, electric inspection light, robe rail, footrest, set of tools, jack and repair tire outfit.



Deering touring car, showing standard equipment. Note up-to-date straight-line body

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Salon Exhibits Show Individuality

Cabriolets and Landaulets Predominate—Marked Improvement in Collapsible Features

NEW YORK, Jan. 2—The fourteenth annual automobile salon which is now running at the Hotel Astor lives up to its traditions of striking the dominant note in fashionable custom body work. The salon is always a body show, and in spite of war-time conditions is again displaying examples which are typical of the finest of the coachmaker's art. Because of the European upheaval the salon this year is the only automobile exhibition of international character to be held anywhere in the world.

While originally limited to motor cars of European design, the salon is now open to the products of American makers, and it is upon the American chassis that some of the finest examples of body design are exhibited. As usual, the exhibition this year typifies the fashions in custom body work and affords a prediction for what will come in a modified way in stock body design.

To a student of body design there are several facts which stand out as typifying the lesson of the salon: the improvement and adaptation of the convertible and collapsible types; the falling off in the divided front seat for touring cars; the practice of building the car body to fit the user; the increasing convenience in the control members; the better mounting of external fittings such as windshields, tire carriers, runningboards, trunk racks, etc.; the tendency toward straight line construction in both open and closed cars, and the more artistic simplicity of body interiors may all be taken as indicative of the features brought out at the Astor exhibit.

Cabriolets and landaulets predominate in the closed car exhibits at the salon. The ingenuity and fine workmanship in taking care of the collapsible features of these cars is somewhat offset by lines which are not as graceful as they should be, due to the exaggeration of the flat top. The flat roof on the closed car tends to give the appearance of an outward flare at the top, with the result that a box-like appearance can hardly be avoided.

Another weak point is in the use of horizontal bonnet lines with the short cowl, which tends to give a sagging effect at the forward end of the front compartment. This is quite noticeable on some of the town cars. The effect is avoided by others in the use of a slanting line at the side of the hood.

There are only two open cars with divided front seats at the show. The consensus of opinion among body makers is that this type is disappearing in favor of the center cowl arrangement. Where the center cowls are used they are larger and more distinct than formerly. There is no doubt a structural reason for the abandonment of the divided front seat in that it cuts an important transverse supporting member of the body. With the center cowl arrangement this transverse member is substantially reinforced with the result that it is much easier to maintain door tightness.

Some of the bodies shown illustrate the tendency to build the car to fit the needs of the user. The dimensions of the seats and the positions of the control members are arranged in these cars to suit the physical makeup of the buyer. Naturally cars of this type are the open design where the owner is to do his own driving. One of the cars which may be mentioned as an example of the built-to-fit type is a four-passenger Murray job all in aluminum. The running boards and body and hood lines are all angular, giving a sort of cubist effect. The driver's seat in this has been laid out to measurements to suit the purchaser of the car, who happens to be the son of Andrew Carnegie.

Another tailor-made body is shown at the Brewster booth where there is a sedan built for the personal use of the president of the Brewster company. This is a square type with the flat roof but in this case the flat roof has been relieved by the sloping front line of the body so that the eye is led gradually off the top of the car instead of being somewhat shocked by the abruptness generally given with a combination of flat side lines and flat top. Even the slit in the windshield is correctly placed in this car so that it will not interfere with the vision of the particular driver who will use the car.

Body attachments and other parts of the structure which must be added to the exterior are now fastened or built in with the greatest amount of rigidity possible. Where two bolts were thought to suffice for windshield supporting members three and four bolts of larger size are employed. Fender supports are universally more substantial as are also headlight brackets and fittings universally.

In the way of new products there is very little to be found at the salon. The Biddle company has its new Duesenberg engine-equipped car on the floor and a new company known as the Mercury exhibited for the first time. The new Biddle, selling for $3,650, is very much the same as the previous type on the same 122-in. wheelbase. The former Biddle is also continued selling for $2,650 with a Buda engine. No material changes have been made in the chassis except that the drive members have been strengthened to take the greater output of the Duesenberg engine.

The Mercury cars made by Mercury Cars, Inc., Hollis, L. I., have open models priced from $2,750 to $2,950 and closed models at $3,600 to $3,900. The body work is custom style exclusively. The car exhibited is a four-passenger job and is one of the two divided front seat open types on the floor. It has the angular side lines which are popular this season.

White, Locomobile and Simplex, passenger car manufacturers of long standing, showed complete lines of bodies which are more accurately of a stock nature than the other cars on the floor. Nearly all the other exhibits represent the individual efforts of custom body designers.

White shows a coupe in dark and light gray finish with cloverleaf seating which is an example of compactness in this style. The use of the two shades tends to break up the appearance of flatness which would otherwise be likely to be apparent due to the ample head room and flat roof.

Fageol, which has discontinued the manufacture of passenger cars owing to government appropriation of the Hall-Scott engine plant, shows the last of twenty-five of these cars which were put through production. The chassis alone sells for $10,000 and the entire car for $13,000. This car is geared 1½ to 1 and 750 revolutions of the motor represents a mile of travel.

Phianna has two town cars on exhibit both of which show a tendency toward narrow lines in bodies of this kind. Cunningham, Lancia, Murray and Rolls-Royce all show town and convertible town bodies which are typical of the high narrow design which seems to be nearly universal for the formal type of city vehicle.

One of the features of the show is the rectangular lined Brewster-Knight sedan which is finished in gray with red running gear. This car is a good example of light weight body design, the body itself weighing but 785 lb., or about 400 lb. less than the average Brewster-Knight sedan body. It has four doors and is finished in cane and spruce. The inside of the doors are lined with the caning material and this does away with the usual interior panel. The result is the exceptionally light weight as noted. This car is covered with a brown canvas top which extends forward so that it forms a peak for the windshield. The windshield itself has an angle formed by a horizontal projecting line and the shield does not rise and fall in the usual manner but is raised and lowered through a space of several inches by means of a lever control.

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Further Increase in Pressure Feed May Result from Shortage of Alloy Steel

Bearing Speed Increasing Because of Engine Characteristics and Larger Shaft Diameter

OWING to the continual tendency toward stiffening crankshafts, there is an increase in pressure feed systems. This is natural because engine speeds, as well as crankshaft diameters, have increased, thereby giving a higher linear speed to the bearing. When bearing speeds go above 1000 ft. per min. linear velocity, the matter of maintaining the oil film becomes of the highest importance if the bearing is not to be destroyed. Even the highest quality of bearing materials will disintegrate quickly unless metal-to-metal contact is prevented. For this reason the utilization of a pressure feed is necessary.

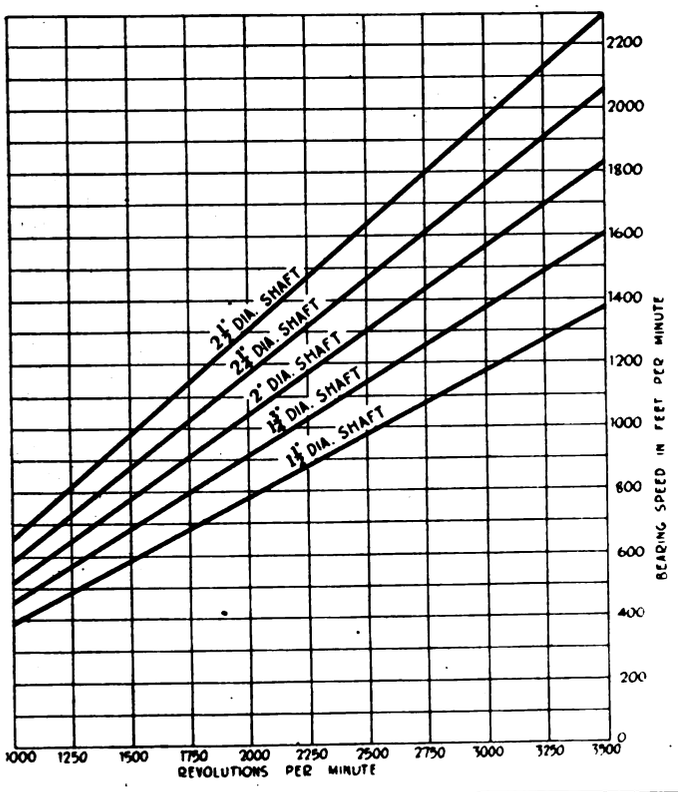
There is a tendency for the molecules of the bearing metal to be pulled out by the revolving shaft, and it is this frictional pull rather than abrasive wear which causes the destruction of the bearing.

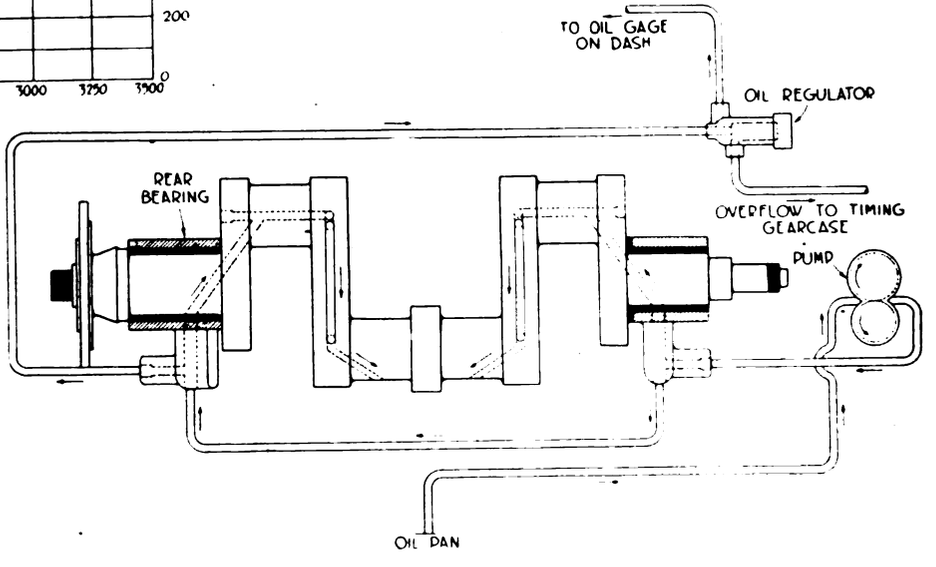
Working pressures for oil systems range from 2 to 60 lb., depending on the speed at which the engine rotates, the method of oil feed, and largely on the personal beliefs of the engineer designing the system. There are two distinct functions of the oil in reaching the main crankshaft bearings, one being to lubricate the surface by maintaining an anti-frictional film between the surfaces of the bearing and the shaft, and, secondly, a cooling function in which the flow of the oil is made use of to carry off the heat generated by friction.

Systems using the oil as a lubricant as well as a lubricating medium, and which operate with a working pressure of approximately 40 lb. per sq. in., are particularly well adapted for high-speed engines. A system of this kind generally employs a crankshaft drilled so the oil is conducted directly to all the crankshaft bearings and to the lower connecting-rod bearings. It is also quite customary to include the camshaft in the circulating system, so that the camshaft bearings as well as the cams themselves are always working in a flood of oil.

Large Strainer Necessary

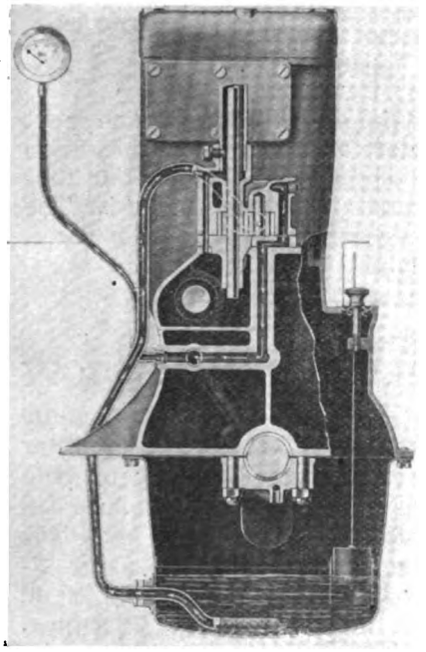
One of the points which must be carefully watched in a system of this kind is that the brass wire gauze strainer is of a sufficiently large area to give the right amount of strainer space for a system which requires as much oil flow as this does. Should a small part of the area of the strainer be clogged when the strainer is only just sufficient to allow the passage of the proper amount of oil,

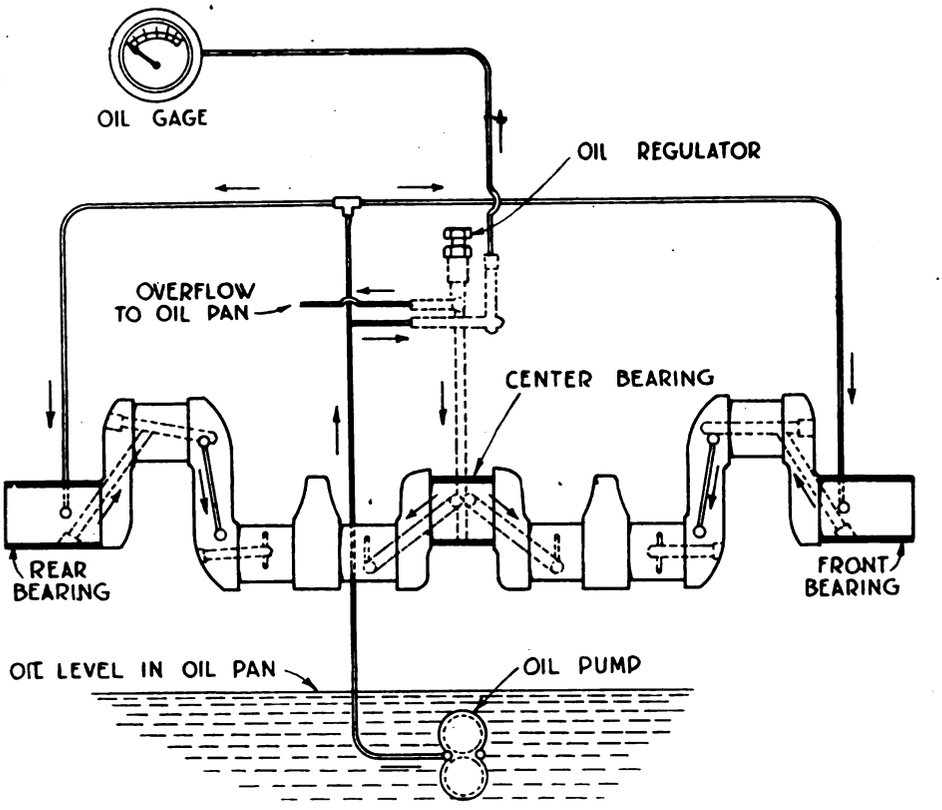




Above — Curves illustrating linear speeds of main bearings for different diameter shafts between 1000 and 3000 r.p.m. Right—Oiling diagram of the Oldsmobile 44 showing arrangements of leads and direction of flow

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Above—Diagram of the Hupp pressure feed, showing self-priming pump and oil leads. Right—Layout of the Oakland-Northway oiling system, showing the path of oil and method of pressure adjustment

the result would be that the oil would back up to such an extent that the pump feed may be starved, while the interior of the engine itself may be flooded so the rods will dip, causing an undesirable splash action and consequently allowing the engine to smoke.

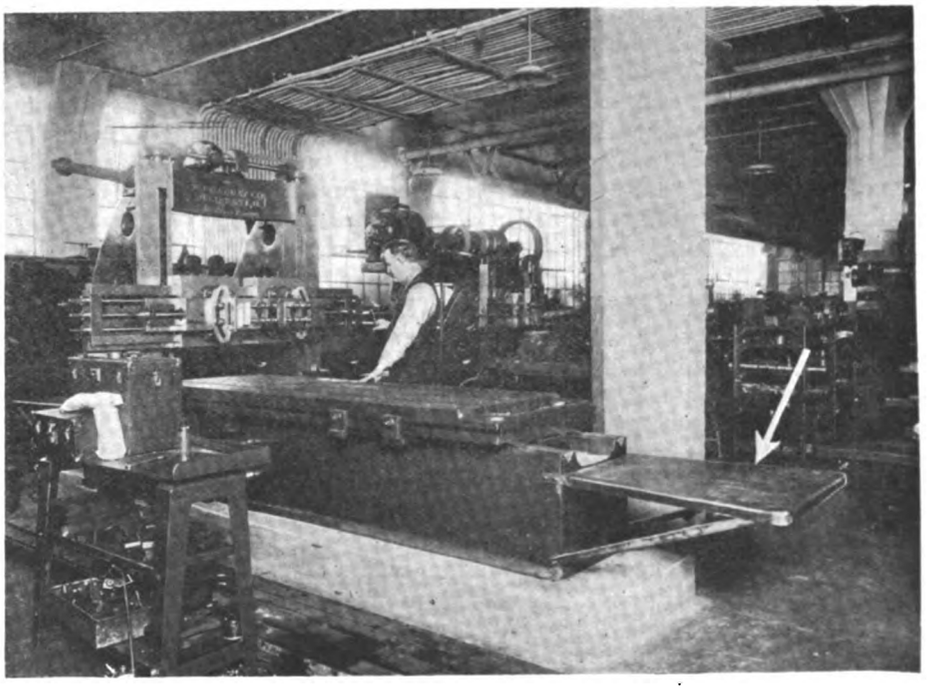
For the sake of appearance and cleanliness, it is advisable that the oil system be self-contained, with the exception of the pressure gage on the instrument board.

With conditions making it desirable to economize in alloy steels, it may be necessary to use carbon steel shafts of larger diameter. This will naturally give an increase in bearing speed, as shown in the curves herewith, and it may be that designers, changing to the larger diameter shaft, will have to alter the oiling system either by a change from splash over to pressure or by an increase in pressure, since it is quite customary to have the main bearings under pressure even though the remainder of the engine is oiled by splash.

Two typical pressure-feed layouts as used in passenger-car practice are shown herewith. The Oldsmobile Model 44 and the Oakland six are the two shown. On the Oldsmobile the pressure used on the system is not over 20 lb. maximum and 2 lb. minimum, while on the Oakland the pressure is arranged somewhat lower, so that at 20 m.p.h. the working pressure is from 10 to 15 lb. The pressure is set on the Oakland model by the adjustment shown in the drawing, controlling an overflow by-pass to the oil pan.

A Planer Safety Appliance

The cut opposite illustrates a safety device used in the plant of the Ford Motor Company. It is a planer extension, put onto the bed of a large planer, and prevents persons walking past the machine through the aisle from being struck by the planer table



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AUTOMOTIVE INDUSTRIES
The Automobile

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War Show Spirit

THE big manufacturer who dropped the remark at the Detroit Athletic Club that he would not attend the automobile show this year because, to use his exact words, "It is all right to go there in normal times to play, but these are busy times," has not the best war attitude toward the coming shows.

The situation is entirely reversed; in normal times it may be all right to stay away, but under present conditions every automobile manufacturer can perform a desirable function at the show.

Dealers come to the show by hundreds in normal times, and this year they are coming in as great numbers as ever; they are coming to learn of the future business outlook. Under these circumstances the manufacturer can scarcely afford to stay away.

Now is the time when the dealer needs the national analysis that comes from talks with the best minds in manufacturing organizations. These men should be on hand and should be there every minute. The dealers need more courage. Courage is bred of a correct analysis of business fundamentals. This has been evidenced during the past 6 months, and the opportunity afforded by the show should be taken advantage of.

The show this year is not to be taken in the light of an Oriental bazaar nor a carnival to bolster up the prospect list. It is an essential business get-together.

The industry is on trial and the jury which must be convinced is the dealer. The manufacturer knows that future business is as firm as the realization that motor transport has come to stay can make it. The dealer should be impressed with this. The manufacturer should show him.

Do your bit by being at the show.

Abandonment of the Aero Show

AFTER considering the matter from every angle the committee in charge of organizing another aero show for New York City has decided to drop the project. Government departments apparently looked with some disfavor on the plan, and it is hardly possible that the aircraft industry was greatly interested, in view of the fact that all established firms are rushed to the limit with work. Just now, also, there is no need to stimulate public interest by artificial means, as aircraft development is receiving all needed encouragement through Government channels.

One reason mentioned in connection with the abandonment of the show is that it would have been an unnecessary tax on our transportation system, which is already strained to its limit. It would have been necessary to carry much bulky material from the factories—many of them located far inland—and back again, and show attendants and out-of-town visitors would have added to the passenger traffic.

No show made up exclusively of historical and experimental exhibits would have served its purpose and satisfied the public. It would have been necessary to secure the co-operation of leading firms of the industry, and preparation of the exhibition material at the plants of these firms might have interfered with production on Government orders, which would have been impermissible.

Therefore, while it cannot be denied that the proposed show promised certain beneficial results, as outlined in these columns some months ago, it is undoubtedly to the advantage of both the national and the aero industry that no show be held this year.

Tractor Service

WHEN an automobile owner complains to a dealer regarding some trouble with his car, the latter will often say: "Drive her around to our service station some day and we will have one of our men look her over." Such a proposal generally appeals to the owner, because he is most likely to come by the station anyway in his driving, or even if he has to go out of his way say 5 miles, it is only a matter of a few minutes.

It is an entirely different proposition with the tractor, however. In the course of its regular use the farm tractor never comes to town. It is a very slow vehicle and road travel is particularly severe on it. Moreover, during the period of its most in-

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tense use, when it is most likely to require the attention of service men, the farmer is exceedingly busy and cannot spare any time from his work. The very fact that the service man on his motorcycle or automobile can travel at least ten times as fast as the farmer with his tractor and needs to move only a small fraction of the weight makes it obvious that the service man must go to the tractor—that the tractor cannot be brought to him. This is, moreover, the practice with respect to other heavy, slow-moving farm machinery, such as seeders and binders.

It would seem that tractor service should open up an excellent field for the motorcycle. Ordinarily it is not necessary to carry much heavy equipment. What tools and instruments are required might be carried in a leather roll strapped to the machine, but if this does not suffice a side attachment with carrier box would give all the carrying capacity needed.

It is true that the farmer has learned a great deal about gasoline engines and kindred mechanism by his experience with pumping engines, automobiles and lighting sets, but the day where he can do without the service of the expert is still far off. The fact that the tractor is tied to the field, so to speak, that it cannot be taken great distances to machine shops, makes it necessary to organize service for it on an even more elaborate scale than for automobiles.

Economy in Transportation

THE world-wide wave of economy cannot pass over such a fundamental of modern life as transportation. It is affecting every other phase of human existence and it cannot help but affect our mode of transportation as well. In fact it has already done so. Our railroads have been taken over by the government.

If the railroads are affected automobiles will also be affected. They will have to be operated more economically, and the cars of the future must be more efficient from a transportation basis than ever before. More miles of travel per dollar of expense must be given to the owner, better performance, better endurance, better service in every direction must come back to the purchaser of automobile transportation.

As a nation we are through buying cars, we are buying transportation itself. The car of to-day is not judged by any other standard than by the amount of transportation it provides and the quality of this transportation. If we have been extravagant in the past, we are now becoming economical. Our daily habits are undergoing a marked change. We are getting down to a war-time basis and our method of getting from place to place must be altered in conformity with the other changes that have taken place.

First cost as represented by the price mark on an automobile is not necessarily effected by this change in viewpoint. The only difference is that buyers are going to scan more closely the return for their money and if the difference between a low-priced car and one that is higher priced is made up in better performance, in better service, in more comfort, the price mark alone is not going to serve as a barrier. Useless extravagance in weight, engine size, gasoline consumption, tire wear and even in space required are all going to be checked. The 100 per cent efficient car would utilize every inch of wheelbase, it would have the lightest possible weight per pound of passenger load, it would utilize ever ounce of energy in the fuel, every bit of rubber in the tires and every bit of lubricating quality in the oil. We will never have the 100 per cent perfect car, but we must shoot as closely as possible to the mark to meet the changed demands of automobile buyers who no longer buy their vehicles by the pound.

The Coming S. A. E. Meeting

AS was the case at Washington last summer, the winter meeting of the S. A. E. in New York next week will be confined to a single day. As the most important engineering development in this country during the past six months has been the design of the Liberty aircraft engine and the design of the Liberty trucks, and as the S. A. E. has been closely connected with this work, it is fitting that these pieces of engineering work have been chosen as subjects of discussion. It will be interesting to the membership to hear directly from the men responsible for these designs the reasons behind their work. Neither the aircraft engine nor the motor truck is a one-man job and we presume that all of the features involved were fully discussed over the drawing table, so that the chief designers are thoroughly familiar with all the pros and cons not only of the features adopted, but of others that might have been used instead. As it is seldom that engineers fully agree regarding the relative advantages and disadvantages of different constructions it is not unlikely that a spirited discussion will ensue when these subjects are taken up.

Much of the time at the coming meeting will be taken up with a consideration of the report of the Standards Committee. A bulletin containing the reports of the various divisions awaiting action at the Standards Committee meeting has just been issued and contains easily the largest number of items ever taken up at any semi-annual meeting. This increased volume of work of the Standards Committee results, of course, in part from the launching out into new lines and the appointment of new divisions, but it is also in no small measure due to more energetic management of the Standards work than prevailed in the past.

Wanted—Specialists

THE great need of specialized knowledge was never so keenly recognized as now. The talk about a shortage of skilled labor when boiled down to its ultimate state is nothing more or less than the result of the demand for specialists. We are not short of man power, and whereas the shortage of labor may be stated in terms of thousands, the shortage of specialists means the urgent need for a few hundred right men for the right jobs.

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□ Latest News of the

Search Reveals No Labor Shortage

Vanderlip's Theory Disproved by Figures Showing Army of Men Out of Work—Some Skilled Men Needed

NEW YORK CITY, Jan. 2—The Frank A. Vanderlip statement made in his speech-making tour a week ago to the effect that the shortage of overcoats by our soldiers was due directly to a labor shortage, and that much of this labor was engaged in what Mr. Vanderlip describes as industries not connected directly with the war, has been denied by figures furnished by the Clearing House of Labor in this city, which is an organization in touch with 100 employment bureaus throughout New York state. The bureaus in question are described as non-fee bureaus in that they do not charge any fee for placing a worker in a job. Morris L. Ernst, director of the bureau, says that in New York City alone there are 30,000 garment workers out of employment, so that with this number of idle garment makers the labor shortage referred to by Mr. Vanderlip does not exist.

Mr. Ernst gives some clue to the possible labor situation when he says that contracts for clothing have been given to concerns without factories, and that factories had to be built and labor moved in before production started. Such conditions must not be interpreted as meaning a shortage of labor, but rather a failure in bringing the worker and the job together.

Vanderlipian Theory Disproved

Mr. Vanderlip's Vanderlipian theory that there is a general labor shortage throughout the country and which he is talking so generally on in his war-saving certificate campaign around the country, has been unqualifiedly challenged by the Department of Labor in Washington, which calls Mr. Vanderlip's statements about such shortage not only untrue but unpatriotic and not common sense, because they tend to create a panicky condition in industries which is very injurious to our activities in the war. This is not the first time that the Department of Labor, which is closely in touch with labor conditions throughout the country, has blankly denied the statements being credited to Mr. Vanderlip on this subject.

At present there is no acute labor shortage in this country. The Western shipyards need 25,000 men and the Department of Labor knows where to get them at the proper time from west of the Mississippi. The Eastern seaboard shipping yards need a few men who can be secured in their home towns. In seven or eight months there will be a demand for about 40,000 skilled workers, and not 400,000 as some reports have it. The Department of Labor states it knows where to get these men without serious disturbance to any industry. The 40,000 skilled men needed will come from 30 different trades, one of which has 700,000 members, which shows how diversified the demand will be and how little it will affect any industry. The greatest present labor problem is that of man-adjustment and getting together the many ideal men who are found in some cities where many plants need them. The situation is common to almost every city in the country.

Mr. Ernst, speaking with regard to the labor situation in New York state, gives numerous figures that are illuminating on this subject.

An Army Out of Work

In New York City there are 500 expert jewelers out of work; it is reported that in Boston 1000 men in the same line are seeking employment. These men are experienced in working with delicate machines and in performing exact operations and yet great difficulty is being found in placing them in lines where experience of this nature would be invaluable. While searching for positions for these men, fifty-five plants were written to and only two needed any men. The Aircraft Manufacturers' Assn. reported less than 10 days ago that they have all the men they can use.

There is admittedly a shortage of specialists. This is always true regardless of any times and particularly so whenever a big change of conditions is taking place. Some of the employment agencies in large centers along the Atlantic Seaboard, such as New York City, for instance, have from 100 to 200 men looking for work every morning. One of the most noticeable points in this connection is the stand taken by those out of work in refusing to accept anything but the choicest kinds of positions at the most advanced prices. This condition is directly traceable to the stories which have been going forth that a shortage exists. Naturally this puts the idea into the mind of the laborer that he can command his own price with the result that he is loath to take anything that does not pay him more than would normally be expected.

A small item in a New York newspaper, dated Nov. 14, to the effect that a shipbuilding concern needed 2000 men brought scores of letters from all over the country requesting particulars. A large percentage of these men were skilled laborers seeking high class jobs. This is significant and shows that no shortage of man power exists at the present time.

—

Award Contracts for 4100 War Trucks

WASHINGTON, Dec. 29—Contracts for 4100 war trucks, to be delivered early in 1918, for service in the Aircraft Division of the Signal Corps, have been awarded. These include 2200 of the 1½-ton light trucks mounted on pneumatic tires and specially intended for high speed work, and 1900 of the 5½-ton trucks of similar design but mounted on solid tires. The contracts have been awarded as follows:

1½-Ton Light Trucks	
Signal Motor Truck Co.	500
Republic Motor Truck Co.	500
Denby Motor Truck Co.	500
General Motors Truck Co.	700
3½-Ton Heavy Trucks	
Standard Motor Truck Co.	350
United Motor Truck Co. (Grand Rapids)	250
Federal Motor Truck Co.	500
Kelly-Springfield Truck Co.	500
Velie Motor Co.	400

—

Plan Six More Truck Trains

DETROIT, Dec. 31—It is expected that six more United States Army truck trains, each consisting of thirty Packard trucks, will leave this city overland for the seaboard. The Packard Motor Car Co. has received an unofficial notice to prepare these trucks for the drive. The Government, however, is to supply the drivers, and these must be organized before the drive-away takes place. It is stated that the first trip overland was entirely successful and the trucks will soon be running on a regular schedule from the factories.

—

Airplanes Can Now Be Insured

WASHINGTON, D. C., Jan. 2—The National Advisory Committee for Aeronautics has taken up the subject of insurance for aircraft, and announces that it has arranged with insurance companies so that they will now insure aircraft against fire while in flight, on the earth, or on any lake or river in the United States. Caution is advised by the committee to avoid the congestion of hangars which are usually remote from fire protection.

—

American Tractor Corp. Formed

RICHMOND, VA., Dec. 31—The American Tractor Corp. has been organized with a capital of $1,000,000 to manufacture and sell traction engines. F. S. Crosby has been elected president and H. H. Chalkley secretary.

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Automotive Industries

Class A Trucks Reach Washington

White, Denby and Autocar Vehicles Encounter No Difficulties En Route

WASHINGTON, D. C., Jan. 2—The three samples of Class A standardized war trucks which were manufactured in the White, Denby and Autocar factories, and were driven overland from these factories, arrived in Washington in good condition, none of them experiencing any mechanical troubles. The trucks, with load, averaged 5.3 miles per gallon, and their speed over the highways averaged 17 m.p.h. Governors were set to regulate the speed between 13 and 17 m.p.h.

The truck assembled by the Denby Motor Truck Co., Detroit, took 9 days for the overland trip. The one assembled by the White Motor Co., Cleveland, required 7 days from that city to Washington, and the one assembled by the Autocar Co., Ardmore, Pa., required 5 days for the trip. The Denby picked up the White at Cleveland, and these two in turn picked up the Autocar, so that all three arrived in Washington together.

The first AA standardized truck will probably be finished before Jan. 15, as per schedule. The parts for this truck are now almost complete.

Two models of the standardized A truck will be given a series of severe tests in and around Washington for several weeks. The third model of these trucks will be turned over to the drafting department.

—

To Fix More Steel Prices

WASHINGTON, Jan. 2—A bill meeting the ideas of the President as to additional legislation necessary to the fixing of prices of steel and iron is to be pushed vigorously and promptly by Senator Pomerene of Ohio. Senator Pomerene, who fathered such a measure during the special session of Congress, is to revive his bill, it is understood, and push it at once. He has had conferences with the President on the subject. The provisions of the bill probably will be extended to include agricultural implements, it is said.

—

Jackson Munition Corporation in Light

JACKSON, MICH., Jan. 3—The proposal to form a corporation to manufacture munitions here similar to the one recently formed in Detroit is slowly taking shape. Local manufacturers have appointed two committees to ascertain whether such a corporation would be preferable to manufacture by individual companies. One committee will investigate the formation of the Detroit corporation and the other will make local investigations. Two plants are being considered as suitable for the use of a shell corporation. One of these is the Jackson automobile factory and the other is the old Imperial plant.

—

Troy to Make Trailers for Government

TROY, OHIO, Jan. 2—The Troy Wagon Works Co. has received a Government order for 100 two- to five-ton Troy trailers of special design for the Signal Corps.

—

Lansing Companies Get Orders for Escort Wheels

LANSING, MICH., Jan. 2—The Prudden Wheel Co. and the Auto Wheel Co. have received Government contracts for escort wheels amounting to $3,000,000. The contracts must be completed by Dec. 31, 1918, and are proportional to the respective production capacities of the two companies. It is estimated that the Auto Wheel Co. will require 800 additional employees to complete the work in that time. Other big orders for the same type of wheel have been placed with the Kelsey Wheel Co., Detroit, and the Hayes Wheel Co., Jackson.

—

To Facilitate Grand Rapids Airplane Work

GRAND RAPIDS, MICH., Jan. 2—The Federation of Furniture Manufacturers here, to which about 300 local industrial plants belong, is appointing a sub-committee to act as a clearing house for Government orders. Peter B. Schravesa, president of the School Equipment Co., is chairman of the committee. Several million dollars' worth of airplane parts will be ordered, it is expected.

—

Stearns to Make Rolls-Royce Airplane Engines

CLEVELAND, Jan. 2—The F. B. Stearns Co. has received a contract stated to involve several million dollars for the manufacture of airplane engines for the British Government. This is a sub-contract under the British Rolls-Royce Co. and under it the Stearns Co. will manufacture Rolls-Royce engines complete except for a few minor parts. The contract will require several additions to the Stearns plant and a directors' meeting will be called this week to complete arrangements for enlargement. It is stated that though this contract will require some slight curtailment in the production of Stearns-Knight cars manufacture will be continued.

Prompt Unloading Is Mandatory

Railroad Dictator Threatens Dilatory Dealers with Embargo—The Situation

WASHINGTON, D. C., Jan. 2—Secretary McAdoo, who is now railroad dictator, has issued an order to-day to the effect that any consignee who does not promptly unload freight cars and release them for return trips will be embargoed. This order has a distinct meaning to the automobile industry, both to the manufacturer and the dealer. Many dealers had been receiving shipments of automobiles that they were not expecting from the factory and had made no provision for the immediate unloading of them, in which case the factory was at fault. If these unloading delays are continued the dealer will be embargoed. New England dealers have been constant violators of this unloading problem.

Many dealers do not realize how closely they are being watched in this work. There are twenty or thirty local committees of the American Railroad Association in different parts of the country. In the same cities there are other committees representing the national, industrial traffic league, which is the national organization of shipping interests. Both of these sets of committees work together. Flagrant abuses of dealers not unloading automobile shipments promptly are reported to the National Automobile Chamber of Commerce, but there are hundreds and thousands of cases which are not so reported. It is dangerous work for the dealer to delay an hour in this unloading work.

In addition to the two sets of committees watching the situation there are scattered throughout the country inspectors of the Railroad War Board who are moving about all of the time in search of violations of this unloading regulation.

The taking over of the railroads by the Government looks like increased railroad facilities, and can only be considered as beneficial to the general situation. The outlook is very favorable for the automobile industry in general, as the railroad dictator is not considering any move at this time that would injure any of the industries.

The policy is one of construction. The Railroad Dictator has issued orders creating genuine pooling of railroads, appointing capable assistants and promising an increase in wages to all railroad workers, requisitioning 1800 locomotives originally designed for foreign

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service and ordering many lines not requiring their engines and cars to transport them to the congested districts.

Many passenger coaches will be converted into freight cars and additional freight terminals will be built as required. Common freight terminals will be arranged in Chicago, New York and New Jersey, and the Railroad Dictator also plans to construct many new tracks, freight cars and engines, all of which, it is hoped, will care for freight requirements of the war, aided by electrical lines, waterways and motor transportation without creating disturbance to any industry.

—

Fuel Situation Easier

DETROIT, Jan. 2—Although the fuel situation is bad here it is not expected that industries will be harmed to an alarming extent. Michigan Fuel Administrator W. K. Prudden has ordered that all emergency coal entering Detroit be used first to alleviate any shortage for domestic use and any surplus turned over to the industries. At present most industries are running at almost normal capacity though there have been some instances of shut-downs. Briscoe, for example, shut down 2 days last week and closed at 2:15 p. m. several days owing to lack of coal, but is running full time now. Oakland, in Pontiac, is short of coal but is running full time. Both Olds and Reo have plenty of coal for the present but the future looks bad.

—

Jobbers Ready for Convention

NEW YORK, Jan. 2—The third annual meeting of the National Association of Automobile Accessory Jobbers will be held Jan. 14-15-16 at the Hotel Astor in the North Ball Room on the eighth floor. These three days will be devoted to the open sessions of the association. Committee meetings will be held Jan. 11-12, the last two days of the New York show.

Commissioner William M. Webster, in the convention program, states that the association has continued to grow during the past year and enters 1918 with indications of continued steady growth. There have been about a dozen resignations, due, he states, to the discontinuance of manufacturers and to the attitude of the Ford Motor Co. in regard to its dealers acting as jobbers.

—

Stewart to Make Airplane Wheels

INDIANAPOLIS, Dec. 31—The Stewart Wire Wheel Corp. of Frankfort, Ind., has signed a Government contract to manufacture 4500 wire wheels for airplanes. Approximately $45,000 is involved in the order.

—

Gilette Brings $151,000

MISHAWKA, IND., Dec. 31—The Gilette Motors Co. has been sold to M. W. Mix, president of the Dodge Mfg. Co., and the sale has been approved by the South Bend Circuit Court. The consideration was $151,000. In July, 1916, the Gilette Co. was formed to take over the plant and patent rights of the Wilmo Co., accessory manufacturers, Chicago.

Detroit Calms Down Before Show

Coal Situation Relieved—Manufacturers Start for New York

DETROIT, Dec. 28—In spite of the abnormal conditions that have at times seemed to threaten the automobile industry, conditions in the past week have calmed down considerably, and manufacturers are preparing to attend the New York show and get ready for Spring business. Throughout the city and state the coal situation has eased up, due partly to the holidays, but more directly to receipt of coal shipments.

Recently 1800 carloads of coal arrived in Detroit, and there is a prospect of eight or ten times that amount arriving in the next ten days. Grand Rapids reports every dealer supplied, and 100 tons on hand. The Sparks-Withington Co., Jackson, says that though the electric power company has only a limited supply of coal on hand, they, personally, have sufficient. This company also states a more cheerful outlook on the part of manufacturers. Some time ago stop-orders on parts for manufacturers were more or less common, but recently orders have been coming in in a manner that indicates that makers are getting their nerve back, and going ahead on a square basis.

There is a strong possibility that the automobile and parts manufacturers of Jackson will form a shell company similar to that recently formed in Detroit. Last week Mayor Sparks, Jackson, received a telegram from A. W. Copland asking if the manufacturers would be interested in forming such a company, to which the manufacturers replied affirmatively. A survey of the companies will be made, and a committee may be sent to Washington to arrange the details.

The Harroun Motor Co., Wayne, is rapidly speeding up production, and is now shipping 30 cars a day. Freight car and coal shortage, hindering the Detroit manufacturers, is less acute in Wayne, and Harroun reports no difficulty in that direction.

During the past week the Liberty Motor Car Co. has shown a marked expansion in its dealers organization, and manufacturers are optimistic for the coming season. Among the new agencies established are: F. E. Styvesant Co., Cleveland, with branches in Toledo, and later in Columbus and Cincinnati; J. D. Moore, Walla Walla, Wash.; Twin City Motor Car Co., Minneapolis; Edgar F. Sanger Co., Milwaukee, and the Means Automobile Co., Des Moines.

As an example of the further working out of the drive-away problem, to relieve the freight car situation, two cases are cited whereby passenger cars have been delivered on trucks overland. In one case, three twin-six Packard enclosed cars were loaded on Packard 3-ton trucks, and started on Dec. 24 for Baltimore, a fourth truck carrying a passenger car body. The second instance is that of a Washington, D. C., cartage man who contracted to bring two Cadillacs with him on two Packard 3-ton trucks he was driving back for his own use.

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Stevens Point for Trenam Tractor Site

STEVENS POINT, WIS., Dec. 31—The Trenam Tractor Co., Milwaukee, organized several months ago with $400,000 capital to manufacture a tractor designed by J. J. Trenam, has decided to establish its permanent plant and headquarters in Stevens Point. The company has purchased the entire plant and holdings of the Central City Iron Works, Stevens Point, consisting of a large malleable and grey iron foundry, machine and assembling shops, office and warehouse building. The first castings for the new tractor have been made already. The company will furnish parts to other tractor manufacturers and railroads.

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Dump Bodies from Milwaukee

MILWAUKEE, Dec. 31—The Horizontal Hydraulic Hoist & Body Co. has been organized with a capital stock of $50,000 to manufacture automatic dump bodies and hoisting devices for motor trucks. Arrangements are now being made for the establishment of a factory in Milwaukee. Charles F. Millmann, Edward R. Bacon and Benjamin A. Reese are the incorporators.

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New Erd Kerosene Engine

SAGINAW, MICH., Dec. 30—The Erd Motor Co. will manufacture a kerosene burning tractor motor larger than the present model. This will embody radical changes in design and have greater power and economy. The Erd plant will be expanded to give added facilities for the manufacture of the new tractor.

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Phoenix Rushed with Government Orders

EAU CLAIRE, WIS., Dec. 31—The Phoenix Mfg. Co. is delivering a number of Phoenix Centipede tractor trucks to the United States Quartermaster's department in Texas for exhaustive army tests. The trucks were constructed under Government supervision and employ the well-known creeper-type driving principle.

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Airplanes from Indianapolis

INDIANAPOLIS, Dec. 31—Preliminary incorporation papers have been filed by several well-known Indianapolis business men who intend to organize a corporation here to manufacture airplanes. The company has been capitalized at $1,000. The directors of the company include Albert D. Johnson, secretary-treasurer of the Diamond Chain & Mfg. Co.; A. B. Jennings, a real estate dealer; Lewis Wallace and Joseph T. Markey, attorneys, and George H. Cottrill, a lumber dealer.

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First Motor Truck Train Completes Trip

Proves Feasibility of Motor Truck Transportation—Orders Issued to Companies to Use Highways for Drive-Aways

WASHINGTON, D. C., Dec. 29—The motor truck convoy which left Detroit Dec. 14 to make the first test overland drive-away to the Eastern seaboards arrived at Baltimore, its American terminal, yesterday. One of the 30 trucks starting the journey failed to finish, having been struck by a train en route. The trip marks the beginning of a new era of huge and vast drive-aways. Orders were issued immediately following the end of the journey by Major Miller to all motor companies shipping war trucks east to utilize the highways of the nation for drive-aways in all instances. The journey was made slowly under orders from the War Department, averaging 50 miles a day.

The complete convoy comprised 28 3-ton Packard motor trucks, 2 Packard oil tank trucks, a Dodge 5-passenger car, a Dodge roadster, a Dodge light delivery truck and a General Motors light ambulance truck. The personnel included: Capt. Bennett Bronson, Quartermaster Corps, in charge of convoy; Lieut. C. A. Riley, Quartermaster Corps, in charge of motor train; Lieut. L. J. Ward, U. S. M. C., medical officer in charge; eight National Army men; Capt. E. B. Butchers, representing U. S. Engineers Corps, and H. C. Ostermann, representing Highways Transport Committee.

The trip is particularly remarkable in view of the fact that none of the drivers has ever driven any truck before. They were all men taken from an infantry camp and placed at the wheel. Weather conditions were the most adverse possible. The convoy left Detroit at 4 below zero and fought through snow all the way up to Pennsylvania. Schools were let out along the route, business, military and professional men turned out to give welcome to the trucks and the Red Cross had hot meals ready for the soldiers at every stop.

The trip absolutely proves the feasibility of motor truck transportation in all kinds of weather. Following is an outline of the journey:

The U. S. Motor Transport left Detroit Dec. 14 at 10 a. m. from the Packard factory, proceeding through Detroit without difficulty as the streets were cleared of traffic and no deep snow was found. The transport arrived at Monroe, Mich., at 9 p. m. after laying 3½ miles west of Monroe 3 hours attempting to clear the route of snow. The distance covered the first day was 45 miles.

The transport arrived at Toledo at 5:30 p. m. without encountering any particular difficulty between Monroe and Toledo with the exception of short stretches where the road had not been dragged and light traffic had broken the drifts into a zig-zag line. No effort had been made by county officials to scrape off the roads. In many instances the road was broken on one side, covering a portion of the shoulder of the road, making it dangerous to heavy truck transportation. Distance on the second day 18 miles.

They left Toledo 7:30 a. m. Dec. 16, passed to Norwalk, Ohio, and arrived at 7:30 p. m. No effort had been made by the county and township officials to clear the roads and considerable snow drift trouble was encountered. The mileage of the day was 62 miles.

Leaving Norwalk at 8:20 a. m. Dec. 17, the convoy found the road, with a few exceptions, well cleared of snow and experienced no difficulty in reaching Cleveland at 6 p. m., covering 58 miles for the day.

It left Cleveland at 9 a. m. Dec. 18 and arrived at Ravenna, Ohio, at 5 p. m. The road showed some care but work had not been completed in an intelligent manner and many high centers were encountered. From Ravenna to Warren through misunderstanding the route was changed and 24 miles of bad roads were encountered. Later it was learned that officials had cleared the road on the original routing. Trucks arrived at Warren at 3 a. m., covering 65.5 miles.

On the route from Ravenna to Warren truck No. 21 was struck by a passenger train and the driver was killed. This necessitated laying over at Warren on Dec. 19.

The party left Warren at 7:15 a. m. Dec. 20 and arrived at New Brighton at 8 p. m., covering 54.8 miles. Considerable difficulty was encountered on that section of the road known as the "cut-off" between New Springfield and Unity. A little graveling had been done by Mahoning county and nothing at all by the Columbiana county. The stretch was narrow and a primitive dirt road. Three sharp right angle turns were found. After the trucks passed over the road, ruts a foot deep were left.

New Brighton was left at 8:20 a. m. and Pittsburgh reached at 2 p. m. Dec. 21. No difficulty was experienced over this 32 miles of the trip.

From Pittsburgh east the journey was made without difficulty, road conditions in Pennsylvania and Maryland being found in excellent shape.

Credit is given by members of the party to the State Highway Departments of Pennsylvania and Maryland for the remarkable condition of all roads. The last 232.9 miles were made in 7 days.

The trip was educational and resulted in a conference in Washington with the War Department about the lessons learned on the trip. The success of the trip is indicated by the fact that 6 similar truck trains have been ordered to leave Detroit next week, carrying supplies to the seaboard.

The snow organization was bad in Michigan and Ohio, but excellent in Pennsylvania and Maryland. The Highway Transport Committee would like all highway departments to remember that motor truck trains of this kind demand a wider clearance of the roads than passenger cars.

Europe's Post-War Models

Fiat, Renault, Berliet and Others to Get Into Large Production on Medium-Priced Machines

PARIS, Dec. 10—Reports of huge after-war schemes in French motor circles have been prevalent for a long time, but few definite announcements have been made. Now comes the news that the Berliet company of Lyon, France, has formed an auxiliary company, with a capital of $5,000,000, with the intention of building and putting on the market a popular automobile, to be built in series of 30,000 and sold complete at $1,200.

No official announcement has been made regarding the type of car, but it is well known in automobile circles that Berliet has closely studied American production methods, that he has had in hand all the popular American cars, and that experimental models on these lines have been built. Thus it is safe to assume that the $1,200 car will be a six-passenger touring model with electric lighting and starting. It is obvious, too, in view of European taxation and gasoline cost, that it will have a small, comparatively high-speed four-cylinder motor.

While not the biggest in Europe, the Berliet factory, located at Lyon, is recognized as one of the most modern in France. Marius Berliet, the proprietor and founder of the firm, is a self-made man who got into the automobile business in 1899 with three workmen and a capital of $900. Before the war the factory covered 720,000 sq. ft., employed 2000 workpeople and produced 3000 cars a year. The works have grown enormously since 1914, the number of workers now being about 8000. For some time Berliet has specialized on trucks, and thus has kept his works on automobile production during the war. An additional factory is to be erected for the production of the popular after-the-war model.

There are several other firms capable of carrying out a program as big as that announced by Berliet. Fiat Co. at Turin, Italy, for instance, could certainly produce between 40,000 and 50,000 cars a year if the whole of the present factory were concentrated on one model. This company, which claims to be the biggest automobile concern in Europe, has a factory area of 5,400,000 sq. ft., a staff of 25,000 workpeople, and a nominal capital of $10,000,000. In addition it has recently absorbed the Ferriere Piemontesi Steel and Iron Foundries, Rolling Mills, etc., with a capital of $1,800,000; the Officiene Gia Fili Diatto (Tramways and Rolling Stock Works), with a capital of $800,000, and The Industrie Metallurgiche Torino Steel and Iron Works, with a capital of $800,000.

Fiat has not made any announcement of its post-war program, but is already putting out for war service five-passenger cars built on American lines complete with electric lighting and starting. Like Berliet, Fiat has kept on automobile work throughout the war. The Ital-

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ian factory has taken advantage of war conditions to make itself independent of all outside concerns; thus it is producing practically every part of its cars, including electric appliances, but excluding magnetos in its own factories. It is reported that even magnetos will be Fiat produced after the war. Fiat has also developed the practice of building a large number of its own machine tools and special factory machinery.

In addition to Fiat there is in Turin a branch concern known as the Fiat San Giorgio, interested in Diesel motors, submarines, aviation motors, etc. This was originally a part of the main Fiat company, but during the past year the Fiat San Giorgio has secured financial independence.

Another firm expected to play an important role in the after-war competition is Renault, of which Louis Renault is the sole proprietor. This factory is now the biggest in France, with a staff of rather more than 20,000 workpeople, engaged on aviation motors, trucks and staff cars. Louis Renault, who started in the automobile business in 1898, in partnership with his two brothers, now dead, and a staff of about half a dozen workpeople, understands American production methods better than any other man in France, for he has made a number of visits to the United States and closely studied automobile conditions there. Up to the war, however, he had refused to break away from the European plan of building a variety of cars to suit the various classes of society. Rumor has it that Renault will put his big factory on the production of one or two popular models to be sold at a popular price. Only one man knows whether this is so or not—and Louis Renault is not talkative.

Reports are busy around the name of Citroen & Co., a firm which before the war made a specialty of gears and gear cutting, not only for the automobile industry but for general engineering. This factory has grown until the staff employed is about 15,000, and if reports can be believed Citroen will make a bold bid in the automobile business.

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More Liberty Contracts for General Motors

DETROIT, Jan. 2—It is understood that the contracts for Liberty airplane engines now held by the General Motors Corp., and being filled by the Cadillac and Buick companies, have been extended. It is stated that these two companies have received new contracts which call for the completion of 50 Liberty engines a day for an indefinite period. The original order was for 1000 engines.

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Women Taxicab Drivers

SEATTLE, Dec. 24—The Seattle Taxicab & Transfer Co. has employed 20 women as taxi drivers, to replace men who have joined the army. More women will be employed as vacancies occur. The new drivers will take the city examination and will be admitted to the Auto Drivers' Union.

Gasoline Allowance Cut in France

11 Gallons Per Month Allowed —Taxicab Use Restricted— Used Cars Drop

PARIS, Dec. 8—With the first day of January French motorists are to be deprived of all gasoline supplies and will receive no more permits to travel, thus making it impossible for them to use up any stocks they may have collected. The maximum gasoline allowed per month will be 11 gallons. This is the summary of a decree issued this week by the authorities and published in the *Journal Officiel*. The new decree puts France on the same footing as England and Italy, where for a few months private motoring has been forbidden. The situation of France is likely to be worse that that of England, for car owners in the latter country have found a certain measure of relief in the use of coal gas carried in rubber containers. This is not possible in France owing to the shortage of coal.

While the general principle of the decree is a complete cessation of motoring, it has been necessary in the interest of the nation to make certain exceptions. Thus the prefects are authorized to issue gasoline cards to persons running public service vehicles or doing work of national importance. This will cover doctors, farmers, business men whose business is necessary to the public, and public officials. It is obvious, too, that there must be a certain number of automobile owners who are completely dependent on the use of an automobile and could not exist without a car or some other means of locomotion. These cases will be considered on their merits, but the maximum amount of gasoline to be allowed in each case is fixed at 11 gallons per month. Up to a few weeks ago the allowance for private motorists was 66 gallons per month.

Ever since the war it has been necessary to have permit to travel by automobile in France. The deliverance of these permits, however, was a mere formality, and in the absence of police on the roads the official piece of paper was not even necessary. With the new year the travel permits will be entirely parochial, so that no automobile owner can get beyond his own immediate neighborhood. Further, the permits to purchase gasoline and the permits to travel will be given out together, a control being kept over the two, thus preventing gasoline being obtained by fraudulent purposes or the use of stocks which have been got together in normal times.

For long-distance touring the same regulations will apply, the authorities issuing the pass when they consider the journey is necessary in the national interests, or is made to transport sick or wounded. A clearly defined route must be followed, and the home trip must be made within a month.

The immediate result of these regulations will be to bring down the price of second-hand cars from the giddy heights they have attained to a more reasonable basis. As an indication of the exaggerated prices a used Rolls-Royce touring car changed hands a few days ago at $9,000, while all the cars discharged from the army as unfit for further war service have been sold to the public at very high figures.

There must be several thousands of small manufacturers and factory owners whose businesses have grown to such an extent that they now find it necessary to use an automobile. Many of these are old touring cars converted to light trucks, which are being worked to destruction with the maximum load on the body and a trailer in the rear. These men must either have gasoline or must limit their activities. It remains to be seen how the Government officials will take care of such cases. There is certainly a wide difference between the liberality of 1916 and 1917 and the proposed restrictions of 1918.

Taxicabs are to be given a special allowance of gasoline,, but they cannot be taken more than 3½ miles from the district in which they are licensed. Thus, in the case of Paris taxicabs, it will be impossible to go more than 3½ miles beyond the city walls.

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Gasoline Exports Drop

WASHINGTON, Jan. 3—Exports of gasoline from the United States fell off approximately 24,000,000 gal. during the first 11 months of 1917 as compared with the same period in 1916. Exports of lubricating oil on the other hand increased nearly 27,000,000 gal. Crude oil fell off about 11,000,000 gal. Following are the figures:

Nov. 1917	11 mos. 1916	11 mos. 1917
	Gasoline, Gal.	
56,996,017	332,105,215	308,917,887
	Lubricating Oil, Gal.	
25,145,639	244,284,558	271,733,613
	Crude Oil, Gal.	
7,444,253	158,534,638	147,942,870

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German Plot Injures War Trucks

WASHINGTON, D. C., Dec. 29—What is claimed to be a German plot was discovered by the War Department, in the injury of 600 war trucks recently ordered and delivered to this city. Upon reception of the trucks they were subjected to the usual examination. Pistons were found to be slightly out of plumb and they were sent back to the factory for correction. They returned with a slight knock, and an investigation by the secret service revealed that a German foreman who headed the machine shop where the trucks were had contrived to put them out in defective condition.

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Stutz Engines—Correction

The Stutz Motor Car Co. manufactures only cars with 4-cylinder, 16-valve engines, and an item to the contrary in AUTOMOTIVE INDUSTRIES of Nov. 29 was incorrect.

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Curtiss Bond Issue of $15,000,000

To Simplify Advances from Government and Retire Present Outstanding

BUFFALO, Dec. 30 — The Curtiss Aeroplane & Motors Corp. will issue $15,000,000 of first mortgage 6 per cent bonds, in 6 series, on Jan. 1. This is to simplify the process of securing advances from the Government through the War Credits Board, which are to be made for assisting its production on war contracts.

Series A, of $359,000, maturing Jan. 1, 1919; Series B, of $356,000, maturing Jan. 1, 1920; Series C, of $348,000, maturing Jan. 1, 1921; Series D, maturing Jan. 1, 1922, and Series E, of $1,982,000, maturing Jan. 1, 1923, will be used to retire, on a dollar-for-dollar basis, the present outstanding 6 per cent notes and the gold 6s of 1927. With the shortened maturity, no difficulty is expected, especially as the new notes, like the old, are convertible into common stock at $50 a share, and callable at 102½.

Series F, not convertible, and redeemable at par, is neither to be issued nor sold, but deposited with the Government as collateral against the expected advance upon contracts, in order to provide the "proper security" required by law in case of a Government advance. Officials of the company explain that the entire plan is not, strictly speaking, a new financing operation, but is merely intended to simplify the company's financial position in respect to the funded debt, preparatory to the Government's advance on contracts. This advance became necessary to give the company a free hand and plenty of working capital for the near future, as the labor of financing its new plant had imposed a heavy strain upon the company's resources.

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Reo Shipping 125-150 Cars a Day

LANSING, MICH., Dec. 31—Daily shipments of the Reo Motor Car Co. average from 125 to 150 cars and many of these are being driven overland by dealers. Part of these cars are being taken by the dealers and stored at points near Lansing in the hope that the freight car situation will ease up slightly and permit them to be shipped to their ultimate destination. When and wherever possible drive-aways will, however, be used.

The Reo Motor Car Co. is tooling up preparatory to the manufacture of tractors for the United States Government. It is stated that this work will not materially reduce the production of the Reo company, as it works in nicely with the equipment and labor at hand. Hence the Reo dealers throughout the country will suffer no particular hardship. There are at present about 3500 cars on hand ready for transportation providing the equipment were available and officers of the company state that the recent Government control of railroads will doubtless better the freight car situation. This will be particularly due to the fact that any particular railroad equipment may be sent in any desired direction when needed—a condition that has been impossible in the past.

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Kissel Released from B Truck Contract

WASHINGTON, D. C., Dec. 29—The Kissel Motor Car Co. has been released from its contract for 500 Class B heavy duty war trucks because of its need for all facilities to handle more recent contracts for four-wheel-drive trucks. The contract for the 500 B trucks was transferred to the Garford Motor Truck Co., making the Garford contracts for B trucks total 1000. It is rumored that two or three other concerns will also be released from their contracts.

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Lang to Build Bodies

CLEVELAND, Dec. 27—The Lang Body Co. is completing its building and expects to start production by Feb. 1. The first unit, a three-story, L-shaped building of mill construction and the dry kiln is practically finished. The work is about thirty days behind schedule due to unusual weather conditions.

The company now has in stock lumber, aluminum and steel for the manufacture of commercial and passenger car bodies. The plant occupies five acres of land on the switch of the New York Central near West 106th Street and has an option on five adjoining acres. The officers of the company are: President and treasurer, Charles E. J. Lang, formerly vice-president and treasurer of the Rauch & Lang Carriage Co., and later vice-president and director in the consolidation of the Rauch & Lang Carriage Co., and the Baker Co.; vice-president and general manager, Elmer J. Lang; secretary, John H. Price. L. L. Williams, formerly with the body department of the Peerless Motor Car Co., is engaged in similar work in the Lang company.

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New R. & L. Electric Model

CLEVELAND, OHIO, Dec. 31—The Baker R. & L. Co., manufacturers of the Rauch & Lang electric car, has developed a new model chassis styled W-42. This has a wheelbase of 142 in. and new body design. The construction is practically the same with several improvements incorporated including a more powerful motor. Three body styles are offered, a touring car, sedan and limousine.

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Monroe Lowers Its Prices

PONTIAC, MICH., Dec. 31—In spite of the continually increasing cost of material the Monroe Motors Co. is decreasing the price of its product for 1918. The model N-6, four-cylinder touring car, previously cost $1,095 and this has been reduced $100 for the coming year. The sedan body, mounted on the same chassis, sells for $1,850. The reason stated for this decrease is that an increased production renders the reduction in price possible.

Truck Makers Try Drive-Aways

J. C. Wilson Co. and Dodge Will Follow Policy All Winter

DETROIT, Jan. 2—Truck manufacturers are following in line with passenger car manufacturers and using the drive-away method of getting trucks into dealers' hands. The J. C. Wilson Co. is having drive-aways to cities as far away as Boston, Philadelphia and Baltimore. Members of the firm say that in spite of road conditions saving in time and expense is considerable, even though freight car equipment were available.

Careful records of the last drive-away to Baltimore were kept. Each truck, of the 2-ton type, carried parts for the Baltimore service department. The distance of 543 miles was covered in 4 days, via Toledo, Cleveland, Youngstown, Pittsburgh, Uniontown, Cumberland and Baltimore. The average number of gallons of gasoline consumed was 52, with 1 gal. of oil. The total expense per truck, including insurance and mechanical wear proportional to yearly overhead, was $62.91; the cost per day, $15.56; the mileage cost, 11.6 cents, and the ton-mileage, 5.8 cents.

Dodge Brothers are likewise delivering their new commercial car overland, and this policy will be followed all winter, regardless of weather conditions. Already cars have been delivered to Lawrence, Kan.; Atlanta; Hannibal, Mo.; Paris, Tenn.; Waterloo, Iowa; Cincinnati; Davenport, Iowa; Johnstown, Pa.; Terre Haute and Chicago.

—

Jones to Have Continental Engine

WICHITA, KAN., Dec. 27—Jones cars and trucks will have Continental engines. A contract has been signed, by which the Continental Motor Co., Detroit, will supply engines for the new 27 A-B-C series and the 1 and 2-ton trucks. Model 26 A-B-C will continue with the Lewis engine.

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Maxwell Preparing for Government Work

DETROIT, Dec. 31—The Maxwell Motor Co. is taking on tool designers, tool makers and die makers, and otherwise preparing for filling the Government contracts which it now has on hand. Due to the large amount of Government work at present being placed in production there is a premium placed on this class of skilled labor and it is difficult to obtain it even then.

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Government Work for McFarlan

INDIANAPOLIS, IND., Dec. 31—The McFarlan Motor Car Co., Connersville, has signed a contract with the Government for the manufacture of 6,000 automobile tool chests. Officials of the company state that the order will keep the plant in operation to full capacity for several months.

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France to Receive 1500 Tractors

Will Plant 1,500,000 Extra Acres of Wheat and Potatoes

WASHINGTON, Jan. 2—Fifteen hundred farm tractors will be sent to France by the Food Administration. All will be over-seas for spring plowing in March. It is estimated that this increase in the French food supply, through greater efficiency, will release 2,000,000 tons of shipping in 1918 that otherwise would be needed to transport food. France in 1917 had 30,742,157 acres of crops, compared with 40,657,293 in 1913. The total food crop in 1917 was 24,581,290 tons as compared with 30,462,340 tons in 1913. The tractors will enable the French to plant 500,000 additional acres of potatoes and an extra million acres of wheat.

The plan for sending the tractors was conceived by Henry Morgenthau and his son, Henry Morgenthau, Jr., the latter of whom will supervise the delivery of the tractors in France and establish schools to train older men and women to use them. The French government has accepted them and they will be distributed by the French Minister of Agriculture. The National Implement and Vehicle Association approved the plan and gave assurance that it would not interfere with American farm production.

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Washington Has New Car Licensing Law

WASHINGTON, Jan. 2—Washington's new motor car law, providing for the yearly licensing of cars, which was enacted by Congress last session, went into effect Jan. 1. Motorists will have the entire month of January in which to procure their numbers, owing to the inability of the officials to secure numbers fast enough. The new registration law bases the tax on horsepower and the S. A. E. rating has been adopted. The rates are: 24 hp. and under, $3 per year; 30 hp. and less, $5; over 30 hp., $10; demonstrating cars of dealers, flat rate of $6 each; motorcycles, $2. Heretofore the tax was $2 per car and was good as long as the person to whom it was issued owned the car. Maryland is the only state in the union that has no reciprocity agreement with the District of Columbia. Motorists in that state will be compelled to take out licenses here if they desire to come into the District of Columbia.

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Goodyear Profits Increase 100 Per Cent in 1917

NEW YORK, Jan. 2—Last year was the most successful in the history of the Goodyear Tire & Rubber Co. Gross sales jumped from $63,000,000 in 1916 to $111,000,000 in 1917 and net profits from $7,003,330 to $14,044,206. This shows an increase of 74 per cent in volume and 100 per cent in profits. Of this amount less than 1 per cent resulted from war business. The plant capacity of the company was almost doubled during the year.

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Reilly Goes with Globe

SAN FRANCISCO, Jan. 2—W. P. H. Reilly, Pacific Coast sales manager of the Ajax Rubber Co., has resigned to become special representative of the Globe Rubber Tire Mfg. Co.

This change followed when J. C. Matlack accepted the presidency of the Globe Co. Reilly has been associated with Matlack for many years.

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To Make Reversing Oil Engine

MILWAUKEE, Dec. 31—The American Oil Motors Co. is being organized with a capital stock of $1,000,000 by members of the Corporation Finance Co., 309 Caswell block, to manufacture an internal combustion engine designed by Charles S. Salfeld. This is capable of using the heaviest oils and distillates as fuel. The engine is designed for application to all kinds of vehicles, tractors and airplanes and is a reversing type. A. C. Lingelbach, Milwaukee, is handling the details of the promotion.

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50 Trucks Overland from Buffalo

BUFFALO, Jan. 1—Fifty Pierce-Arrow army trucks left to-day overland for New York. This is the largest convoy ever started out in this way. The convoy of trucks which recently went from Michigan to Baltimore numbered 30. The first truck is fitted with a snow-plow and the engineers were fitted out with winter clothing by the Buffalo Red Cross. Captain J. D. K. Loach, Twentieth United States Engineers, is in charge of the trucks and the 92 men who operate them.

—

Syracuse Plant for Smith Wheel

SYRACUSE, N. Y., Dec. 31—The Smith Wheel, Inc., will increase its capital from $100,000 to $3,000,000 and take over the Globe Malleable Iron Co. The latter is the oldest manufacturing plant in Syracuse. Both companies are working on war orders.

—

Carrell Appointed Chief Engineer

SAGINAW, Jan. 2—William A. Carrell has been appointed chief engineer and works manager of the Erd Motor Co., Saginaw. He will also direct the sales and advertising. Formerly he was associated with the Wisconsin Motor Co., Milwaukee, and general superintendent of the Beaver Mfg. Co. and superintendent of the Milwaukee plant of the International Harvester Co.

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Sweet Is Captain in Aviation Section

GRAND RAPIDS, Jan. 2—George P. Sweet, manager of the United Motors Co., Grand Rapids, has been commissioned a captain in the aviation section of the signal corps.

Detroit Feels Need of Specialists

But Shortage of Highly Skilled Men Will Not Seriously Hamper Production

DETROIT, Jan. 3—As has been the case for some months, there is a scarcity of what might be called specialist labor in Detroit, by this being meant such artisans as tool designers, tool makers, die makers, gage inspectors, time study experts, factory layout men, and chief inspectors. Although there is a scarcity of these specialists there is no danger of this condition delaying war materials getting into production. Chester M. Culver, manager of the Detroit Employers Association, an organization handling 225 Detroit concerns, states that there will not be any delay on production due to these causes.

It is these men who make the tools and equipment necessary for the production of all war materials, but after these tools are made comparatively unskilled labor can be used in the actual production. From that time on a small force of skilled men is required to keep the supply of tools, jigs and fixtures up to normal, and the others can be released for subsequent tool making.

The Government is taking many of these skilled laborers directly into their arsenals. Recently representatives were here from Watervliet, and to-day several were here from Rock Island, Ill., for the same purpose. The Government furnishes the gages, etc., for the manufacturer of munitions, and these representatives complain that unless they get men the work on the actual contracts will be greatly delayed, as that work cannot go ahead until the gages and fixtures are at hand.

At present every tool shop in the city needs tool makers, and practically all the manufacturers are advertising and desiring the same kind of labor. The statement that this kind of labor is not to be permanently required is demonstrated by the fact that the Rock Island arsenal representative does not desire these men for more than 2 or 3 months, and suggests that their families be left in the city, for after that time unskilled labor can take up the work and carry on the production.

Culver states that the building trades will supply many men for production work, as these trades are very quiet today. In their own field these men are experts, and hence readily pick up the small amount of training required in manufacturing munitions. Dilution of labor will relieve the problem once we are in production. This simply means that unskilled men and women will be trained to do one part of the production work in an expedient manner, the skilled workmen being used to check up the work and keep the tools in order.

It is stated that Frank E. Vanderlip's talks and newspaper articles did not take this fact into consideration, for an im-

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mense amount of the production can be done by unskilled labor and skilled men are only needed to prepare the tools and later a few to maintain the equipment, but more time will be required to get into the actual production, because of this scarcity of skilled labor.

Many thousands of workmen will be needed in the city. It is estimated that Dodge Brothers' plant will require from 8000 to 10,000 men, that of the Lincoln Motors will require from 5000 to 7000 men and women, and the Detroit Shell Co., the Fisher Body Co., the Packard Motor Car Co., the Cadillac Motor Car Co. and the Maxwell Motor Co. will require many thousands more. But once in production by the dilution of labor the situation can be satisfactorily handled.

—

Northway in New Vehicle Company

BOSTON, Jan. 4—The Northway Motors Corporation has just been formed here and has secured a charter from the State to manufacture cars and trucks. R. E. Northway, formerly head of the Northway company of Detroit, that made motors, transmissions, rear axles, etc., and was taken over by General Motors in 1909, has come East to be chief engineer. Senator James E. Cavanagh is president; James E. Finneran, head of a big drug company, is treasurer, and some men prominent in other lines comprise the board of directors. The company has been incorporated for $5,000,000. The plant will be located in Boston.

—

Another Motor Mail Route

LOUISVILLE, Jan. 2—An automobile mail route will be established between Cave City, Ky., and Louisville. It previously has been announced from Indianapolis that a similar route from Louisville to Indianapolis would be established. This plan is being tried out by the government to enable farmers to market their perishable and other products. If these routes prove successful the system probably will become universal throughout the country. By Feb. 14 the routes will be ready for business, it is thought.

From Louisville to Cave City is a distance of 88.8 miles. An automobile will leave Louisville and Cave City at 5 o'clock each morning except Sunday and will have reached its destination by 2 o'clock in the afternoon. The Dixie Highway will be traversed and the following towns reached on the Cave City route: Shively, West Point, Elizabethtown, Upton, Bonnieville, Munfordsville, Rowletts and Horse Cave.

Towns which the route between Louisville and Indianapolis will pass through include New Albany, Bennettsville, Borden, Salem, Vallonia, Brownstown, Seymour, Janesville, Columbus, Taylorsville, Edinburg, Franklin and Greenwood.

Daily trips between Louisville and Indianapolis are planned. The automobiles will be "post-offices on wheels." One will leave each of the two cities at 4.30 o'clock in the morning and reach its destination at 6 o'clock in the afternoon.

Postmaster Schmitt will accept bids for carrying on the work under government contract.

G. M. Earnings Are $12,900,000

Represent 4 Months Profits and an Increase of 43.4 Per Cent Over That of 1916

NEW YORK, Jan. 2—During the 4 months ended Nov. 30, 1917, the General Motors Corp. earned undivided profits of $12,900,000. This compares with $8,993,633 in the same period of 1916, an increase of $3,906,367, or 43.4 per cent. This figure of profits, after allowing for proportionate preferred dividends, but before allowing for war taxes, amounts to 15.1 per cent on the $82,500,000 common stock outstanding for the four months' period.

No official estimate will be available for General Motors war taxes until further rulings are made, but in entirely unofficial quarters taxes are estimated at a maximum of $8,000,000 per annum, which for the four months' period would work out about 3 per cent on the common stock. On this basis of calculation, General Motors in four months, after proportionate taxes and preferred dividend requirements, earned a surplus equal to 12.1 per cent on the common stock.

Sales in the four months ended November amounted to 72,923 cars and trucks against 52,868 in the same period of 1916. Net sales for the period were $74,868,000 against $48,383,997.

Cash in the bank and sight drafts with documents attached as of December 18, 1917, amounted to $23,530,000.

Comparison of results for the four months ended November 30, 1917, with the corresponding period of 1916 follows:

	1917	1916	Increase
Cars & trucks sold	72,923	52,868	20,055
Net sales	$74,868,000	$48,383,997	$26,484,003
Undivided profits	12,900,000	8,993,633	3,906,367

—

Navarre to Attempt Flight Across Atlantic

PARIS, Dec. 22—Jean Navarre, who, until his mad exploits which brought him in contact with the Paris police, was the best aviator France possessed or ever had possessed, has just announced his intention of making a flight across the Atlantic. For several months now Navarre has been in disgrace. After his foolish escapades in Paris he was brought before the military courts, where it was pleaded that he was not in full possession of his mental faculties, the solution of the matter being his discharge from the army. According to *l'Echo des Sports*, in which journal Navarre has confided, the famous aviator is completely cured of his youthful wildness and is determined to retrieve his reputation.

In the present stage of aviation a flight across the Atlantic is just within the range of possibility, but the risks are so great that it needs a man of the daring and audacity of Navarre to make the attempt. Two methods are possible: A fast, light, scout type of machine capable of an average speed of more than 125 miles an hour; such machines exist; and a big slow machine, of the Handley Page, Gotha, or Caproni type, averaging between 80 and 90 miles an hour.

Navarre is in favor of the latter type of machine, which he considers should be fitted with four engines of 300 hp. each, and should carry three men, who will be both pilots and mechanics.

The shortest route across the Atlantic is about 2500 miles, thus with an 85 miles an hour machine the flight would last 30 hours, and each of the three men would undertake two periods of piloting of five hours each. After the first 5 hours at the wheel, the pilot would look after the engines for 2½ hours, then rest for 7½ hours, and at the end of this time would take his place at the steering wheel.

The weight of the machine, with supply of fuel, oil and provisions for a flight of this length is estimated at 12 tons. It is intended, at the outset, to use all four engines. At the end of ten hours, when the consumption of fuel will have reduced the total weight to 9 tons, it is intended to run with three engines, thus maintaining the same average speed with a lower consumption of fuel. At the end of another ten hours, when the weight will have reduced to 6 tons, a second engine will be stopped, and the flight finished with two engines only, developing 600 hp.

The machine will be a biplane hydroplane with two of the motors carried in the fuselage and one each to the left and right, on the wings. The bearing surface will be more than 3000 sq. ft., the wing span about 108 ft.

—

Louisville Show Abandoned

LOUISVILLE, Jan. 2—No show will be held this winter under the auspices of the Louisville Automobile Dealers' Association. This was decided last week at the annual meeting of the organization after carefully considering a committee report that the First Regiment Armory could not be obtained, as it is being used for government purposes. There is no other building in the city suitable to house an exhibition of such magnitude.

The following officers were elected to serve during the coming year: Prince Wells, president; W. A. Thomas, vice-president, and Philip S. Longest, secretary.

—

Jordan Earns at Rate of 66 Per Cent

DETROIT, Jan. 3—The statement of the Jordan Motor Car Co. for the quarter ending Jan. 1 shows an increase of 30 per cent in the number of cars sold, compared with the corresponding period last year. Net car sales for the last quarter of 1917 totalled $571,232. Sales of parts amounted to $19,593. The cost of cars amounted to $500,746. The total cost of doing business was $540,524. The net profit was $50,302.55 and the total income $590,826. This represents 16.7 per cent on $300,000 preferred capital for the quarter at the rate of 66 per cent for the year.

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New York Exports $9,481,394

November Shipments to Allies Largest Factor—England Gets 971 Trucks

NEW YORK, Dec. 27—Exports of passenger cars, trucks and parts from this port for November totaled $9,481,394. This includes shipments of 1403 passenger cars, valued at $3,844,194, and 1403 commercial vehicles and motor trucks valued at $3,446,072. The value of parts exported was $1,921,595.

Russia was the largest purchaser of passenger cars, 202 cars valued at $454,781 being shipped there from New York. Australia's purchases rank second and amount to 551 cars valued at $437,310. The average value of the car sent to Russia is 3 times as great as that sent to Australia. England leads in the number and value of trucks exported, having purchased 971 commercial vehicles and motor trucks valued at $2,316,478. France ordered 106 trucks at $297,146.

Our shipments to the Allies were by far the largest factor in export trade from the port of New York. These amounted to $4,598,819. The next largest customer was South America, whose bill was $1,286,310.

—

$1,000,000 More Taxes from Motorists?

BOSTON, Dec. 29—A plan to collect $1,000,000 in taxes from Massachusetts motorists to replace a similar amount appropriated for road maintenance, but needed for other Government expenses, was given wide publicity yesterday. A short time ago a commission appointed to raise revenue told the Highway Commission that the commonwealth was in need of more money, and that $1,000,000 of the amount held by the commission for road maintenance should be turned into the state treasury and an extra tax of $5 per vehicle and $3 on operating fee be collected to make up the loss. The commission pointed out that the money had been appropriated for road maintenance and could not be used for anything else. The Boston Automobile Dealers' Assn. called together the heads of all motor organizations and a letter of protest against the passing of such a law was sent to Governor McCall, who, it is understood, plans to embody the suggestion of the Revenue Commission in his annual message to the legislature on Jan. 2.

—

Detroit Shell Co. Has Option on Springfield Plant

DETROIT, Dec. 28—A meeting of the Springfield Body Corp. and the Springfield Realty Co. was held to-day by the referee in bankruptcy to show a cause of action in the re-sale of the property. The actual sale of the plant of the Springfield Body Corp. has not yet taken place. However, the Detroit Shell Co., recently organized by Detroit automobile makers and financiers, has an option on the plant. At present the affair is pending the action of the Detroit Shell Co.

Automobile, Truck and Parts Exports from New York for November

	Cars (No.)	Value	Trucks (No.)	Value	Parts
Argentine	485	$355,443	2	$1,450	482,913
Australia	551	437,310	36	44,983	103,365
Barbados	3	1,129	....	....	....
Bolivia	5	8,187	....	....	....
Brazil	249	141,308	....	....	45,805
British East Africa	3	2,110	....	....	116
British Guiana	48	30,276	....	....	2,342
British Indies	6	5,755	....	....	17,338
British South Africa	219	174,545	6	17,667	1,499
British West Africa	....	....	4	2,159	196
British West Indies	19	16,241	21	84,770	2,595
Chile	337	417,592	5	13,555	....
China	1	1,492	....	....	77,257
Colombia	13	10,883	....	....	3,789
Costa Rica	1	1,020	....	....	725
Cuba	140	171,464	35	63,045	101,264
Danish West Indies	3	1,095	1	2,150	583
Denmark	....	....	....	....	100
Dutch East Indies	372	338,546	36	103,431	77,257
Dutch Guiana	5	1,825	....	....	....
Dutch West Indies	1	850	....	....	653
Eucador	22	18,926	....	....	1,879
England	123	168,675	971	2,316,478	568,974
France	17	201,884	106	297,146	469,987
French Africa	1	619	....	....	....
French Guiana	4	1,600	....	....	....
French West Indies	3	2,070	2	5,000	4,311
Guatemala	1	1,625	....	....	207
Haiti	2	1,200	....	....	3,192
Honduras	2	2,075	....	....	380
Italy	4	936	....	....	2,200
Jamaica	14	8,317	....	....	6,857
Japan	4	3,150	1	1,040	625
Korea	1	....	2	1,629	....
Mexico	127	114,148	7	10,795	3,222
New Foundland	3	3,200	....	....	527
New Zealand	295	266,064	10	18,575	683
Nicaraugua	1	710	....	....	25
Norway	1	2,600	....	....	....
Panama	25	12,976	8	12,000	7,214
Peru	37	51,339	2	6,572	3,317
Portugal	5	6,981	4	16,880	853
Russia	202	454,781	77	226,902	100,806
Salvador	3	3,277	....	....	187
Santo Domingo	21	13,231	4	2,999	6,178
Scotland	....	....	55	88,200	....
Siam	....	....	....	....	30
Spain	184	209,085	5	2,057	11,277
Trinidad	22	18,009	3	6,569	10,931
Uruguay	223	132,270	....	....	17,716
Venezuela	14	6,115	....	....	4,435

To Start 4,000-Mile Mail Route

Post Office Department Will Operate Chain of Trucks for Parcels Delivery

WASHINGTON, Jan. 2—The installation of motor truck parcel-post routes in various sections of the country, aggregating between 3000 and 4000 miles, is the plan of the Post Office Department. It is expected these routes will be in operation within the next 3 months. One chain of motor routes will extend from Portland, Me., to New Orleans. Another will cover much of a large stretch of territory in Ohio, Indiana, Illinois and West Virginia. On the Pacific Coast routes will be established between San Francisco and Sacramento, via Stockton and Fruitdale, a distance of 125 miles, and between Redlands and Los Angeles, via Ontario and Pomona, Cal., a distance of 76 miles.

The existing law does not provide for the employment of Government-owned motor trucks on rural delivery routes, nor does it require the rural carriers to use motor vehicles.

In the star route service, however, where the mail is carried under contract, a recent law permits the Post Office Department to designate the kind of vehicles to be employed, and in awarding new contracts the department will specify that motor trucks shall be employed on all routes where the roads are such as to admit of their use. These contracts are advertised for bidders, and where payment asked for the service is deemed to be excessive the department is authorized to provide Government-owned motor trucks and to employ drivers for the operation of these routes.

A further extension of the employment of Government-owned motor vehicles by its adoption for the parcel post service of the rural routes will be made whenever Congress enacts a law now pending for that purpose.

—

Expect Advance Rumely Profits Increase

LAPORTE, IND., Dec. 27—It is expected that profits of the Advance Rumely Co. for 1917 will be 30 to 50 per cent greater than in 1916 when the company earned $278,478. With the prospects of a record year for agricultural products throughout the country, the company is preparing for a bigger year than 1917, and in addition is trying to get government work to keep its plants up to their full capacity.

—

Fiat Absorbs Three Companies

TURIN, ITALY, Dec. 23—The Fiat Co. has absorbed three companies. They are: Ferriere Piemontesi Steel and Iron Foundries, capitalized at 9,000,000 liras; Officiene Gia Fili Diatto Railways and Trams Rolling Stock Works, capital 4,000,000 liras, and Industrie Metallurgiche Torino Steel and Iron Works, capital 4,000,000 liras.

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Kliesrath Leaves Bosch— Buys Interest in Simms Co.

EAST ORANGE, N. J., Dec. 29—Victor W. Kliesrath, for many years chief engineer of Bosch Magneto Co., has acquired an interest in the Simms Magneto Co., East Orange, and after Jan. 1 will devote his entire time to the business in the capacity of consulting engineer. It is probable that new types of magnetos not made now by the Simms Magneto Co. will be added to complete a line of ignition equipment to meet every requirement. New types of interest will soon be announced.

—

A. C. Barber has been appointed division manager for the Willys-Overland Co. with headquarters in Moline, Ill. R. L. Butler is sales manager and has been transferred from Toledo to Moline.

—

C. R. Clough has been appointed sales manager of the Stephens Motor branch of the Moline Plow Co., with headquarters in Moline. He was formerly eastern district sales manager, and this position will be filled by his assistant, J. F. Hunter.

—

George M. Ellis and **W. C. Dudgeon** have joined preparatory classes for the ordnance department at Ann Arbor. Both were connected with the Campbell Ewald Advertising Agency. L. W. Chamberlain, of the Carl M. Green Advertising Agency, is planning to join them.

—

Ferris B. Fick, purchasing agent of the Saxon Motor Car Co., has resigned to become purchasing agent for Chalmers material at the Maxwell Motor Co., Detroit plant.

—

C. J. Pomeroy, formerly in charge of the operating department of the Seattle branch of the B. F. Goodrich Co., has received the commission of captain in the United States Army. He will be stationed at Camp Lewis.

—

Gregory Flynn, for seven years sales manager of the Rajah Auto Supply Co., Bloomfield, N. J., has been appointed assistant to the president of the Edward A. Cassidy Co., New York.

—

C. J. Elston, service manager of the Saxon Motor Car Co., Detroit, has resigned to become sales representative of the Asbestos & Rubber Works of America, New York.

—

C. T. Dunkle, formerly manager of the Columbus branch of the Willys-Overland Co., has organized a $100,000 company under the style Overland-Dunkle Co. to take over Overland sales in central Ohio territory.

—

C. J. Cunningham has been made service manager of the Detroit Weatherproof Body Co. For the past three years he has been working in the factory with this positien in view.

Men of the Industry

Changes in Personnel and Position

P. P. Hinckley has been transferred from the sales department of the Connecticut Telephone & Electric Co., Meriden, to the position of purchasing agent of the company.

—

Wetmore Hodges has been elected vice-president and general manager of the Haskelite Co., Grand Rapids.

—

A. W. Sayre has been appointed district manager of the Willard Storage Battery Co. factory branch at New York. He was formerly in charge of the Willard service station, Rochester, N. Y.

—

Edwin P. Jones has been made manager of the Brooklyn branch of the Firestone Tire & Rubber Co., to succeed H. A. Lane. Jones has been manufacturers' representative for several Western hardware concerns, and has also been connected with the Philadelphia branch of the Firestone organization.

—

R. M. Hernandez, for 10 years with the United States Tire Co. in the central States district, has been appointed central district manager of the Carlisle Cord Tire Co., Inc. His headquarters will be at Chicago.

—

Charles E. Stahl has been made assistant general manager of the Connecticut Telephone & Electric Co., Meriden. He will continue the direction of the sales department.

—

Raphael Semmes, vice-president of the Semmes Motor Co., Washington, has received a first lieutenant's commission in the Signal Corps. He will probably be attached to the non-flying division of the aviation section.

—

A. N. Pearson is district representative in the New England States for the Denby Motor Truck Co., and will have his headquarters in Boston.

—

Roy Coffeen has been made branch manager of the Willys-Overland, Inc., succeeding M. O. Bridgman who for the past 5 years has been branch manager.

—

G. G. Giese, St. Louis, secretary and manager of the Panama Rubber & Equipment Co., has joined the Quartermaster's Department.

—

Leonard Veith Passes Away

NEW YORK, Dec. 22—Leonard Veith, secretary of Asch & Co., died yesterday.

McMullen Goes West— To Represent Timken Co.

DETROIT, Dec. 31—George C. McMullen, assistant plant manager of the Metal Products plant of the Timken-Detroit Axle Co., has been obliged to leave Detroit due to the poor health of Mrs. McMullen. He will locate in or near Los Angeles, and will represent the Timken-Detroit Axle Co. and the Timken Roller Bearing Co. on the coast. The Detroit plant with which McMullen has been associated for the past two years has given him an indefinite leave of absence. Previous to the above-mentioned connection he was with the Crane Motor Car Co. of Bayonne, N. J., for five years.

—

Donald F. Whitaker, sales and advertising manager of the Detroit Truck Co., has resigned.

—

L. Berry, Chicago, has been transferred to St. Louis as manager of the Ahlberg Bearing Co. branch.

—

Robert Bron, formerly with the Union Electric Co., St. Louis, has been appointed manager of the Philadelphia storage battery service in that city.

—

L. A. Sumner, former general factory manager, is now assistant general manager of the Allen Co.

—

C. L. Allen has joined the Chevrolet Motor Co., having resigned as production manager of the Allen Motor Car Co.

—

G. E. Draw Mutual Motors Trustee

JACKSON, MICH., Nov. 13—G. E. Draw has become trustee for the Mutual Motors Co., which manufactures the Marion-Handley. He was formerly treasurer. An inventory is being taken and manufacturing has been stopped. The capitalization is $1,000,000, having 500,000 shares of common and 500,000 of preferred.

—

Oakland Gets 50 Freight Cars

PONTIAC, MICH., Dec. 26—The Oakland Motor Car Co. has obtained 50 new Northern Pacific freight cars for motor vehicle transportation. These are being loaded for immediate passage to Seattle and Portland. Each freight car will carry 5 vehicles.

—

Packard Starts Trucking Exchange

DETROIT, Dec. 26—The Packard Motor Car Co. has established a Detroit Trucking Exchange, to serve as a truck clearing house. Owners of trucks are listed, and when a company requires an additional truck the exchange is advised and obtains an idle truck. This service, which is performed without charge, will help relieve terminal and warehouse congestion, improve the freight situation and keep material moving.

—

L. E. Joels has been appointed works manager of the Duesenberg Motors Corp., New York. He occupied a similar position with the Packard company.

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Studebaker Government Work Reaches $13,000,000 Mark

NEW YORK, Jan. 2—The Studebaker Corp. is understood to have orders for Government work amounting to $13,000,000 and it is stated that the consummation of these orders may operate to reduce the production of passenger cars to substantially below the 50,000 car mark reached in 1917. The Government work is for such products as escort wagons, water tank wagons, mine anchors and artillery wheels. Both the South Bend and Detroit plants will be utilized for this work.

—

Smith Adds to Directorate

CHICAGO, Jan. 2—The Smith Motor Truck Corp. has added the following men to its directorate: P. L. Coonley, vice-president Link Belt Co., Chicago; C. E. Danforth of Van Emburgh & Atterbury; W. R. Dawes, vice-president Central Trust Co., Chicago; O. J. Fehling, manager National Malleable Castings Co., Chicago; D. W. Figgis, president of the company; David R. Forgan, president National City Bank, Chicago, and C. B. Little; J. M. Hoyt, Central Bond & Mortgage Co., Chicago; J. L. Putnam, New York. It is stated that the company has marketed slightly more than 20,000 Smith Form-A-Truck units during the year.

—

New Upholstery Material

CHICAGO, Jan. 2—Wilson & Co., one of the largest packers and provisioners in the country, has been granted a patent on a new process of preparing curled hair for use in upholstery. The patent is No. 1,248,066. The new process is one by which curled hair is woven on burlap fabric. With the new product a piece of woven hair cut to dimensions, and of uniform thickness, is used in place of loose curled hair which heretofore has been used extensively. The new product eliminates difficulties with properly upholstering seat cushions and makes impossible any bunching of the hair after the cushion is completed.

—

Wisconsin Duplex to Have Oshkosh Plant

OSHKOSH, WIS., Dec. 31—The Wisconsin Duplex Automobile Co., which was organized a year ago with $500,000 capital to manufacture a quadruple-drive passenger and commercial car chassis, has selected Oshkosh, Wis., as the permanent location of its factory and offices. Early in the spring a large machine shop will be erected and the manufacture of chassis undertaken on a large scale. Until then the present experimental shops at Milwaukee will be continued for a regular output of a limited number of cars.

—

Changes in Capital

MILWAUKEE, Dec. 29—The W. S. Seaman Co., manufacturer of closed car bodies, has increased its capital stock from $50,000 to $150,000.

—

CLEVELAND, Dec. 28—The Hydraulic Pressed Steel Co. has increased its capitalization from $5,700,000 to $7,200,000.

—

SAGINAW, MICH., Dec. 27—The Erd Motor Co. has increased its capital stock from $100,000 to $250,000.

Ajax Co. Buys $2,000,000 Greenpoint Plot for Factory

NEW YORK, Dec. 31—The Ajax Rubber Co., Inc., has bought a $2,000,000 plot in Greenpoint, adjacent to the site of the State Barge Terminal, on which it expects to build a factory and warehouse. The property, which consists of several old brick and frame buildings on about 169 lots, has a 900-ft. frontage on the East River and Newtown Creek, and an average depth of 470 ft. The tenants of these buildings have been asked to vacate immediately, and the Ajax company will improve the site as soon as building conditions are favorable.

The plot, which is opposite Twenty-third Street, Manhattan, is known as the "Sugar House property," being formerly occupied by the American Sugar Refining Co. as a refinery, and later as a storage warehouse.

—

Cooper Union Adds Engine Course

NEW YORK, Jan. 2—A motor vehicle engineering course has been added to the other night classes at Cooper Union Institute. It will include classroom work and there will be an extensive laboratory course, covering testing materials and engine testing. The course is free and will be conducted by Ethelbert Favary.

—

Stanley Hall Dies

BOSTON, MASS., Jan. 3—Stanley Hall of the H. & H. Specialties Co., formerly manager of some of the big tire branches in New England, died here last week after a few months' illness. He was a director of the Bay State A. A. of Boston and active in the accessory trade.

Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co.	45	50	+4½
*J. I. Case T. M. Co. pfd.	73	77	+1
Chalmers Motor Co. com.	2	4	..
Chalmers Motor Co. pfd.	..	50	..
*Chandler Motor Car Co.	66½	67½	+4¼
Chevrolet Motor Co.	93	95	+17½
*Fisher Body Corp. com.	20	34	..
*Fisher Body Corp. pfd.	70	87½	+2½
Fisk Rubber Co. com.	..	45	..
Fisk Rubber Co. 1st pfd.	98	103	..
Fisk Rubber Co. 2nd pfd.	60	70	..
Firestone Tire & Rubber Co. com.	95	98	..
Firestone Tire & Rubber Co. pfd.	96	98	..
*General Motors Co. com.	97	98	+5
*General Motors Co. pfd.	77	78	+3
*B. F. Goodrich Co. com.	35	37	+1
*B. F. Goodrich Co. pfd.	94	99	+5¾
Goodyear Tire & Rubber Co. com.	135	140	..
Goodyear Tire & Rubber Co. pfd.	92	94	—2
Grant Motor Car Corp.	1½	2	—1
Hupp Motor Car Corp. com.	1½	2	—1½
Hupp Motor Car Corp. pfd.	72	78	..
International Motor Co. com.	12¾	13½	+1½
International Motor Co. 1st pfd.	23	25	—25
International Motor Co. 2nd pfd.	15	25	..
*Kelly-Springfield Tire Co. com.	40	41	+2
*Kelly-Springfield Tire Co. 1st pfd.	72	78	+2
*Lee Rubber & Tire Corp.	13½	14½	+2
*Maxwell Motor Co., Inc., com.	23½	24½	+2
*Maxwell Motor Co., Inc., 1st pfd.	54	55	+2
*Maxwell Motor Co., Inc., 2nd pfd.	20½	22	+2
Miller Rubber Co. com.	130	140	..
Miller Rubber Co. pfd.	95	98	..
Packard Motor Car Co. com.	95	103	+2
Packard Motor Car Co. pfd.	92	96	..
Paige-Detroit Motor Car Co.	11	12½	..
Peerless Truck & Motor Corp.	11	14	+1
Portage Rubber Co. com.	109	111	..
Regal Motor Car Co. pfd.	..	20	..
Reo Motor Car Co.	14	16	..
*Saxon Motor Car Corp.	6½	7½	+1
Springfield Body Corp. com.	..	..	..
Springfield Body Corp. pfd.	..	..	..
Standard Motor Construction Co.	7½	8½	..
Standard Parts Co.	..	78	+3
*Stewart-Warner Speed. Corp.	43	45	—1
*Studebaker Corp. com.	45	46	+ ½
*Studebaker Corp. pfd.	88	91	+10
Swinehart Tire & Rubber Co.	16	26	..
United Motors Corp.	18⅞	19	+2¼
*U. S. Rubber Co. com.	51	52	+1
*U. S. Rubber Co. pfd.	93	94	+1
*White Motor Co.	35	37	+1
*Willys-Overland Co. com.	19	19½	+ ½
*Willys-Overland Co. pfd.	72	75	+5

*At close December 29, 1917. Listed New York Stock Exchange.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	Bid	Asked	Net Ch'ge
Auto Body Co.	..	8¾	..
Bower Roller Bearing Co.	..	..	..
Chevrolet Motor Co.	92	94	+17
Commerce Motor Car Co.	..	..	..
Continental Motor Co. com.	5	5¼	..
Continental Motor Co. pfd. (new)	..	..	..
Edmunds & Jones com.	..	..	..
Edmunds & Jones pfd.	..	..	..
Ford Motor Co. of Canada	150	..	+5
Hall Lamp Co.	..	..	..
Michigan Stamping Co. com.	12	..	— ¼
Motor Products	..	..	..
Packard Motor Car Co. com.	90	96½	..
Packard Motor Car Co. pfd.	..	92¼	..
Paige-Detroit Motor Car Co.	12⅛	12¾	+ ⅞
Prudden Wheel Co.	10¼	..	+ ¼
Reo Motor Car Co.	15⅜	15⅝	— ⅛

INACTIVE STOCKS

Atlas Drop Forge	..	32	..
Kelsey Wheel Co. pfd.	70	78	—10
Regal Motor Car Co. pfd.	..	26½	..

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New Companies Formed

Latest additions to ranks of Automotive Industries

St. Louis Aircraft Co. To Make 3 Airplanes Daily

ST. LOUIS, Dec. 31—The St. Louis Air Craft Co. has been organized here, and in a few weeks will begin the manufacture of three airplanes daily. The motors will be shipped here to be placed in the assembled machines.

The Air Craft Co. was organized under the direction of A. J. Seigel, president of the Huttig Sash & Door Co., a planing mill. The St. Louis Car Co. joined in the organization to manufacture metal parts and the airplanes will be assembled at its plant. A small amount of special shop construction is required by the Huttig Co., but for the most part wooden parts will be manufactured in existing planing mills.

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Zelle Tractor Co. Organized

ST. LOUIS, Dec. 31—The Zelle Tractor Co. has been organized to manufacture a tractor designed by William C. Zelle, a local engineer. The tractor has a 33-in. clearance, which enables its use as a cultivator of growing crops. Zelle is president of the new company and several local insurance men and bankers are officers. The company offers to sell $1,000,000 of stock in $20 shares.

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Wisconsin Co. to Sell Supplies

APPLETON, WIS., Dec. 29—The Bradford Co. has been organized to deal in motor cars, accessories and supplies, with a capital stock of $25,000. The incorporators are H. N. Bradford, Benjamin Wild and E. Wild Bradford.

—

Smith Form-A-Truck Co. Formed in Milwaukee

MILWAUKEE, Dec. 29—The Smith Form-A-Truck Co. has been incorporated with a capital of $10,000 by William F. Coerper, Walter Mayer and Ray E. Coerper.

—

To Rebuild Storage Batteries

CLEVELAND, Dec. 28—The Storage Battery Rebuilding Co. has been incorporated for $13,000 by Henry L. Beggs and Samuel L. Bowlus.

—

London Wholesaler Opens Here

NEW YORK, Jan. 2—S. Smith & Sons Motor Accessories, Ltd., London, has opened a buying office in New York at 154 Nassau Street, with J. H. Rose in charge. Smith & Sons, which was established in 1841, and has branches in South Africa, Australia, New Zealand, the Dutch East Indies and Siam, has been finding it difficult to secure goods in England because of the war. Its volume in 1917 was nearly $4,000,000. The office will be permanently retained here after the war.

—

New Company to Make Safety Device

PEORIA, ILL., Dec. 29—The Safety Signal Corp. has been incorporated with a capital stock of $200,000 by B. F. Hardesty, W. H. Kirk and H. O. Johnson. The company will manufacture a safety device for motor cars.

—

Canadian Carburetor Co. Organized

TORONTO, Dec. 20—The (British) Young High-Velocity Carburetor Co., Ltd., has been incorporated with a capital of $250,000 by Henry H. Davis, Edward H. Brower, Lawrence A. Landriau and others. The company will manufacture carbureters, automobile accessories and machinery.

—

To Manufacture Bovey Heaters

CHICAGO, Jan. 2—The Bovey Automobile Heater Co. has been incorporated with a capital of $30,000 by Thomas Bovey, Sidney J. Bovey and Frank Thomason.

—

Engineering Corp. to Solve Truck Problems

CHICAGO, Dec. 26—The Engineering & Sales Corp., 122 South Michigan Avenue, Chicago, has taken over the engineering problems and supervision of purchases of the Oklahoma Auto Mfg. Co., Muskogee, Okla., and of the Mutual Truck Co., Sullivan, Ind.

—

Dividends Declared

BUFFALO, Jan. 2—The Curtiss Aeroplane & Motors Corp. has declared a semi-annual dividend of 3½ per cent on preferred stock, payable Jan. 15, to stock of record Jan. 2.

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CLEVELAND, Dec. 27—The National Tool Co. has declared the regular quarterly and the usual extra dividend on common stock, together with 3 per cent interest and the regular quarterly dividend on preferred, all payable Jan. 2 to stock of record Dec. 28.

—

SPRINGFIELD, OHIO, Dec. 29—The Westcott Motor Car Co. has declared the regular quarterly dividend on the 7 per cent preferred stock, payable to stock of record Dec. 31.

—

PITTSBURGH, Jan. 2—The Westinghouse Electric & Mfg. Co. has declared a regular quarterly dividend of 1¾ per cent on common, payable Jan. 31 to stock of record Dec. 31, and a dividend of 20 per cent in stock payable Jan. 15 to stock of record Dec. 31.

Current News of Factories

Notes of New Plants—Old Ones Enlarged

United States Motor Truck Plans to Triple Output

COVINGTON, OHIO, Dec. 28—Officers and department heads of the United States Motor Truck Co., Cincinnati, gave a dinner at the Industrial Club in honor of F. J. Alvin, general manager of the company. The officers pledged their determination to triple the output during the next year.

Those present included: R. C. Stewart, president of the company; R. S. Stewart, vice-president; F. J. Alvin, E. S. Lee, Jr.; E. C. Shumard, W. E. Dugan, E. A. Haskins, F. A. Trinkle, C. E. Hoover, William Lally, Fred Geiger, A. C. Durant, A. O. Fenning, H. W. Gillespie, E. B. Chamberlain, O. W. Williams, H. Z. Yeager, T. W. Semler, Walter Walkinghorst and Ralph H. Jones.

—

Haskelite May Use United Truck Building

GRAND RAPIDS, Jan. 2—The Haskelite Co., which manufactures veneer parts for airplanes, is starting work on its new plant. Pending its completion one of the new buildings of the United Motor Truck Co. will probably be used for experimental work in the making of airplane bodies.

—

Studebaker to Build New Factory

DETROIT, Dec. 27—The Studebaker Corp. has secured a building permit for a 4-story brick and steel factory 325 x 51. The cost will be approximately $150,000.

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Indiana Truck Co. Plans Expansion

MARION, IND., Dec. 31—The Indiana Truck Co. will enlarge its plant to provide for a Government contract for 500 Liberty trucks.

—

American Forge to Build Heat Treating Plant

CANTON, O., Jan. 2—The American Forge & Machine Co., Canton, Ohio, is erecting a steel building 40 x 100 as a heat treating department. The building will be equipped with car type furnaces, heat receiving instruments and quenching tanks, thus insuring the scientific treatment of all forgings. Testing machines of various types will be installed.

—

One-Wheel Trucks in Market Jan. 3

ST. LOUIS, Dec. 31—The One-Wheel Truck Co. announces that first deliveries will begin Jan. 10. On that date three of the novel motors will come out of the shop. The first will go to the Anheuser-Busch Brewing Association.

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Industrial Review of the Week

A Summary of Major Developments in Other Fields

COAL SITUATION IMPROVING

The consumption of anthracite has somewhat decreased during the past week. This has been due almost entirely to moderation of weather conditions, resulting in a less insistent demand for domestic fuel. The railroads have also by a strenuous cleaning up of the congested conditions resulting from the great snow storm of early December been able to move a slightly greater tonnage than during the past two or three weeks. The efforts of the anthracite operators to induce the mine workers to produce a maximum tonnage have been reinforced by admonitions from various ecclesiastics high in the Roman church, urging the miners to labor to their maximum capacity even on Sunday and other church days, excepting only Christmas and New Year's Day. It is rumored also that the period of labor during the present war may be extended from eight to nine hours per day. All of these circumstances combine to render the situation less strenuous than it has been in the recent past. On the other hand, car supplies to the mines and movement all-rail, particularly to New England points, have been poor, and some suffering has resulted from a lack of adequate fuel supply. It is hoped that the use of government locomotives, as well as those diverted to the East from points further west, will tend still more strongly to relieve the present situation.

The situation in bituminous coal is apparently but little less strenuous than formerly, the chief factor tending to relieve the situation being milder weather than formerly prevailed. On the other hand, there are certain symptoms which would indicate that the scarcity of domestic fuel particularly was not as great as was believed. Among these indications are the unwillingness of certain consumers who complained loudly that they were "freezing" to pay the contract price for coal which had been commandeered to meet their needs. The distribution of a considerable tonnage of coal intended for Lake shipment did much to relieve immediate fuel needs in Ohio and lower Lake territory generally. On the other hand, such manufacturing districts as Michigan and New England are extremely short of coal supplies, and unless a considerable tonnage is received shortly many manufacturing plants and public utilities will doubtless be required to close down, at least temporarily. A strong sentiment prevails which would favor the compulsory shutting down of unessential industries, such as the manufacture of musical instruments, and the like. This would not only relieve a certain amount of traffic in raw materials and finished product, but would tend also to set free a certain amount of labor which might be more advantageously used in other pursuits. Proper priority orders will doubtless accomplish this result. Already many cities have adopted "lightless nights," this term being applied to the burning of electric signs and similar advertising illumination. In some places also apartment house owners have adopted stringent measures to reduce the consumption of coal for heating purposes, while curtailment of street and interurban electric lines and abandoning of many passenger trains on various roads which were more or less superfluous, have all done much to conserve slender stocks of fuel. Complaints of shortage in bituminous coal are most pronounced among steam users, while the domestic consumers appear to be, if anything, better taken care of. It is apparent thus that although the production and receipt of steam coal is at least equal to that of last year, and in many cases far greater, the manufactories of the country are running at much higher capacity than was the case a year ago. —*Coal Age.*

A New Service

¶ *Herewith* AUTOMOTIVE INDUSTRIES *supplies for the benefit of its readers a general summary of important developments in other fields of business. This is rendered possible by the editorial co-operation of leading industrial publications which are recognized authorities.*

By compressing the general industrial situation into this form we hope to give our readers a clear and comprehensive idea of up-to-the-minute developments which they could otherwise secure only with considerable expenditure of time and effort.

CLEVELAND ORE PRODUCERS OBJECT TO CONTRACT REVISIONS

The expected announcement by the President that iron and steel prices would remain in effect for three months longer was made on Dec. 28. With it came the proviso, agreed to at a meeting of steel manufacturers and the War Industries Board held the same day, that on contracts made in the next three months prices would be revised on deliveries after April 1 to conform to any changes that might become effective on that date.

Iron ore producers at Cleveland are emphatic in objecting to the action taken as to the revision of contracts. Representing an industry in which contracts have always been made running 12 months ahead, they are opposed to making ore sales subject to a possible reduction in price. Pig iron soared far out of range with the ore prices of 1917, and the ore trade argues that for it an advance is in order now rather than a possible reduction.

The prospect of orders for 100,000 cars that comes with Government control of railroads is not unwelcome to equipment companies, but with the steel trade the practical question is what tonnage of plates can be spared for car building. The shipbuilding program will absorb more steel later in the year, but new plate capacity is nearing completion and shipyards are not yet organized to take the present plate mill output in full.

Surprisingly large additions to the country's steel making capacity are shown by the statistics for 1917. In the year 97 new open-hearth furnaces, some of which will be operated duplexing, were completed, capable of an output of 4,326,500 tons of ingots per year. Of this total 1,220,000 tons is furnished by the Steel Corporation. In 1916, previously the record year, the new capacity added was 4,205,000 tons.

Fourteen new blast furnaces were blown in in 1917, with annual capacity of 2,520,000 tons, against only five furnaces in 1916 with capacity of 800,000 tons.

In the face of all this new construction is the fact that pig iron production in 1917, estimating that of December at 3,000,000 tons, was but 38,700,000 tons, or 735,000 tons less than in 1916. Coke was the limiting factor, as has been said over and over.

At the same time, by drawing on pig iron stocks and by a larger use of scrap, steel works produced about 42,400,000 tons of ingots last year, or 1,000,000 tons more than in 1916, making 1917 the high record year.

The 9000 railroad cars for Italy are about placed. The bulk if not all is likely to go to the Standard Steel Car Co. and the American Car & Foundry Co. Both have uncompleted Russian car orders and could utilize some of the steel on hand and under orders.

Manufacturing consumers end the year as a rule with fair stocks of material. In many general lines activity has tapered off, and with Government price control there has not been the incentive to seek maximum protection through contracts. Now that Washington stipulates that price revision on deliveries after March 31 will be in order, the average buyer may show more interest. Meanwhile his output has been subnormal because of transportation delays and labor shortage, and this fact accounts for the smaller stocks he has been satisfied to carry.

In northern Ohio, in contrast with some other districts, there is active demand for pig iron, one inquiry from Erie, Pa., representing Government work, being for 3000 tons of basic iron per month for a year, beginning with March.—*Iron Age.*

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Open Bids for Postal Trucks

WASHINGTON, Jan. 2—The post-office department will open bids Jan. 10, at 2 o'clock p. m., for not to exceed fifty motor gasoline motor trucks of from 1 to 1½-ton capacity, equipped as follows:

Screen body, screens front and rear; front screens, collapsible gate type; rear screens, hinged doors opening outward, with proper lock; body built out over wheels with wells in front to accommodate wheels; screens to be carried up from edge of flare boards to roof, properly supported; tires, 36 by 6, pneumatic cord, extra tire mounted on rim; tire rack, complete; headlight lenses to be of a type meeting requirements of various State laws; each car equipped with full set of chains and the customary tool equipment; bodies to be painted green, with gold lettering and red running gear.

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Torbensen Axle Co. Insures Employees

CLEVELAND, Dec. 28—The Torbensen Axle Co. gave each of its 500 employees a certificate of insurance as a Christmas gift. Those who have entered the service of the company since July 1, 1917, are insured for $250, this amount to be raised to $500 upon completion of 6 months' service. Those who have been with the company for more than a year are insured for $600, with an increase of $100 for each additional year of service until a maximum of $1,500 has been provided. This insurance was in force from noon of Dec. 24, and does not interfere with the Workman's Compensation as provided by the Ohio State law.

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Model Factory for Fan Belts

ENDICOTT, PA., Dec. 31—Walter L. Johnson, manufacturer of fan belts, will open a model factory here. The building will be 150 x 60, and more than 3,000,000 fan belts will be manufactured in it during 1918.

Calendar

ASSOCIATIONS

Jan. 3-4—New York Automotive Electric Assn. meeting.
Jan. 7-8—New York, National Automobile Dealers' Assn. directors' meeting with vice-presidents from Eastern States.
Feb. 4-7 — St. Louis, American Road Builders' Assn. Convention.

SHOWS

January — Kalamazoo, Mich., Kalamazoo Automobile Dealers' Assn., Armory.
Jan. 2-9—New York, Salon, Automobile Salon, Inc., Astor Ballroom. John R. Eustis, Mgr.
Jan. 5-12 — New York Show, Grand Central Palace, National Automobile Chamber of Commerce.
Jan. 11-19 — Philadelphia, 17th Annual Show, Philadelphia Auto Trade Assn., Commercial Museum Bldg.
Jan. 11-19—Providence, R. I., R. I. Licensed Auto. Dealers' Assn., State Armory. Percival S. Clark, Mgr.
Jan. 14-19 — Rochester, N. Y., Tenth Annual Exposition Park. C. A. Simmons, Mgr.
Jan. 16-27 — Milwaukee, Wis., Milwaukee Automobile Dealers, Inc., Auditorium. (First 7 days, passenger cars; last 3 days, commercial cars.) Bart J. Huddle, Mgr.
Jan. 18-24 — Des Moines, Ia., Ninth Annual Passenger Car and Second Annual Truck, Des Moines Automobile Dealers' Assn., Coliseum. C. G. Van Vliet and Dean Schooler, Mgrs.
Jan. 19-26—Detroit Automobile Dealers' Assn., Overland Bldg. H. H. Shuart, Mgr.
Jan. 19-26 — New York Motor Boat Show, Grand Central Palace, National Assn. of Engine and Boat Manufacturers.
Jan. 19-26—Detroit, Willis Avenue Overland Service Station.
Jan. 19-27 — Cleveland, Seventeenth Annual. Cleveland Automobile Show Co., Wigmore Coliseum. Fred. H. Caley, Mgr.
Jan. 19-28 — Montreal, Can., Montreal Automobile Trade Assn., Ltd., Almy Bldg. T. C. Kirby, Mgr.
Jan. 21-26—Manchester, N. H., Academy. Couture Bros.
Jan. 21-26—Scranton, Pa., Scranton Motor Trades Assn., Armory. Hugh B. Andrews, Mgr.
Jan. 21-26—York, Pa., Queen Street Tabernacle, York Automobile Dealers' Assn.
Jan. 21-26 — Wilmington, Del., Hotel Du Pont.
Jan. 21-26—Buffalo, N. Y., Buffalo Automobile Dealers' Assn., Broadway Auditorium.
Jan. 21-26 — Richmond, Va., Richmond Automobile Dealers' Association, First Regimental Armory. Henry B. Marks, Mgr.
Jan. 22-24—Montreal, Can., Convention of All Men Interested in the Automobile Industry in Eastern Canada.
Jan. 22-25—Oklahoma City, Oklahoma City Motor Car Dealers Assn. Carhart Building.
Jan. 22-26—Baltimore, Md., Baltimore Automobile Dealers' Assn. and Automobile Club of Maryland, 5th Regiment Armory.
Jan. 22-26 — Oklahoma City, Okla., Oklahoma City Automobile Dealers' Assn., 701 No. Broadway. Roy H. Haun, Mgr.
Jan. 23-28—Allentown, Pa., Lehigh Auto. Trade Assn., Traylor Motor Co.'s Garage. P. W. Leisering, Publicity Mgr.
Jan. 26-Feb. 2 — Chicago National Show, Coliseum and Armory, National Automobile Chamber of Commerce.
Jan. 26-Feb. 2—Chicago, Salon, Elizabeth Room of Congress Hotel.
Jan. 26-Feb. 2—Bridgeton, N. J., Bridgeton Auto Dealers' Assn. O. P. Riley, Sec.
Jan. 26-Feb. 2—Harrisburg, Pa., Capital City Motor Dealers' Assn. J. Clyde Myton, Mgr.
Jan. 26-Feb. 3—York, Pa., York County Auto. Dealers' Assn., Tabernacle. T. F. Pfeiffer, Sec.
Jan. 28-Feb. 2—Buffalo, N. Y., Buffalo Automobile Dealers' Assn., Broadway Auditorium.
February — Greensburg, Pa., Westmoreland Automobile Dealers' Association.
Feb. 2-16—Bronx, N. Y., Bronx Auto. Dealers' Assn., Second Battery Armory. D. J. Barrett, Chairman Show Committee.
Feb. 5-9—Binghamton, N. Y., Binghamton Automobile Dealers' Assn., Kalurah Temple. William M. McNulty, Mgr.
February — Peoria, Ill., Peoria Auto and Accessories Dealers' Assn. W. O. Ireland, Mgr.
Feb. 6-9—Lancaster, Pa., Automobile Track Assn., Fidelity Bldg. R. W. Shreiner, Mgr.
Feb. 9-16 — Bronx, N. Y., 2d Battery Armory, Bronx Automobile Dealers' Assn. D. J. Barrett, Mgr.
Feb. 11—Toledo, Terminal Auditorium, Toledo Auto Show Co.
Feb. 11-16—St. Louis, Mo., St. Louis Auto Mfrs. & Dealers' Assn. Robert E. Lee, Mgr.
Feb. 11-16 — Kansas City, Mo., Kansas City Motor Car Dealers' Assn., Convention Hall. E. E. Peake, Mgr.
Feb. 11-16—Kansas City, Mo., Third Annual National Tractor Show.
Feb. 11-16—Toledo, O., Toledo Auto Shows Co.
Feb. 16-23—New York, Second Pan-American Aeronautic Exposition, Grand Central Palace and Madison Square Garden.
Feb. 16-24—San Francisco, Cal., San Francisco Dealers' Assn., Exposition Auditorium. G. A. Wahlgreen, Mgr.
Feb. 18-23—Grand Rapids, Mich., Automobile Business Assn., Klingman Building. Ernest T. Conlon, Mgr.
Feb. 18-23—Newark, N. J., N. J. Auto Exhibition, Co. G, First Regiment Armory. Claude E. Holgate, Mgr.
Feb. 18-23—Des Moines, Ia., Des Moines Automobile Dealers' Assn., Coliseum. C. G. Van Vliet & Dean Schooler, Mgrs.
Feb. 16-23—Newark, N. J., First Regiment Armory.
Feb. 18-23 — Springfield, Ohio, Springfield Auto Trades Assn., Memorial Hall. C. S. Burke, Mgr.
Feb. 18-23 — Waterbury, Conn., United Shows Co.
Feb. 18-23—Duluth, Minn., Duluth Automobile Trade Association. John J. Lane, Mgr.
Feb. 18-24 — Des Moines, Ia., Ninth Annual Passenger and Second Annual Truck, Des Moines Automobile Dealers' Assn., Coliseum. C. G. Van Vliet & Dean Schooler, Mgrs.
Feb. 18-24—Des Moines, Ia., Second Annual Truck, Auditorium. Dean Schooler & C. G. Van Vliet, Mgrs.
Feb. 18-25 — Pittsfield, Mass., State Guard, State Armory. James J. Callaghan, Mgr.
Feb. 20-23—Quincy, Ill., First Annual, Armory. L. B. Bartlett, Mgr.
Feb. 18-27—So. Bethlehem, Pa., Fourth Annual (cars 18-23; trucks 25-27), Coliseum. J. L. Elliott, Mgr.
Feb. 22-Mar. 9—Brooklyn, N. Y., Brooklyn Motor Vehicle Dealers' Assn., Twenty-third Regiment Armory. I. C. Kirkham, Treas.
Feb. 25-Mar. 2—Muskegon, Mich., Second Annual, Merrill Auditorium. John C. Fowler, Mgr.
Feb. 25 - Mar. 2 — Bridgeport, Conn., Fourth Regiment Conn. Home Guard, State Armory & Casino. B. B. Steiber, Mgr.
Feb. 27-Mar. 2—Columbus, O., Auto Exhibitors Co. W. L. Carney, Mgr.
Feb. 27-Mar. 6—Boston, Mass., Salon, Boston Automobile Dealers' Assn., Copley Plaza Hotel. Chester I. Campbell, Mgr.
Mar. 1 — Lyons, France, Third Sample Fair.
Mar. 2-9—Pittsburgh, Pa., Automobile Dealers' Assn. of Pittsburgh, Motor Square Garden. John J. Bell, Mgr.
Mar. 4-9—Utica, N. Y., Utica Motor Dealers' Association, Inc., State Armory.
Mar. 6-9—Clinton, Ia., Clinton Automobile Dealers' Assn., Coliseum.
Mar. 8-11 — Green Bay, Wis., Brown County Automobile Trade Assn.
Mar. 15-20—Great Falls, Mont., Montana Automobile Distributers' Association, Lexington Garage. A. J. Breitenstein, Mgr.
Mar. 16-20—Great Falls, Mont., Montana Automobile Distributers' Assn.
Mar. 19-24—Cedar Rapids, Ia., Cedar Rapids Auto Trade Assn., Auditorium.
Mar. 20-22—Houlton, Me., Second Annual, Houlton Motor Car Dealers' Assn., Bangor St. Exhibition Hall. J. D. Luth, Mgr.
Apr. 9-13—Stockton, Cal., San Joaquin Auto Trade Assn. Samuel S. Cohn, Mgr.
Sept. 23-28 — Chicago, National Accessory Show for Fords, Coliseum.

S. A. E.

Jan. 9—New York, Tenth Annual Dinner, Motor & Accessory Mnfrs. Assn., Waldorf-Astoria, 7:30 p. m.
Jan. 10—New York, Automotive Dinner at Hotel Biltmore
Jan. 11-16—New York, Convention, National Association Automobile Accessory Jobbers, Hotel Astor.
Jan. 29-31—Chicago, Annual Convention, Garage Owners' Assn. of Ill., Green Room, Congress Hotel.
Feb. 1 — Chicago, War Dinner during Winter Meeting.

Engineering

American Society of Heating and Ventilating Engineers.
Mining and Metallurgical Society of America.

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1918 Passenger Automobiles Listed

MAKE AND MODEL	Wheelbase	No. of Cylinders	Bore and Stroke, Inches	Piston Displacement, Cubic Inches	Make of Engine	Cylinder Shape	Camshaft Drive	Water Circulation	LUBRICATION System	LUBRICATION Type of Pump	CARBURETION Make of Carburetor	CARBURETION Fuel Feed	IGNITION System	IGNITION Make	IGNITION Control	ELECTRIC SYS Generator Make	ELECTRIC SYS Voltage	CLUTCH Make	CLUTCH Type
Abbott.....6-62	122	6	3½x5½	303	Continent.	L.	Helical	Cent.	Splash-Pres.	Piston.	Stromberg.	Vacuum.	Single.	Remy.....	Hand	Remy.....	6	Muncie....	Disk...
Allen.....41	112	4	3½x5	221	Own.....	L.	Helical	Ther.	Ciro-Spl....	Piston.	Stromberg.	Vacuum.	Single.	Connecticut.	Hand	Auto-Lite....	6	Borg & Beck	Plate...
American.....B	122	6	3½x5	230	Rutenber.	L.	Helical	Cent.	Splash-Pres.	Piston.	Zenith.....	Vacuum.	Single.	G&D.....	Hand	G&D.....	6	Borg & Beck	Plate...
Anderson.....20	120	6	3½x4½	224	Continent.	L.	Helical	Cent.	Splash-Pres.	Piston.	Zenith.....	Vacuum.	Single.	Connecticut.	Hand	Westinghouse	6	Borg & Beck	Plate...
Apperson.....	130	6	3½x5	288	Own.....	L.	Helical	Cent.	Splash-Pres.	Gear...	Rayfield....	Vacuum.	Single.	Remy.....	Hand	Bijur.....	6	Own.....	Plate...
Apperson.....	130	8	3½x5	332	Own.....	L.	Helical	Ther.	Splash-Pres.	Gear...	Johnson....	Vacuum.	Single.	Remy.....	Hand	Bijur.....	6	Own.....	Plate...
Arbens.....25	108	4	3½x5	166	Lycoming.	L.	Helical	Ther.	Splash.....	Piston.	Carter.....	Gravity.	Single.	Dyneto.....	Hand	Dyneto.....	6	.....	Cone...
Auburn.....6-39	120	6	3½x4½	224	Teet-Hart.	L.	Helical	Cent.	Splash-Pres.	Piston.	Rayfield....	Vacuum.	Single.	Remy.....	Hand	Remy.....	6	Borg & Beck	Plate...
Auburn.....6-44	131	6	3½x5½	303	Continent.	L.	Helical	Cent.	Splash-Pres.	Piston.	Rayfield....	Vacuum.	Single.	Remy.....	Hand	Remy.....	6	Borg & Beck	Plate...
Austin.....	142	12	2½x5	389	Weidely...	I.	Helical	Cent.	Pressure.....	Gear...	Stromberg.	Vacuum.	Single.	Delco.....	Hand	Delco.....	6	Muncie....	Disk...
Biddle.....H	121	4	3½x5½	226	Buda.....	L.	Helical	Ther.	Ciro-Spl....	Gear...	Zenith.....	Vacuum.	Single.	Eisemann....	Hand	G&D.....	6	Own.....	Plate...
Bour-Davis.....18A	118	4	3½x5	220	Continent.	I.	Helical	Cent.	Ciro-Spl....	Gear...	Miller.....	Vacuum.	Single.	Westinghouse	Hand	Westinghouse	6	Borg & Beck	Plate...
Bour-Davis.....18B	118	6	3½x5½	303	Continent.	L.	Helical	Cent.	Ciro-Spl....	Piston.	Stromberg.	Vacuum.	Single.	Westinghouse	Hand	Westinghouse	6	Borg & Beck	Plate...
Brewster.....1	125	4	4 x5½	276	Own.....	K.	Chain...	Cent.	Pressure.....	Gear...	Zenith.....	Vacuum.	Single.	Bosch.....	Hand	U-S-L.....	12	Own.....	Cone...
Briscoe.....6-24	104	4	3⅛x5½	163	Own.....	L.	Helical	Ther.	Ciro-Spl....	Piston.	Dave-Buick.	Gravity.	Single.	Connecticut.	Hand	Auto-Lite....	6	Own.....	Rev-C...
Buick.....E-6-34	106	4	3½x4½	170	Own.....	I.	Helical	Cent.	Ciro-Spl....	Gear...	Marvel.....	Vacuum.	Single.	Delco.....	H&A.	Delco.....	6	Own.....	Cone...
Buick.....E-6-35	106	4	3½x4½	170	Own.....	I.	Helical	Cent.	Ciro-Spl....	Gear...	Marvel.....	Vacuum.	Single.	Delco.....	H&A.	Delco.....	6	Own.....	Cone...
Buick.....E-6-44	118	6	3½x4½	242	Own.....	I.	Helical	Cent.	Ciro-Spl....	Gear...	Marvel.....	Vacuum.	Single.	Delco.....	H&A.	Delco.....	6	Own.....	Disk...
Buick.....E-6-45 & 46	118	6	3½x4½	242	Own.....	I.	Helical	Cent.	Ciro-Spl....	Gear...	Marvel.....	Vacuum.	Single.	Delco.....	H&A.	Delco.....	6	Own.....	Disk...
Buick.....E-6-45 & 50	124	6	3½x4½	242	Own.....	I.	Helical	Cent.	Ciro-Spl....	Gear...	Marvel.....	Vacuum.	Single.	Delco.....	H&A.	Delco.....	6	Own.....	Disk...
Cadillac.....57	125 / 132	8	3½x5½	314	Own.....	L.	Chain...	Cent.	Pressure.....	Gear...	Own.....	Pressure.	Single.	Delco.....	H&A.	Delco.....	6	Own.....	Disk...
Campbell.....	110	4	3½x4	189	Own.....	L.	Sp-G....	Ther.	Ciro-Spl....	Gear...	American ..	Vacuum.	Single.	At Kent.....	Hand	Auto-Lite....	6	Muncie....	Disk...
Case.....U	125	6	3½x5½	303	Continent.	L.	Helical	Cent.	Splash-Pres.	Piston.	Rayfield....	Vacuum.	Single.	Westinghouse	Hand	Westinghouse	6	Borg & Beck	Plate...
Chalmers.....	117 / 122	6	3½x4½	224	Own.....	L.	Chain...	Ther.	Splash-Pres.	Gear...	Stromberg.	Vacuum.	Single.	Remy.....	Hand	Westinghouse	6	Own.....	Disk...
Chandler.....25	123	6	3½x5	289	Own.....	L.	Chain...	Cent.	Splash-Pres.	Piston.	Rayfield....	Vacuum.	Single.	Bosch.....	Hand	Westinghouse	6	Borg & Beck	Plate...
Chevrolet.....490	102	4	3½x4	171	Own.....	I.	Helical	Cent.	Splash-Pres.	Gear...	Zenith.....	Gravity.	Single.	Remy.....	Hand	Auto-Lite....	6	Own.....	Cone...
Chevrolet.....	108	4	3½x5½	224	Own.....	I.	Helical	Cent.	Splash-Pres.	Gear...	Zenith.....	Vacuum.	Single.	Remy.....	Hand	Auto-Lite....	6	Own.....	Cone...
Chevrolet.....D-4 & D-5	120	8	3½x4	286	Own.....	I.	Helical	Cent.	Splash-Pres.	Gear...	Zenith.....	Vacuum.	Single.	Remy.....	Hand	Auto-Lite....	6	Own.....	Cone...
Cole.....870	127	8	3½x4½	346	Northway.	L.	Helical	Gear.	Pressure.....	Gear...	Stromberg.	Vacuum.	Single.	Delco.....	H&A.	Delco.....	6	Northway.	Cone...
Columbia.....C&D	115	6	3½x4½	224	Continent.	L.	Helical	Cent.	Splash-Pres.	Piston.	Stromberg.	Vacuum.	Single.	At Kent.....	Hand	Rob-Myers.	9	Borg & Beck	Plate...
Comet.....C-60	125	6	3½x5	289	Lewis.....	L.	Helical	Cent.	Splash-Pres.	Piston.	Miller.....	Vacuum.	Single.	Delco.....	H&A.	Dyneto.....	6	Mechanics.	Disk...
Commonwealth.....4-40	112	4	3½x5	192	Lycoming.	L.	Helical	Ther.	Ciro-Spl....	Piston.	Carter.....	Vacuum.	Single.	At Kent.....	Hand	Dyneto.....	6	Mechanics.	Disk...
Crawford.....6-40	122½	6	3½x5½	303	Continent.	L.	Helical	Cent.	Ciro-Spl....	Piston.	Stromberg.	Vacuum.	Double.	Bosch.....	Hand	Westinghouse	6	Own.....	Plate...
Crow-Elkhart.....CE-36	114	4	3½x5	192	Own.....	I.	Helical	Ther.	Ciro-Spl....	Gear...	Zenith.....	Vacuum.	Single.	Connecticut.	Hand	Dyneto.....	6	Borg & Beck	Plate...
Cunningham.....	132 / 142	8	3½x5	442	Own.....	L.	Helical	Cent.	Pressure.....	Gear...	Stromberg.	Vacuum.	Single.	Delco.....	H&A.	Westinghouse	6	.....	Disk...
Daniels.....B	127	8	3½x5	332	Herah-Sp.	L.	Helical	Cent.	Pressure.....	Gear...	Zenith.....	Vacuum.	Single.	Westinghouse	Hand	Westinghouse	6	Brown-Lipe.	Disk...
Davis.....H, I & K	119	6	3½x4½	224	Continent.	L.	Helical	Cent.	Splash-Pres.	Piston.	Stromberg.	Vacuum.	Single.	Delco.....	Hand	Delco.....	6	T.W Warner	Cone...
Davis.....J & JI	125	6	3½x5½	303	Continent.	L.	Helical	Cent.	Splash-Pres.	Piston.	Stromberg.	Vacuum.	Single.	Delco.....	H&A.	Delco.....	6	T.W.Warner	Cone...
Dishrow.....A	116	4	5½x5½	446	Wisconsin.	T.	Sp-G....	Cent.	Pressure.....	Gear...	Miller.....	Pressure.	Single.	K-W.....	Hand	Leece-N.....	12	Warner...	Disk...
Dispatch.....G	120	4	3½x5	221	Wisconsin.	L.	Helical	Ther.	Pressure.....	Gear...	Rayfield....	Vacuum.	Single.	Delco.....	Hand	U-S-L.....	12	Own.....	.....
Dodge.....	114	4	3½x4½	212	Own.....	L.	Helical	Cent.	Ciro-Spl....	Gear...	Stewart....	Vacuum.	Single.	Delco.....	H&A.	North-East.	12	Own.....	Disk...
Durrie.....I-C	130	6	4 x5	377	Own.....	I.	Helical	Cent.	Pressure.....	Gear...	Stromberg.	Vacuum.	Single.	Bosch.....	Hand	Westinghouse	6	Brown-Lipe.	Disk...
Dort.....11	105½	4	3½x5	192	Lycoming.	L.	Helical	Ther.	Ciro-Spl....	Piston.	Carter.....	Gravity.	Single.	Connecticut.	Hand	Westinghouse	6	Own.....	Cone...
Elcar.....	116	4	3½x5	192	Lycoming.	L.	Helical	Ther.	Ciro-Spl....	Piston.	Carter.....	Vacuum.	Single.	At Kent.....	Hand	Dyneto.....	6	Mechanics.	Disk...
Elcar.....	116	6	3½x4½	224	Continent.	L.	Helical	Cent.	Splash-Pres.	Piston.	Stromberg.	Vacuum.	Single.	At Kent.....	Hand	Dyneto.....	6	Borg & Beck	Plate...
Elgin.....A	117	6	3½x4½	196	Falls.....	I.	Helical	Ther.	Ciro-Spl....	Piston.	Stromberg.	Vacuum.	Single.	Wagner.....	Hand	Wagner.....	6	Borg & Beck	Plate...
Empire.....50-51	115	4	3½x5	236	Teet-Hart.	T.	Helical	Cent.	Ciro-Spl....	Piston.	Stromberg.	Vacuum.	Single.	Connecticut.	Hand	Auto-Lite...	6	Borg & Beck	Plate...
Empire.....70-A	120	6	3½x4½	224	Continent.	L.	Helical	Cent.	Splash-Pres.	Piston.	Stromberg.	Vacuum.	Single.	Connecticut.	Hand	Auto-Lite..	6	Borg & Beck	Plate...

ABBREVIATIONS

2-pt—*Two Point*
¾ Ell—¾ *Elliptic*
¾ *Float*—¾ *Floating*
¾ Plat—¾ *Platform*
Amid—*Amidships*
Atmtc—*Automatic*
B & P—*Ball and Plain*
B & R—*Ball and Roller*
B R & P—*Ball, Roller and Plain*
C & C—*Cup and Cone*
Cant—*Cantilever*
Cent—*Centrifugal*
Circ-Spl—*Circulating Splash*
Dual-D—*Dual Double*
Ell—*Elliptic*
F—*F-Head*
Float—*Floating*
Fric—*Friction*
Gear—*Gear Pump*
H—*Horizontal*
H & A—*Hand and Automatic*
I—*I-Head*
Imp—*Impeller*
K—*Knight type*
L—*L-Head*
Mag—*Magnetic*
Non-Spl—*Non-Circulating Splash*
Opt—*Optional*
Plan—*Planetary*
Plat—*Platform*
Rad-Rd—*Radius Rods*
Rev-C—*Reversed Cone*
Roll—*Roller*
S-A—*Semi-Automatic*
S-E—*Semi-Elliptic*
Semi-F—*Semi-Floating*
Sp-B—*Spiral Bevel*
Sp-G—*Spiral Gear*

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with Their Technical Specifications

TRANSMISSION								RUNNING GEAR							BEARINGS			
GEARSET			Final Drive	Torque Taken By	Make of Rear Axle	Rear Axle Type	Gear Ratio on Direct	TIRES		Wheels	Rear Spr'gs	Make of Steering Gear	Make of Speed-ometer	Crank-shaft Bearings and Number	Gearset	Rear Axle	Front Wheel	MAKE AND MODEL
Make	Location	Forward Speeds						Front	Rear									
Muncie	Unit M...	3	Sp.B...	Springs...	Salisbury...	¾ Float...	4.30–1	34x4	34x4	Wood†	S-E...	Gemmer	Stewart	Plain 3...	Ball...	B&R...	Roll...	Abbott-6-62
Own	Unit M...	3	Sp.B...	Springs...	Adams	Float...	4.25–1	32x3½	32x3½	Wood...	S-E...	Ditwiler	Stewart	Plain 2...	B&R...	Ball...	Roll...	Allen-41
Mechanics	Unit M...	3	Sp.B...	Springs...	Salisbury...	¾ Float...	4.42–1	32x4	32x4	Wood...	S-E...	Gemmer	Van Sicklen...	Plain 3...	B&P...	B&R...	Ball...	American-B
Durston	Unit M...	3	Sp.B...	Springs...	Columbus	¾ Float...	4.58–1	33x4	33x4	Wood†	S-E...	C. A. S.	Stewart	Plain 3...	Ball...	Roll...	Ball...	Anderson-20
Own	Amid...	3	Sp.B...	Springs...	Own	Semi-F...	4.25–1	34x4	35x4½	Wood†	¾-Ell...	Own	Van Sicklen...	Plain 4...	Roll...	Roll...	Plain...	Apperson
Own	Amid...	3	Sp.B...	Springs...	Own	Semi-F...	4.25–1	34x4	35x4½	Wood†	¾-Ell...	Own	Van Sicklen...	Plain 3...	Roll...	Roll...	Roll...	Apperson
	Unit M...	3	Bevel...	Springs...	Gemco	Float...	4.25–1	30x3½	30x3½	Wood...	Cant...		Carter	Plain 2...	Ball...	Roll...	Ball...	Arbenz-25
Grant-Lees	Unit M...	3	Sp.B...	Tor-A...		¾ Float...	4.42–1	34x4	34x4	Wood...	S-E...	Jacox	Stewart	Plain 3...	Ball...	Roll...	Ball...	Auburn-6-30
Grant-Lees	Unit M...	3	Sp.B...	Tor-A...		Float...	4.08–1	35x4½	35x4½	Wood...	Cant...			Plain 3...	Ball...	Roll...	Ball...	Auburn-6-44
Muncie	Unit M...	3	Sp.B...	Springs...	Own	Float...	*3.75–1 •5.25–1	34x4½	34x4½	Wood†	Cant...	Lavine	Stewart	Plain 3...	Ball...	B&R...	Roll...	Austin
Own	Unit M...	4	Sp.B...	Springs...	Own	Float...	4.40–1	32x4	32x4	Wire...	S-E...	Gemmer	Warner	Plain 3...	B&R...	Roll...	Roll...	Biddle-H
Detroit	Unit M...	3	Sp.B...	Springs...	Salisbury...	¾ Float...	4.00–1	32x4	32x4	Wood...	S-E...	Gemmer	Van Sicklen...	Plain 3...	Ball...	Roll...	Ball...	Bour-Davis-18A
Detroit	Unit M...	3	Sp.B...	Springs...	Salisbury...	¾ Float...	4.07–1	33x4½	33x4½	Wood...	S-E...	Gemmer	Van Sicklen...	Plain 3...	Ball...	Roll...	Ball...	Bour-Davis-18B
Own	Unit T...	3	Sp.B...	Tor-T...	Own	Float...	4.50–1	34x4½	34x4½	Wood...	Cant...	Own	Stewart	Plain 3...	Ball...	Roll...	Roll...	Brewster-1
Own	Unit X...	3	Bevel...	Tor-A...	Own	Semi-F...	4.25–1	30x3½	30x3½	Wood†	Ell...	Own	Stewart	Plain 2...	BR&P	B&R...	Ball...	Briscoe-4-24
Own	Amid...	3	Bevel...	Springs...	West-M...	¾ Float...	4.08–1	31x4	31x4	Wood...	S-E...	Jacox	Stewart	Plain 3...	Ball...	Roll...	Ball...	Buick-E-4-34
Own	Amid...	3	Bevel...	Springs...	West-M...	¾ Float...	4.08–1	31x4	31x4	Wood...	S-E...	Jacox	Stewart	Plain 3...	Ball...	Roll...	Ball...	Buick-E-4-35
Own	Amid...	3	Sp.B...	Tor-T...	West-M...	Float...	4.08–1	34x4	34x4	Wood...	Cant...	Jacox	Stewart	Plain 4...	Ball...	Roll...	Roll...	Buick-E-6-44
Own	Amid...	3	Sp.B...	Tor-T...	West-M...	Float...	4.08–1	34x4	34x4	Wood...	Cant...	Jacox	Stewart	Plain 4 ..	Ball...	Roll...	Roll...	Buick-E-6-45 & 46
Own	Amid...	3	Sp.B...	Tor-T...	West-M...	Float...	4.61–1	34x4½	34x4½	Wood...	Cant...	Jacox	Stewart	Plain 4...	Ball...	Roll...	Roll...	Buick-E-6-49 & 50
Own	Unit M...	3	Sp.B...	Tor-T...	Timken...	Float...	4.43–1 5.07–1	35x5 34x4½	35x5 34x4½	Wood...	Plat...	Own		Plain 3...	BR&P	Roll...	Roll...	Cadillac-57
Muncie	Unit M...	3	Bevel...	Springs...	Salisbury...	Float...	4.25–1	30x3½	30x3½	Wood...	S-E...	Own	Van Sicklen...	Plain 3...	Ball...	B&R	Ball...	Campbell
Grant-Lees	Unit M...	3	Sp.B...	Springs...	Columbia...	¾ Float...	4.45–1	35x4½	35x4½	Wood†	S-E...	Jacox	Stewart	Plain 3...	Ball...		Roll...	Case-U
Own	Unit M...	3	Sp.B...	Springs...	Timken...	Semi-F...	4.75–1 5.09–1	32x4 34x4	32x4 34x4	Wood...	S-E...	Own	Stewart	Plain 3...	Roll...	Roll...	Roll...	Chalmers
Own	Unit M...	3	Sp.B...	Tor-T...	Own	Float...	4.40–1	34x4	34x4	Wood...	S-E...	Gemmer	Stewart	Plain 3...	Ball...	Ball...	Roll...	Chandler-25
Own	Amid...	3	Bevel...	Springs...	Own	¾ Float...	3.65–1	30x3½	30x3½	Wood...	Cant...	C. A. S. T.W.Warner.	Stewart	Plain 3...	B&P...	Roll...	C&C...	Chevrolet-490
Own	Amid...	3	Bevel...	Springs...	Own	¾ Float...	4.25–1	33x4	33x4	Wood...	Cant...	T.W.Warner.	Stewart	Plain 3...	B&P...	Roll...	C&C...	Chevrolet
Own	Amid...	3	Bevel...	Tor-T...	Own	¾ Float...	4.25–1	34x4	34x4	Wood...	Cant...	T.W.Warner.	Stewart	Plain 3...	B&P...	Roll...	C&C...	Chevrolet-D-4 & D-5
Northway	Unit M...	3	Sp.B ..	Springs...	Columbia...	Float...	4.45–1	35x4½	35x4½	Wood†	S-E...	Warner	Warner	Plain 3...	Ball...	Roll...	Roll...	Cole-870
T.W.Warner	Unit M...	3	Sp.B...	Tor-T...	Timken...	¾ Float...	4.75–1	32x4	32x4	Opt...	Cant...	T.W.Warner.	Stewart	Plain 3...	Ball...	Roll...	Roll...	Columbia-C&D
Mechanics	Unit M...	3	Sp.B...	Tor-T...	W-Weiss...	¾ Float...	4.50–1	33x4	33x4	Opt...	Cant...	C. A. S.	Stewart	Plain 3...	Ball...	Roll...	Ball...	Comet-C-30
Mechanics	Unit M...	3	Sp.B...	Springs...	Peru	Float...	4.00–1	32x3½	32x3½	Opt...	¾ Ell...	Ditwiler	Van Sicklen...	Plain 2...	Ball...	B&R...	Ball...	Commonwealth-4-40
Own	Unit M...	3	Sp.B...	Springs...	Timken...	¾ Float...	4.08–1	32x4	32x4	Wood...	S-E...	Gemmer	Stewart	Plain 3...	Roll...	Roll...	Roll...	Crawford-6-40
Own	Unit M...	3	Bevel...	Springs...	Peru	Float...	4.25–1	32x3½	32x3½	Opt...	S-E...	Jacox	Stewart	Plain 3...	Ball...	Roll...	Roll...	Crow-Elkhart-CE-36
	Unit M...	3	Sp.B...	Tor-T...	Timken...	Float...	3.08–1 4.08–1	35x5 37x5	35x5 37x5	Opt...	¾ Ell...	Gemmer	Warner	Plain 3...	BR&P	Roll...	Roll...	Cunningham
Brown-Lipe	Unit M...	3	Sp.B...	Tor-T...	Timken...	¾ Float...	4.45–1	34x4½	34x4½	Wood...	S-E...	Gemmer	Warner	Plain 3...	B&R...	Roll...	Roll...	Daniels-B
T.W.Warner	Unit M...	3	Sp.B...	Springs...	Columbia	¾Float...	4.58–1	34x4	34x4	Wood...	S-E...	T.W.Warner.	Stewart	Plain 3...	B&P...	Roll...	Ball...	Davis-H, I & K
T.W.Warner	Unit M...	3	Sp.B...	Springs...	Columbia	Float...	4.42–1	34x4½	34x4½	Wood...	S-E...	T.W.Warner.	Stewart	Plain 3...	B&P...	Roll...	Roll...	Davis-J & JI
Warner	Unit M...	3	Bevel...	Springs...	American	Float...	2.91–1	33x4½	33x4½	Wire...	S-E...	Warner	Stewart	Plain 3...	Roll...	Roll...	Roll...	Disbrow-A
Own	Amid...	4	Chain...	Springs...	Own	Dead...	4.12–1	36x3½	36x3½	Wood...	Ell...	Foster	Corb.-Brown	Plain...	Ball...	Ball...	Ball...	Dispatch-G
Own	Unit M...	3	Sp.B...	Tor-T...	Own	Float...	4.17–1 3.62–1	32x3½	32x3½	Wood†	¾ Ell...	Own	Johns-Man...	Plain 3...	R&P...	Roll...	Roll...	Dodge
Own	Unit M...	3	Sp.B...	Tor-T...	Timken...	Float...	3.50–1	36x4½	36x4½	Wood...	Plat...	Warner	Warner	Plain 7...	Roll...	Roll...	Roll...	Derris-I-C
Mechanics	Unit M...	3	Bevel...	Tor-T...	W-Weiss...	¾ Float...	4.00–1	30x3½	30x3½	Opt...	Cant...	Jacox	Stewart	Plain 2...	B&P...	R&P...	Ball...	Dort-11
Mechanics	Unit M...	3	Sp.B...	Springs...	Salisbury...	Float...	4.50–1	32x3½	32x3½	Wood†	S-E...	C. A. S.	Stewart	Plain 2...	Ball...	Roll...	Roll...	Elcar
Mumie	Unit M...	3	Sp.B...	Springs...	Salisbury...	Float...	4.50–1	33x4	33x4	Wood†	S-E...	C. A. S.	Stewart	Plain 3...	Ball...	Roll...	Roll...	Elcar
Mechanics	Unit M...	3	Sp.B...	Tor-A...	Adams	¾ Float...	4.45–1	32x4	32x4	Wood...	Cant...	C. A. S.	Van Sicklen...	Plain 3...	B&P...	Ball...	Roll...	Elgin-A
Mechanics	Unit M...	3	Bevel...	Tor-T...	Peru	¾ Float...	4.33–1 3.75–1	33x4	33x4	Opt...	S-E...	C. A. S.	Stewart	Plain 3...	B&P...	B&R...	Ball...	Empire-50-51
Mechanics	Unit M...	3	Sp.B...	Springs...	Hess	Float...	4.58–1	34x4	34x4	Opt...	S-E...	C. A. S.	Stewart	Plain 3...	B&P...	B&R...	Ball...	Empire-70-A

Splash-Pres—*Splash Pressure*
Spur—*Spur Gears*
T—*T-Head*
Ther—*Thermo-Syphon*
Tor-A—*Torsion Arm*
Tor-R—*Torsion Rod*
Tor-T—*Torsion Tube*
Tr. S-E—*Transverse Semi-Elliptic*
Unit-M—*Unit with Motor*
Unit-T—*Unit with Torque Tube*
Unit-X—*Unit with Axle*
Vib-Dup—*Vibrating Duplex*
†—*Wire Extra*
•—*Two-Speed Axle*

EQUIPMENT

Allis-Ch—*Allis-Chalmers*
At Kent—*Atwater Kent*
A. W. T.—*American Watch Tool Co.*
Continent—*Continental*
Cut-Hammer—*Cutler-Hammer*
G.B.&S.—*Golden, Belknap & Swarts*
G. & D.—*Gray & Davis*
Gen. Elec.—*General Electric*
Hersh-Sp—*Herschell-Spillman*
Johns-Man—*Johns-Manville*
Leece-N—*Leece-Neville*
Longmare—*Longuemare*
Mass-Ph—*Massnick-Phipps*
Mer & Evans—*Merchant & Evans*
Reichbch—*Reichenbach*
Rob-Myers—*Robbins & Myers*
Shkspere—*Shakespeare*
Teet-Hart—*Teetor-Hartley*
U-S-L—*U. S. Light & Heating Corp.*
W-Weiss—*Walker-Weiss*
Ward-L—*Ward Leonard*
West-M—*Weston-Mott*

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1918 Passenger Automobiles Listed with

MAKE AND MODEL	Wheelbase	No. of Cylinders	Bore and Stroke, Inches	Piston Displacement, Cubic Inches	Make of Engine	Cylinder Shape	Camshaft Drive	Water Circulation	LUBRICATION		CARBURETION		IGNITION			ELECTRIC SYS.		CLUTCH	
									System	Type of Pump	Make of Carbureter	Fuel Feed	System	Make	Control	Generator Make	Voltage	Make	Type
Empire.....71	120	6	3½x4½	224	Continent.	L.	Helical	Cent.	Splash-Pres.	Piston.	Stromberg.	Vacuum.	Single.	Connecticut.	Hand.	Auto-Lite....	6	Borg & Beck	Plate.
Empire.....73	120	6	3½x4½	224	Continent.	L.	Helical	Cent.	Splash-Pres.	Piston.	Stromberg.	Vacuum.	Single.	Connecticut.	Hand.	Auto-Lite....	6	Borg & Beck	Plate.
Fageol.....	140	6	5 x7	825	Hall-Scott.	I.	Bevel	Cent.	Pressure	Gear	Zenith	Vacuum.	Dual-D	Splitdorf	Hand.	Bosch	12	Hele-Shaw.	Disk.
Fergus.....	130	6	3½x4½	236	Own	I.	Sp-B	Cent.	Pressure	Gear	Zenith	Vacuum.	Single.	Bosch	Hand.	Special	6	Own	Disk.
Fiat.....E-17	140	4	5½x6½	584	Own	L.	Chain	Cent.	Splash-Pres.	Gear	Own	Pressure.	2-Pt.	Bosch	Hand.	Westinghouse	6	Own	Disk.
Ford.....T	100	4	3½x4	177	Own	L.	Sp-G	Ther.	Splash-Grav.		Holley-Kng.	Gravity.	Single.	Own	Hand.			Own	Disk.
Franklin.....9	115	6	3½x4	199	Own	I.	Helical	Air	Pressure	Gear	Own	Vacuum.	Single.	At Kent	Atmtc	Dyneto	12	Own	Disk.
F.R.P.....45B	140	4	4½x6½	445	Own	I.	Helical	Cent.	Splash-Pres.	Piston.	Stewart	Pressure.	2-Pt.	Bosch	Hand.	Bosch	12	Mer. & Ev.	Disk.
Geronimo.....	114	4	3½x5	192	Lycoming.	L.	Helical	Ther.	Ciro-Spl		Carter	Vacuum.	Single.	Delco	Hand.	Dyneto	6	Lycoming.	Disk.
Geronimo.....A-45	122	6	3½x5	230	Rutenber.	L.	Helical	Cent.	Splash-Pres.	Piston.	Stromberg.	Vacuum.	Single.	Delco	Hand.	Dyneto	6	Borg & Beck	Plate.
Ghost.....6-60	125	6	3½x5½	303	Continent.	L.	Helical	Cent.	Splash-Pres.	Piston.	Stromberg.	Vacuum.	Single.	Connecticut.	Hand.	Auto-Lite	6	Borg & Beck	Plate.
Glide.....6-40	119	6	3½x5	230	Rutenber.	L.	Helical	Cent.	Splash-Pres.	Piston.	Rayfield	Vacuum.	Single.	Westinghouse	Hand.	Westinghouse	6	Own	Disk.
Grant.....G	114	6	3 x4½	180	Own	I.	Helical	Ther.	Ciro-Spl	Piston.	Stromberg.	Vacuum.	Single.	Remy	Atmtc	Wagner	6	Durston	Cone.
Hackett.....A L	112	4	3½x4½	188	Own	L.	Chain	Ther.	Splash-Pres.	Piston.	Dave Buick.	Vacuum.	Single.	Connecticut.	Hand.	Dyneto	6		Disk.
Hal.....21-A	135	12	2½x5	389	Weidely	I.	Helical	Cent.	Pressure	Gear	Stromberg.	Vacuum.	Dual.	Remy	Hand.	Westinghouse	6	Borg & Beck	Plate.
Harroun.....	106	4	3½x5½	174	Own	I.	Helical	Ther.	Ciro-Spl	Piston.	Stromberg.	Vacuum.	Single.	At Kent	Hand.	Remy	6	Own	Cone.
Harvard.....4-20	100	4	3x4½	120	Sterling	I.	Helical	Ther.	Ciro-Spl	Gear	Zenith	Gravity.	Single.	At Kent	Atmtc	Wagner	6	Detroit	Cone.
Haynes.....38	121	6	3½x5	289	Own	L.	Helical	Cent.	Ciro-Spl	Piston.	Rayfield	Vacuum.	Single.	Remy	Hand.	Lecce-N	6	Borg & Beck	Disk. Plate.
Haynes.....39	127	6	3½x6	346	Own	L.	Helical	Cent.	Ciro-Spl	Piston.	Rayfield	Vacuum.	Single.	Remy	Hand.	Lecce-N	6	Borg & Beck	Plate.
Haynes.....44	127	12	2½x5	356	Own	I.	Chain	Cent.	Pressure	Gear	Rayfield	Vacuum.	Single.	Delco	H&A.	Lecce-N	6	Borg & Beck	Plate.
Hellier.....196	116	6	3 x4½	180	Falls	I.	Helical	Ther.	Ciro-Spl	Gear	Stewart	Vacuum.	Single.	Remy	Hand.	Splitdorf	12	Own	Cone.
Hellier.....296	116	6	3½x4½	224	Continent.	L.	Helical	Cent.	Splash-Pres.	Gear	Stewart	Vacuum.	Single.	Remy	Hand.	Splitdorf	12	Borg & Beck	Plate.
Hellier.....188	116	8	3 x4½	180	Own	L.	Helical	Ther.	Pressure	Gear	Stewart	Vacuum.	Single.	At Kent	Atmtc	Splitdorf	12	Own	Cone.
Homer-Laughlin.....D	112	8	2½x3½	117	Own		Chain	Ther.	Ciro-Spl		Zenith		Single.	At Kent	Atmtc	Disco	12	Own	
Hudson.....	125	6	3½x5	289	Own	L.	Helical	Cent.	Ciro-Spl	Piston.	Own	Vacuum.	Single.	Delco	H&A.	Delco	6	Own	Disk.
Hupmobile.....R	112	4	3½x5½	182	Own	L.	Chain	Ther.	Pressure	Gear	Stromberg.	Vacuum.	Single.	At Kent	Hand.	Bijur	6	Own	Disk.
Inter-State.....T	110	4	3½x5	192	Beaver	I.	Helical	Ther.	Ciro-Spl	Gear	Sobebler	Gravity.	Single.	Remy	Hand.	Remy	6	Own	Cone.
Jackson.....	118	8	3 x3½	198	Ferro	I.	Helical	Ther.	Pressure	Gear	Zenith	Vacuum.	Single.	Remy	S-A.	Auto-Lite	6	Borg & Beck	Plate.
Jones.....26 AB	125	6	3½x5½	296	Lewis	L.	Helical	Cent.	Ciro-Spl	Piston.	Stromberg.	Vacuum.	Single.	Remy	Hand.	Auto-Lite	6	Borg & Beck	Plate.
Jordan.....J-60	127	6	3½x5½	303	Continent.	L.	Helical	Cent.	Splash-Pres.	Piston.	Stromberg.	Vacuum.	Single.	Bosch	Hand.	Bijur	6	Brown-Lipe.	Disk.
King.....EE	120	8	3 x5	283	Own	L.	Chain	Ther.	Pressure	Gear	Ball	Vacuum.	Single.	At Kent	Hand.	Bijur	6	Borg & Beck	Plate.
Kissel.....	117	6	3½x5	249	Own	L.	Helical	Cent.	Splash-Pres.	Gear	Stromberg.	Vacuum.	Single.	Remy	Hand.	Remy	6	T.W.Warner	Cone.
Kissel.....	128	12	2½x5	259	Weidely	I.	Helical	Cent.	Pressure	Gear	Stromberg.	Vacuum.	Single.	Delco	H&A.	Delco	6	Warner	Disk.
Kline.....6-38	120	6	3½x4½	224	Continent.	L.	Helical	Cent.	Splash-Pres.	Piston.	Rayfield	Vacuum.	Single.	Westinghouse	Hand.	Westinghouse	6	Borg & Beck	Plate.
Lexington.....R	122	6	3½x4½	224	Continent.	L.	Helical	Cent.	Ciro-Spl	Piston.	Rayfield	Vacuum.	Single.	Connecticut.	Hand.	Westinghouse	6	Borg & Beck	Plate.
Liberty.....16-B	115	6	3½x4½	224	Continent.	L.	Helical	Ther.	Splash-Pres.	Piston.	Stromberg.	Vacuum.	Single.	Delco	Hand.	Delco	6	Borg & Beck	Plate.
Locomobile.....38	139	6	4½x5	426	Own	T.	Helical	Cent.	Splash-Pres.	Gear	Ball	Pressure.	Dual-D	Berling	Hand.	Westinghouse	6	Own	Disk.
Locomobile.....48	142	6	4½x5½	525	Own	T.	Helical	Cent.	Splash-Pres.	Gear	Ball	Pressure.	Dual-D	Berling	Hand.	Westinghouse	6	Own	Disk.
Madison.....	120	6	3½x5	230	Rutenber.	L.	Helical	Cent.	Splash-Pres.	Piston.	Rayfield	Vacuum.	Single.	Remy	Hand.	Remy	6	Muncie	Disk.
Madison.....	124	6	3½x5	230	Rutenber.	L.	Helical	Cent.	Ciro-Spl	Piston.	Rayfield	Vacuum.	Single.	Remy	Hand.	Remy	6	Muncie	Disk.
Maibohm.....A	105	4	3½x4	123	Own	L.	Helical	Ther.	Splash-Pres.	Piston.	Zenith	Gravity.	Single.	At Kent	Atmtc	Disco	12	Mechanics	Disk.
Maibohm.....B	115	6	3½x4½	196	Falls	I.	Helical	Ther.	Splash-Pres.	Piston.	Stromberg.	Vacuum.	Single.	At Kent	Hand.	Wagner	6	Borg & Beck	Plate.
Marion-Handley.....A	120	6	3½x5	230	Rutenber.	L.	Helical	Cent.	Ciro-Spl	Piston.	Stromberg.	Vacuum.	Single.	At Kent	Hand.	Westinghouse	6		Disk.
Marion-Handley.....B	125	6	3½x5½	303	Continent.	L.	Helical	Cent.	Splash-Pres.	Piston.	Stromberg.	Vacuum.	Single.	Westinghouse	Hand.	Westinghouse	6		Disk.
Marmon.....34	136	6	3½x5½	340	Own	I.	Helical	Cent.	Pressure	Gear	Stromberg.	Gravity.	Single.	Bosch	Hand.	Bijur	6	Own	Cone.
Maxwell.....25	109	4	3½x4½	170	Own	L.	Helical	Ther.	Splash-Pres.	Piston.	K. D.	Gravity.	Single.	At Kent	Hand.	Simms-Huff.	12	Own	Cone.
McFarlan.....X	136	6	4½x6	572	Teet-Hart.	T.	Helical	Cent.	Splash-Pres.	Piston.	Stromberg.	Vacuum.	Double.	Eisemann	Hand.	Westinghouse	6	Borg & Beck	Plate.
Mercer.....	115	4	3½x6½	298	Own	L.	Chain	Cent.	Pressure	Gear	Zenith	Vacuum.	Single.	Bosch	Hand.	U-S-L		Own	Disk.
Mercer.....	132	4	3½x6½	298	Own	L.	Chain	Cent.	Pressure	Gear		Vacuum.	Single.		Hand.			Own	Disk.
Metz.....25	108	4	3½x4	189	Own	L.	Helical	Ther.	Ciro-Spl	Gear	A.W.T.	Gravity.	Single.	At Kent	Fixed	Westinghouse	6	Own	

ABBREVIATIONS

2-pt—*Two Point*
¾ Ell—¾ *Elliptic*
¾ Float—¾ *Floating*
¾ Plat—¾ *Platform*
Amid—*Amidships*
Atmtc—*Automatic*
B & P—*Ball and Plain*
B & R—*Ball and Roller*
B R & P—*Ball, Roller and Plain*
C & C—*Cup and Cone*
Cant—*Cantilever*
Cent—*Centrifugal*
Circ-Spl—*Circulating Splash*
Dual-D—*Dual Double*
Ell—*Elliptic*
F—*F-Head*
Float—*Floating*
Fric—*Friction*
Gear—*Gear Pump*
H—*Horisontal*
H & A—*Hand and Automatic*
I—*I-Head*
Imp—*Impeller*
K—*Knight type*
L—*L-Head*
Mag—*Magnetic*
Non-Spl—*Non-Circulating Splash*
Opt—*Optional*
Plan—*Planetary*
Plat—*Platform*
Rad-Rd—*Radius Rods*
Rev-C—*Reversed Cone*
Roll—*Roller*
S-A—*Semi-Automatic*
S-E—*Semi-Elliptic*
Semi-F—*Semi-Floating*
Sp.B—*Spiral Bevel*
Sp.G—*Spiral Gear*

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Their Technical Specifications—Continued

TRANSMISSION							RUNNING GEAR							BEARINGS			
GEARSET							TIRES										
Make	Location	Forward Speeds	Final Drive	Torque Taken By	Make of Rear Axle	Rear Axle Type	Gear Ratio on Direct	Front	Rear	Wheels	Rear Spr'gs	Make of Steering Gear	Make of Speedometer	Crankshaft Bearings and Number	Gearset	Rear Axle	Front Wheel	MAKE AND MODEL
Mechanics	Unit M	3	Bevel	Tor-T	West-M	¾ Float	4.00-1	34x4	34x4	Opt	¾ Ell	C. A. S.	Stewart	Plain 3	B&P	B&R	Ball	Empire 71
Mechanics	Unit-M	3	Sp.B	Springs	Hess	Float	4.58-1	34x4	34x4	Opt	S-E	C. A. S.	Stewart	Plain 3	B&P	B&R	Ball	Empire 73
Own	Amid	3	Bevel	Springs	Own	Semi-F	1.50-1	34x4½	34x4½	Wire	S-E	Gemmer	Stewart	Plain 7	Ball	Roll	Roll	Fageol
Own	Amid	3	Sp.B	Tor-T	Own	Semi-F	4.00-1 / 4.75-1	33x4½	33x4½	Opt	Cant	Own		Plain 3	Plain	B&P	Ball	Fergus
Own	Amid	4	Sp.B	Tor-T	Own	Semi-F	2.75-1	35x5	35x5	Wood	S-E	Own	Stewart	Plain 3	Plain	Ball	Ball	Fiat E-17
Own	Plan	2	Bevel	Tor-T / Rad-Rd	Own	Semi-F	3.64-1	30x3	30x3½	Wood	Tr.S-E	Own	None	Plain 3	Plain	Roll	Ball	Ford T
Own	Amid	3	Sp.B	Springs	Own	Semi-F	4.33-1	32x4 / 33x4½	32x4 / 33x4½	Wood	Ell	Own	Stewart	Plain 7	Ball	Ball	Ball	Franklin 9
Own	Amid	4	Bevel	Tor-T	Own	Float	3.00-1	36x4½	36x5	Wire	S-E	Own	Opt	Plain 3	Ball	Ball	Ball	F.R.P 45B
Mechanics	Unit M	3	Bevel	Tor-T	Adams	Float	4.00-1	32x3½	32x3½	Wood	Cant	C. A. S.	Stewart	Plain 2	Plain	Ball	Ball	Geronimo
Dundore	Unit M	3	Sp.B	Springs	W-Weiss	¾ Float	4.50-1	32x4	32x4	Wood	S-E	C. A. S.	Stewart	Plain 3	Ball	Roll	Ball	Geronimo A-45
Grant-Lees	Unit M	3	Sp.B	Springs	Standard	¾ Float	4.33-1	34x4	34x4	Opt	S-E	Lavine	Stewart	Plain 3	Ball	B&R	Roll	Ghent 6-60
Own	Unit-M	3	Sp.B	Springs	American	¾ Float	4.64-1	34x4	34x4	Wood	¾ El	Lavine	Stewart	Plain 3	B&P	Ball	Ball	Glide 6-40
Durston	Unit M	3	Bevel	Tor-T	Peru	Float	4.50-1	32x3½	32x3½	Opt	Cant	Jacox	Van Sicklen	Plain 3	B&P	B&R	Roll	Grant G
Grant-Lees	Unit M	3	Bevel	Springs	W-Weiss	Semi-F	4.00-1	32x3½	32x3½	Wood	¾ Ell	Jacox	Stewart	Plain 3	Ball	Roll	Ball	Hackett A L
Grant-Lees	Unit M	3	Sp.B	Springs	Timken	Float	4.45-1	34x4½	34x4½	Wood†	S-E	Gemmer	Van Sicklen	Plain 3	B&R	Roll	Roll'	Hal 21-A
Mechanics	Unit M	3	Bevel	Tor-T	Own	¾ Float	4.00-1	30x3½	30x3½	Wood	Cant	C. A. S.	Stewart	Plain 3	B&P	B&R	Roll	Harroun
Detroit	Unit M	3	Bevel	Springs	Detroit	Semi-F	4.00-1	28x3	28x3	Opt	Cant	Barnes	Stewart	Plain 3	B&P	B&R	Ball	Harvard 4-20
Own	Unit M	3	Sp.B	Springs	Own	¾ Float	4.42-1	34x4	34x4	Wood	S-E	Jacox	Stewart	Plain 3	Ball	Ball	Ball	Haynes 38
Own	Unit M	3	Sp.B	Springs	Own	¾ Float	4.42-1	35x4½	35x4½	Wood	S-E	Jacox	Stewart	Plain 3	B&P	B&P	Ball	Haynes 39
Own	Unit M	3	Sp.B	Springs	Own	¾ Float	4.07-1	34x4½	34x4½	Wire	S-E	Jacox	Warner	Plain 3	Ball	Ball	Ball	Haynes 44
Own	Unit M	2	Sp.B	Tor-T	Own	Float	4.50-1	32x3½	32x3½	Wood	Cant	Own	Stewart	Plain 3	Ball	Ball	Ball	Hollier 196
Own	Unit M	3	Sp.B	Tor-T	Own	Float	4.50-1	32x4	32x4	Wood†	Cant	Own	Stewart	Plain 3	Ball	Ball	Ball	Hollier 206
Own	Unit-M	2	Sp.B	Tor-T	Own	Float	4.50-1	34x4	34x4	Wood	Cant	Own	Stewart	Plain 3	Ball	Ball	Ball	Hollier 188
Friction	Amid		Chain	Rad-Rd	Own	Dead		30x3½	30x3½	Wire	Cant	Warner	Stewart	Ball 2	Ball	Ball	Ball	Homer-Laughlin D
Own	Unit M	3	Sp.B	Springs	Timken	¾ Float	*4.08-1	34x4	34x4	Wood†	S-E	Gemmer	Stewart	Plain 4	Roll	Roll	Roll	Hudson
Own	Unit M	3	Sp.B	Springs	Own	¾ Float	4.91-1	32x4	32x4	Wood	S-E	Jacox	Van Sicklen	Plain 3	B&P	Roll	Ball	Hupmobile R
Durston	Unit X	3	Bevel	Tor-T	Peru	¾ Float	4.00-1	33x4	33x4	Opt	¾ Ell	T.W.Warner	Stewart	Plain 3	B&R	Roll	Ball	Inter-State T
Covert	Unit M	3	Sp.B	Springs	Salisbury	¾ Float	5.27-1	37x4	37x4	Wood	Ell	Foster	Stewart	Plain 3	Roll	Roll	Ball	Jackson
Covert	Unit M	3	Sp.B	Springs	Timken	¾ Float	4.45-1	34x4	34x4	Wood	S-E	T.W.Warner	Stewart	Plain 3	Roll	Roll	Roll	Jones 26 AB
Brown-Lipe	Unit M	3	Sp.B	Springs	Timken	Semi-F	4.45-1	35x4½	35x4½	Wood	S-E	Gemmer	Van Sicklen	Plain 3	B&P	Roll	B&R	Jordan J-60
Own	Unit M	3	Sp.B	Tor-A	Columbia	Float	4.58-1	34x4	34x4	Wood	Cant	Jacox	Stewart	Plain 3	BR&P	Roll	Roll	King EE
T.W.Warner	Unit M	3	Sp.B	Springs	Own	Float	4.58-1	34x4	34x4	Wood	¾El1	Jacox	Stewart	Plain 3	R&P	Roll	Roll	Kissel
Warner	Unit M	3	Sp.B	Springs	Own	Float	4.58-1	34x4½	34x4½	Wood	¾ Ell	Jacox	Stewart	Plain 3	B&R	Roll	Roll	Kissel
Grant-Lees	Unit M	3	Sp.B	Springs	Hess	Float	4.33-1	34x4	34x4	Wood†	¾ Ell	Lavine	Stewart	Plain 3	Ball	Roll	Roll	Kline 6-38
Warner	Unit M	3	Sp.B	Springs	Hess	¾Float	5.00-1	34x4	34x4	Wood†	S-E	Warner	Stewart	Plain 3	Ball	Roll	Ball	Lexington R
Detroit	Unit M	3	Sp.B	Springs	Timken	Semi-F	4.75-1	32x4	32x4	Wood	S-E	Warner	Stewart	Plain 3	Ball	Roll	Roll	Liberty 10-B
Own	Amid	4	Sp.B	Tor-T	Own	Float	3.85-1	36½x4½	37x5	Wood	¾ Ell	Own	Warner	Plain 7	Ball	Ball	Roll	Locomobile 38
Own	Amid	4	Sp.B	Tor-A	Own	Float	3.85-1	37x5	37x5	Wood	¾ Ell	Own	Warner	Plain 7	Ball	Ball	Roll	Locomobile 48
Muncie	Unit M	3	Sp.B	Springs	Salisbury	¾ Float	4.42-1	34x4	34x4	Wood	¾ Ell	Warner	Stewart	Plain 3	B&P	Ball	Ball	Madison
Muncie	Unit M	3	Sp.B	Springs	Salisbury	¾ Float	4.42-1	34x4	34x4	Wood	¾ Ell	Warner	Stewart	Plain 3	B&P	Ball	Ball	Madison
Mechanics	Unit M	3	Sp.B	Springs	W-Weiss	Float	4.25-1	30x3½	30x3½	Opt	S-E	Jacox	Stewart	Plain 2	Ball	Roll	Ball	Maibohm A
Mechanics	Unit M	3	Sp.B	Springs	Peru	Float	4.25-1	32x3½	32x3½	Opt	S-E	Jacox	Stewart	Plain 3	Ball	Roll	Ball	Maibohm B
Muncie	Unit M	3	Sp.B	Springs	Salisbury	Float	4.41-1	32x4	34x4	Wood†	S-E	Warner	Stewart	Plain 3	B&P	Roll	Ball	Marion-Handley A
Muncie	Unit M	3	Sp.B	Springs	Salisbury	Float	4.07-1	35x4½	35x4½	Wood†	S-E	Warner	Stewart	Plain 3	Ball	Roll	Ball	Marion-Handley B
Own	Unit T	3	Sp.B	Tor-T	Own	¾ Float	3.69-1	32x4½	32x4½	Wire	Brush	Gemmer	Van Sicklen	Plain 4	BR&P	B&R	Roll	Marmon 34
Own	Unit M	3	Bevel	Tor-T	Own	¾ Float	3.58-1	30x3½	30x3½	Opt	S-E	Own	Stewart	Plain 2	R&P	Roll	Ball	Maxwell M
Brown-Lipe	Amid	3	Sp.B	Springs	Timken	Float	3.50-1	35x5	35x5	Opt	S-E	Warner	Warner	Plain 4	Roll	Roll	Roll	McFarlan X
Own	Amid	4	Sp.B	Springs	Own	Float	3.22-1	32x4	32x4	Wire	S-E			Plain 3	Ball	Roll	Roll	Mercer
Own	Amid	4	Sp.B	Springs	Own	Float	3.87-1	32x4½	32x4½	Wire	S-E			Plain 3	Ball	B&R	Roll	Mercer
Friction		7	Chain	Springs	Own			32x3½	32x3½	Opt	Ell	Own	Stewart	Plain 3		Roll	Ball	Metz 25

Splash-Pres—*Splash Pressure*
Spur—*Spur Gears*
T—*T-Head*
Ther—*Thermo-Syphon*
Tor-A—*Torsion Arm*
Tor-R—*Torsion Rod*
Tor-T—*Torsion Tube*
Tr S-E—*Tranverse Semi-Elliptic*
Unit-M—*Unit with Motor*
Unit-T—*Unit with Torque Tube*
Unit-X—*Unit with Axle*
Vib-Dup—*Vibrating Duplex*
†—*Wire Extra*
*—*Also available* 4.45-1, 3.80-1 and 4.90-1

EQUIPMENT

Allis-Ch—*Allis-Chalmers*
At Kent—*Atwater Kent*
A. W. T.—*American Watch Tool Co.*
Continent—*Continental*
Cut-Hammer—*Cutler-Hammer*
G.B.&S.—*Golden, Belknap & Swartz*
G. & D.—*Gray & Davis*
Gen. Elec.—*General Electric*
Hersh-Sp—*Herschell-Spillman*
Johns-Man—*Johns-Manville*
Leece-N—*Leece-Neville*
Longmare—*Longuemare*
Mass-Ph—*Massnich-Phipps*
Mer & Evans—*Merchant & Evans*
Reichbch—*Reichenbach*
Rob-Myers—*Robbins & Myers*
Shkspere—*Shakespeare*
Teet-Hart—*Teetor-Hartley*
U-S-L—*U. S. Light & Heating Corp.*
W-Weiss—*Walker-Weiss*
Ward-L—*Ward Leonard*
West-M—*Weston-Mott*

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1918 Passenger Automobiles Listed with

MAKE AND MODEL	Wheelbase	No. of Cylinders	Bore and Stroke, Inches	Piston Displacement, Cubic Inches	Make of Engine	Cylinder Shape	Camshaft Drive	Water Circulation	LUBRICATION		CARBURETION		IGNITION			ELECTRIC SYS.		CLUTCH	
									System	Type of Pump	Make of Carburetor	Fuel Feed	System	Make	Control	Generator Make	Voltage	Make	Type
Mitchell.....D-40	120	6	3½x5	249	Own.....	L..	Helical..	Cent..	Splash-Pres..	Piston..	Rayfield....	Vacuum..	Single..	Connecticut..	Hand.	Splitdorf....	6	Own.....	Cone...
Mitchell.....C-42	127	6	3½x5	289	Own.....	L..	Helical..	Cent..	Splash-Pres..	Piston..	Stromberg..	Vacuum..	Single..	Connecticut..	Hand.	Westinghouse	6	Own.....	Cone...
Moline-Knight.....C	118	4	3½x5	221	Own.....	K..	Chain...	Ther..	Pressure.....	Gear...	Schebler....	Vacuum..	Single..	Connecticut..	Hand.	Wagner.....	6	Own.....	Cone...
Moline-Knight.....G	122	4	4 x6	302	Own.....	K..	Chain...	Ther..	Pressure.....	Gear...	Schebler....	Vacuum..	Single..	Connecticut..	Hand.	Wagner.....	6	Own.....	Cone...
Mesiter.....	117	6	3½x4½	224	Continent.	L..	Helical..	Cent..	Splash-Pres..	.....	Stromberg..	Vacuum..	Dual...	Heinze.....	Hand.	Heinze.....	6	Borg & Beck	Plate...
Monroe.....M-3	96	4	3 x4½	120	Sterling...	I..	Helical..	Ther..	Circ-Spl.....	Piston..	Zenith.....	Vacuum..	Single..	Connecticut..	Hand.	Auto-Lite....	6	Mechanics..	Disk...
Monroe.....M-6	115	4	3½x4½	149	Own.....	I..	Helical..	Ther..	Splash-Pres..	Gear...	Zenith.....	Vacuum..	Single..	Connecticut..	Hand.	Auto-Lite....	6	Mechanics..	Disk...
Moon.....6-36	114	6	2½x4½	165	Continent.	L..	Helical..	Ther..	Splash-Pres..	Piston.	Tillotson...	Gravity..	Single..	Delco.....	Hand.	Wagner.....	6	Detlaff.....	Disk...
Moon.....6-45	125	6	3½x4½	224	Continent.	L..	Helical..	Cent..	Splash-Pres..	Piston..	Rayfield....	Vacuum..	Single..	Delco.....	Hand.	Delco.....	6	Borg & Beck	Plate...
Moon.....6-66	125	6	3½x5½	303	Continent.	L..	Helical..	Cent..	Splash-Pres..	Piston..	Rayfield....	Vacuum..	Single..	Delco.....	Atmtc	Delco.....	6	Borg & Beck	Plate...
Moore.....30-E	106	4	3½x4½	189	G.B.& S...	L..	Chain...	Ther..	Splash-Pres..	Piston..	Schebler....	Gravity..	Single..	.....	Hand.	Dyneto.....	6	G.B. & S...	Disk...
Moore.....30	108	4	3½x4½	188	G.B.& S...	L..	Chain...	Ther..	Circ-Spl.....	Piston.	Schebler....	Vacuum..	Single..	Splitdorf....	Hand.	Dyneto.....	6	G.B. & S...	Disk...
Murray.....	128	8	3½x5	332	Herab-Sp..	L..	Helical..	Cent..	Pressure.....	Gear...	Zenith.....	Vacuum..	Single..	Splitdorf....	Hand.	Westinghouse	6	Borg & Beck	Plate...
Nash.....681-683	121	6	3½x5	249	Own.....	I..	Helical..	Cent..	Splash-Pres..	Gear...	Marvel.....	Vacuum..	Single..	Delco.....	H&A..	Delco.....	6	Borg & Beck	Plate...
Nash.....671	125	6	3½x4½	267	Own.....	L..	Chain...	Cent..	Splash-Pres..	Gear...	Rayfield....	Vacuum..	Single..	Delco.....	Hand.	Bijur.....	6	Borg & Beck	Plate...
Nash.....684	127	6	3½x5	249	Own.....	I..	Helical..	Cent..	Splash-Pres..	Gear...	Marvel.....	Vacuum..	Single..	Delco.....	H&A..	Delco.....	6	Borg & Beck	Plate...
National.....	128	6	3½x5½	303	Own.....	L..	Helical..	Cent..	Splash-Pres..	Gear...	Rayfield....	Vacuum..	Single..	Splitdorf....	Hand.	Westinghouse	6	Own.....	Cone...
National.....	128	12	2½x4½	370	Own.....	L..	Helical..	Cent..	Pressure.....	Gear...	Rayfield....	Vacuum..	Single..	Delco.....	Hand.	Bijur.....	6	Own.....	Cone...
Nelson.....	104	4	3½x4½	146	Own.....	I..	Helical..	Ther..	Pressure.....	Gear...	Zenith.....	Vacuum..	Single..	Bosch.....	Hand.	U-S-L.....	12	Own.....	Disk...
Oakland.....34B	112	6	2½x4½	177	Northway..	I..	Helical..	Cent..	Splash-Pres..	Gear...	Marvel.....	Vacuum..	Single..	Remy.....	Hand.	Remy.....	6	Northway..	Cone...
Oldsmobile.....37	112	6	2½x4½	177	Northway..	I..	Helical..	Cent..	Pressure.....	Gear...	Johnson....	Vacuum..	Single..	Remy.....	Hand.	Remy.....	6	Northway..	Cone...
Oldsmobile.....45A	120	8	2½x4½	247	Own.....	L..	Helical..	Cent..	Pressure.....	Gear...	Ball.....	Vacuum..	Single..	Delco.....	H&A..	Delco.....	6	Own.....	Cone...
Olympian.....	114	4	3½x4½	149	Own.....	I..	Helical..	Ther..	Pressure.....	Gear...	Stromberg..	Vacuum..	Single..	Remy.....	Hand.	Wagner.....	6	Own.....	Disk...
Overland.....85	112	4	4½x4½	240	Own.....	L..	Helical..	Ther..	Circ-Spl.....	Gear...	Tillotson...	Vacuum..	Single..	.....	Hand.	Auto-Lite....	6	Auto-Lite...	Cone...
Overland.....90	104 106	4	3½x5	178	Own.....	L..	Helical..	Ther..	Circ-Spl.....	Piston..	Tillotson...	Vacuum..	Single..	.....	Hand.	Auto-Lite....	6	Auto-Lite...	Cone...
Overland.....85	116	6	3½x4½	224	Continent.	L.	Helical..	Cent..	Splash-Pres..	Piston..	Tillotson...	.Vacuum.	.Single.	.....	Hand.	Auto-Lite....	6	Auto-Lite...	Cone...
Owen Magnetic.....W-42	142	6	4 x5½	415	Own.....	I..	Sp-G....	Cent..	Pressure.....	Gear...	Zenith.....	Vacuum..	Single..	Bosch.....	Hand.	Own.....	24	.....	.....
Packard.....3-25 & 3-35	128 136	12	3 x5	424	Own.....	L..	Chain...	Cent..	Pressure.....	Gear...	Owa.....	Pressure..	Single..	Delco.....	H&A..	Bijur.....	6	Own.....	Plate...
Paige.....6-39	117	6	3½x5	230	Rutenber..	L..	Helical..	Cent..	Splash-Pres..	Piston..	Stromberg..	Gravity..	Single..	Remy.....	Hand.	G&D.....	6	Borg & Beck	Plate...
Paige.....6-55	127	6	3½x5½	303	Continent.	L..	Helical..	Cent..	Splash-Pres..	Piston..	Rayfield....	Vacuum..	Single..	Remy.....	Hand.	Remy.....	6	Borg & Beck	Plate...
Pan American.....G-5	120	6	3½x5	230	Rutenber..	L..	Helical..	Cent..	Splash-Pres..	Piston..	Rayfield....	Vacuum..	Single..	G&D.....	Hand.	G&D.....	6	Borg & Beck	Plate...
Pan American.....J-7	128	6	3½x5½	303	Continent.	L..	Helical..	Cent..	Splash-Pres..	Piston..	Rayfield....	Vacuum..	Single..	Bosch.....	Hand.	G&D.....	6	Borg & Beck	Plate...
Paterson.....6-45	120	6	3½x4½	224	Continent.	L..	Helical..	Cent..	Splash-Pres..	Piston..	Stromberg..	Vacuum..	Dual...	Delco.....	Hand.	Delco.....	6	Detroit.....	Cone...
Peerless.....56	125	8	3½x5	332	Own.....	L..	Helical..	Cent..	Pressure.....	Gear...	Ball.....	Vacuum..	Single..	At Kent.....	H&A..	Auto-Lite....	6	Brown-Lipe.	Disk...
Pennsy.....	115	4	3½x4½	199	G.B.& S...	L..	Chain...	Ther..	Pressure.....	Piston..	Carter.....	Vacuum..	Single..	Connecticut..	Hand.	Dyneto.....	6	G.B. & S...	Disk...
Pennsy.....	120	6	3½x4½	224	Continent.	L..	Helical..	Cent..	Splash-Pres..	Gear...	Rayfield....	Vacuum..	Single..	.....	Hand.	Heinze.....	6	Borg & Beck	Plate...
Phianna.....M	.....	4	3⅜x6	287	Own.....	L..	Chain...	Cent..	Pressure.....	Gear...	H & N.....	Vacuum..	Single..	Bosch.....	Hand.	Ward-L.....	6	.....	Disk...
Pierce-Arrow.....C-4	134	6	4 x5½	415	Own.....	T..	Helical..	Cent..	Pressure.....	Gear...	Own.....	Pressure..	Double.	Bosch, West.	Hand.	Westinghouse	6	Own.....	Cone...
Pierce-Arrow.....B-4	142	6	4½x5½	525	Own.....	T..	Helical..	Cent..	Pressure.....	Gear...	Own.....	Pressure..	Double.	Bosch, West.	Hand.	Westinghouse	6	Own.....	Cone...
Pierce-Arrow.....A-4	147½	6	5 x7	825	Own.....	T..	Helical..	Cent..	Pressure.....	Gear...	Own.....	Pressure..	Double.	Bosch, West.	Hand.	Westinghouse	6	Own.....	Cone...
Pilot.....6-45	119	6	3½x5	230	Teet-Hart..	L..	Helical..	Cent..	Splash-Pres..	Piston..	Tillotson...	Vacuum..	Single..	Delco.....	Hand.	Delco.....	6	Borg & Beck	Plate...
Premier.....6-C	125½	6	3⅜x5½	295	Own.....	I..	Helical..	Cent..	Splash-Pres..	Gear...	Johnson....	Vacuum..	Single..	Delco.....	H&A..	Delco.....	6	Borg & Beck	Plate...
Princess.....36-F	108	4	3½x4½	188	G.B. & S..	L..	Chain...	Ther..	Circ-Spl.....	Piston..	Schebler....	Vacuum..	Single..	Splitdorf....	Hand.	Disco.....	6	.....	Disk...
Regal.....J	108	4	3½x4½	163	Own.....	L..	Helical..	Ther..	Circ-Spl.....	Piston..	Carter.....	Vacuum..	Single..	At Kent.....	Hand.	Auto-Lite....	6	Own.....	Cone...
Reo.....R	115	4	4½x4½	240	Own.....	F..	Helical..	Cent..	Circ-Spl.....	Piston..	Johnson....	Vac.-Gra.	Single..	Remy.....	Hand.	Remy.....	6	Own.....	Disk...
Reo.....M	126	6	3 7/16x5½	307	Own.....	F..	Helical..	Cent..	Circ-Spl.....	Piston..	Rayfield....	Vacuum..	Single..	Remy.....	Hand.	Remy.....	6	Own.....	Disk...
Reamer.....D-4-75	128	4	4 x6	302	Dues'nb'rg	H..	Helical..	Cent..	Splash-Pres..	Gear...	Stromberg..	Vacuum..	Single..	Bosch.....	Hand.	Bijur.....	6	Borg & Beck	Plate...
Reamer.....C-6-54	128	6	3½x5½	303	Continent.	L..	Helical..	Cent..	Splash-Pres..	Piston..	Stromberg..	Vacuum..	Single..	Bosch.....	Hand.	Bijur.....	6	Borg & Beck	Plate...
Reamer.....D-6-90	138	6	3½x5½	381	Dues'nb'rg	H..	Chain...	Cent..	Splash-Pres..	Gear...	Stromberg..	Vacuum..	Single..	Bosch.....	Hand.	Bijur.....	6	Fuller.....	Disk...
Saxon.....B-5	96	4	2½x4	95	Continent.	L..	Helical..	Ther..	Circ-Spl.....	Piston..	Schebler....	Gravity..	Single..	At Kent.....	Atmtc	Wagner.....	6	Own.....	Plate...
Saxon.....S-4	112	6	2½x4½	175	Continent.	L..	Helical..	Ther..	Circ-Spl.....	Piston..	Stromberg..	Gravity..	Single..	Remy.....	Hand.	Wagner.....	6	Own.....	Plate...
Sayers.....	118	6	3½x4½	224	Continent.	L..	Helical..	Cent..	Splash-Pres..	Piston..	Zenith.....	Vacuum..	Single..	Delco.....	Hand.	Delco.....	6	Borg & Beck	Plate...
Scripps-Booth.....G	110	4	3½x4	171	Mason....	I..	Helical..	Cent..	Splash-Pres..	Gear...	Zenith.....	Vacuum..	Single..	Remy.....	Atmtc	Remy.....	6	Mason.....	Cone...

ABBREVIATIONS

2-pt—*Two Point*
¾ Ell—¾ *Elliptic*
¾ Float—¾ *Floating*
¾ Plat—¾ *Platform*
Amid—*Amidships*
Atmtc—*Automatic*
B & P—*Ball and Plain*
B & R—*Ball and Roller*
B R & P—*Ball, Roller and Plain*
C & C—*Cup and Cone*
Cant—*Cantilever*
Cent—*Centrifugal*
Circ-Spl—*Circulating Splash*
Dual-D—*Dual Double*
Ell—*Elliptic*
F—*F-Head*
Float—*Floating*
Fric—*Friction*
Gear—*Gear Pump*
H—*Horisontal*
H & A—*Hand and Automatic*
I—*I-Head*
Imp—*Impeller*
K—*Knight type*
L—*L-Head*
Mag—*Magnetic*
Non-Spl—*Non-Circulating Splash*
Opt—*Optional*
Plan—*Planetary*
Plat—*Platform*
Rad-Rd—*Radius Rods*
Rev-C—*Reversed Cone*
Roll—*Roller*
S-A—*Semi-Automatic*
S-E—*Semi-Elliptic*
Semi-F—*Semi-Floating*
Sp.B—*Spiral Bevel*
Sp.G—*Spiral Gear*

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Their Technical Specifications—Continued

TRANSMISSION							Gear Ratio on Direct	RUNNING GEAR				Make of Steering Gear	Make of Speedometer	Crankshaft Bearings and Number	BEARINGS			MAKE AND MODEL
GEARSET			Final Drive	Torque Taken By	Make of Rear Axle	Rear Axle Type		TIRES		Wheels	Rear Spr'gs				Gearset	Rear Axle	Front Wheel	
Make	Location	Forward Speeds						Front	Rear									
Own	Unit T	3	Sp.B	Tor-T	Own	¾ Float.	4.25–1	32x4	32x4	Wood	Cant.	Own	Stewart	Plain 3	B&R.	B&R.	Roll.	Mitchell D–40
Own	Unit T	3	Sp.B	Tor-T	Own	Float	4.25–1	34x4	34x4	Wood	Cant.	Own	Stewart	Plain 3	B&R.	Roll.	Roll.	Mitchell C–42
Warner	Amid	3	Sp.B	Tor-A	Timken	Semi-F.	4.90–1	34x4	34x4	Wood	Brush.	Jacox	Stewart	Plain 3	Roll.	Roll.	Roll.	Moline-Knight C
Warner	Amid	3	Sp.B	Tor-A	Timken	Semi-F.	4.00–1	35x4½	35x4½	Wood	Brush.	Jacox	Stewart	Plain 3	Roll.	Roll.	Roll.	Moline-Knight G
Grant-Lees	Unit M	3	Bevel	Springs	Adams	Float	4.08–1 4.50–1	33x4	33x4	Wood	¾ Ell.	Foster	Stewart	Plain	Ball.	B&R.		Monitor
Mechanics	Unit M	3	Sp.B	Tor-T	W-Weiss	¾ Float.	4.00–1	30x3 31x3½	30x3 31x3½	Wood	S-E	Jacox	Stewart	Plain 2	Ball.	Ball.	B&R.	Monroe M–3
Mechanics	Unit M	3	Sp.B	Tor-T	Hess	Semi-F.	4.80–1	32x4	32x4	Opt	Brush.	Jacox	Stewart	Plain 2	Ball.	Roll.	Roll.	Monroe M–6
Jacobson	Unit X	3	Sp.B	Tor-T	Jacobson	Semi-F.	4.75–1	32x3½	32x3½	Wood	S-E	Ditwiler	Stewart	Plain 3	R&P.	Roll.	Roll.	Moon 6–36
Grant-Lees	Unit M	3	Sp.B	Springs	Hess	Float	4.75–1	34x4	34x4	Wood	S-E	Gemmer	Van Sicklen	Plain 3	Ball.	B&R.	Ball.	Moon 6–45
Warner	Unit M	3	Sp.B	Springs	Timken	Semi-F.	4.45–1	35x4½	35x4½	Wood	S-E	Gemmer	Van Sicklen	Plain 3	Ball.	Roll.	Roll.	Moon 6–66
Grant-Lees	Unit-M	3	Bevel	Tor-A	Peru	Float	4.25–1	30x3½	30x3½	Wood	Cant.	Ditwiler	Stewart	Plain 3	Ball.	Roll.	Ball.	Moore 30–E
Grant-Lees	Unit-M	3	Bevel	Tor-T	Peru	Float	4.25–1	30x3½	30x3½	Wood	Cant.	Gemmer	Stewart	Plain 3	Ball.	B&R.	Ball.	Moore 30
Covert	Unit M	3	Sp.B	Springs	Timken	Float	4.45–1 4.08–1	34x4½	34x4½	Wood	¾ Ell.	Gemmer	Stewart	Plain 3	Ball.	Roll.	Roll.	Murray
Own	Unit M	3	Sp.B	Springs	Own	Semi-F.	4.50–1	34x4	34x4	Wood	S-E	Gemmer	Stewart	Plain 3	Roll.	Roll.	Roll.	Nash 681–683
Own	Unit M	3	Sp.B	Springs	Own	Semi-F.	4.50–1	34x4	34x4	Wood	¾ Ell.	Gemmer	Van Sicklen	Plain 3	Roll.	Roll.	Roll.	Nash 671
Own	Unit M	3	Sp.B	Springs	Own	Semi-F.	4.50–1	34x4	34x4	Wood	S-E	Gemmer	Stewart	Plain 3	Roll.	Roll.	Roll.	Nash 684
Warner	Unit M	3	Sp.B	Tor-A	Columbia	Float	4.58–1	34x4½	34x4½	Wood†	Cant.	Warner	Warner	Plain 3	Ball.	Roll.	Ball.	National
Warner	Unit M	3	Sp.B	Tor-A	Columbia	Float	4.58–1	34x4½	34x4½	Wood†	Cant.	Warner	Warner	Plain 3	Ball.	Roll.	Roll.	National
Own	Unit X	3	Sp.B	Rad-Rd	Own	Float	4.25–1	32x4	32x4	Wood	Trans.	Own	Stewart	Plain 2	B&R.	B&R.	Ball.	Nelson
T.W.Warner	Unit M	3	Bevel	Springs	West-M	Float	4.50–1	32x4	32x4	Wood	S-E	Jacox	Stewart	Plain 3	B&P.	B&R.	Ball.	Oakland 34B
Northway	Unit M	3	Sp.B	Springs	West-M	Float	4.58–1	32x4	32x4	Wood	S-E	Jacox	Stewart	Plain 3	BR&P	B&R.	Roll.	Oldsmobile 37
Own	Unit M	3	Sp.B	Springs	West-M	Float	4.92–1	34x4	34x4	Wood	¾ Ell.	Jacox	Stewart	Plain 2	BR&P	B&R.	Roll.	Oldsmobile 45A
Own	Unit M	3	Sp.B	Rad-Rd	Own	¾ Float.	4.75–1	32x3½	32x3½	Opt	Trans.	Warner	Stewart	Plain 2	B&P.	B&R.	Ball.	Olympian
Own	Unit X		Bevel	Tor-T	Own	¾ Float.	4.00–1	32x4	32x4	Wood	Cant.	Own	Stewart	Plain 5	B&R.	B&R.	Roll.	Overland 85
Own	Unit X		Bevel	Tor-T	Own	¾ Float.	4.00–1	31x4	31x4	Wood	Cant.	Own	Stewart	Plain 2	BR&P	B&R.	Roll.	Overland 90
Own	Unit X		Sp.B	Tor-T	Own	¾ Float.	4.60–1	32x4	32x4	Wood	Cant.	Own	Stewart	Plain 3	B&R.	B&R.	Roll.	Overland 85
Magnetic	Unit M	6	Sp.B	Springs	American	Float	4.00–1	35x5	35x5	Opt	S-E	Own	Stewart	Plain 3		Roll.	Roll.	Owen Magnetic W–42
Own	Unit M	3	Sp.B	Tor-A	Own	Semi-F.	4.36–1	35x5	35x5	Wood	S-E	Own	Waltham	Plain 3	B&R.	Ball.	Roll.	Packard 3–25 & 3–35
Own	Unit M	3	Sp.B	Tor-T	Salisbury	¾ Float.	4.42–1	32x4	32x4	Wood	Cant.	Jacox	Stewart	Plain 3	BR&P	B&R.	Roll.	Paige 6–39
Own	Unit M	3	Sp.B	Tor-T	Salisbury	¾ Float.	4.36–1	35x4½	35x4½	Wood	Cant.	Jacox	Stewart	Plain 3	BR&P	B&R.	Ball.	Paige 6–55
Warner	Unit M	3	Sp.B	Springs	Timken	Semi-F.	4.45–1	33x4½	33x4½	Wood	S-E	Warner	Stewart	Plain 3	Ball.	Roll.	Roll.	Pan American G–5
Warner	Unit M	3	Sp.B	Springs	Timken	Semi-F.	3.70–1	33x4½	34x5	Wood	S-E	Warner	Stewart	Plain 3	Ball.	Roll.	Roll.	Pan American J–7
Detroit	Unit M	3	Sp.B	Springs	Hess	Float	4.50–1	32x4	32x4	Wood	¾ Ell.	Jacox	Stewart	Plain	Plain.	Roll.	Ball.	Paterson 6–45
Brown-Lipe	Unit M	3	Sp.B	Springs	Timken	Semi-F.	4.90–1	35x4½	35x4½	Wood	Plat	Gemmer	Warner	Plain 3	B&R.	Roll.	Roll.	Peerless 56
Grant-Lees	Unit M	3	Bevel	Springs	W-Weiss	Semi-F.	4.00–1	32x3½	32x3½	Wood	S-E	Gemmer	Van Sicklen	Plain 3	Roll.	Roll.	Ball.	Pennsy
Detroit	Unit M	3	Sp.B	Springs	Columbia	Float	4.58–1	33x4	33x4	Wood	¾ Ell.	Gemmer	Van Sicklen	Plain 3	Ball.	Roll.	Ball.	Pennsy
	Amid	4	Sp.B	Rad-Rd		Float	4.00–1	32x4½	32x4½	Opt	Cant.		Warner	Plain 3	Ball.	Roll.	B&R.	Phianna M
Own	Amid	4	Sp.B	Tor-T	Own	Semi-F.	3.78–1	34x4½	34x4½	Wood	¾ Ell.	Own	Warner	Plain 7	Ball.	B&R.	Roll.	Pierce-Arrow C–4
Own	Amid	4	Sp.B	Tor-T	Own	Semi-F.	3.53–1	35x5	35x5	Wood	¾ Ell.	Own	Warner	Plain 7	Ball.	B&R.	Roll.	Pierce-Arrow B–4
Own	Amid	4	Sp.B	Tor-T	Own	Semi-F.	2.88–1	36x5½	36x5½	Wood	¾ Ell.	Own	Warner	Plain 7	Ball.	B&R.	Roll.	Pierce-Arrow A–4
Muncie	Unit M	3	Sp.B	Tor-T	Hess	¾ Float.	4.25–1	32x4	32x4	Wood	Cant.	C. A. S.	Stewart	Plain 3	B&R.	B&R.	Roll.	Pilot 6–45
Detroit	Unit M	3	Sp.B	Springs	Timken	Semi-F.	4.45–1	32x4½	32x4½	Wood	S-E	Warner	Warner	Plain 3	B&P.	Roll.	Roll.	Premier 6–C
Grant-Lees	Unit M	3	Sp.B	Springs	Own	Float	4.25–1	32x3½	32x3½	Wood	¾ Ell.		Van Sicklen	Plain 3	B&R.	B&R.	Ball.	Princess 36–F
Grant-Lees	Unit M	3	Bevel	Tor-T	Peru	Float	4.25–1	30x3½	30x3½	Wood	Cant.	C. A. S.	Stewart	Plain 3	Ball.	B&R.	Ball.	Regal J
Own	Amid	3	Sp.B	Tor-A	Own	Semi-F.	4.30–1	34x4	34x4	Wood	¾ Ell.	Own	Stewart	Plain 3	Roll.	Roll.	Roll.	Reo R
Own	Amid	3	Sp.B	Tor-A	Own	Float	4.30–1	34x4½	34x4½	Wood	Cant.	Own	Stewart	Plain 3	Roll.	Roll.	Roll.	Reo M
Grant-Lees	Unit M	3	Sp.B	Tor-T	Hess	¾ Float.	3.77–1	32x4½	32x4½	Wire	S-E	Jacox	Stewart	Plain 3	B&R.	Ball.	Ball.	Roamer D–4–75
Grant-Lees	Unit M	3	Sp.B	Tor-T	Hess	¾ Float.	3.77–1	32x4	32x4	Wire	S-E	Jacox	Stewart	Plain 3	B&R.	Ball.	Ball.	Roamer C–6–54
Fuller	Unit M	3	Sp.B	Tor-T	Timken	Float	3.50–1	34x4½	34x4½	Wire	S-E	Jacox	Warner	Plain 3	B&R.	Ball.	Roll.	Roamer D–6–90
Own	Unit X	3	Sp.B	Tor-T	Timken	Semi-F.	5.00–1	30x3	30x3	Wood	¼ Ell.	Own	Standard	Plain 2	BR&P	B&R.	Ball.	Saxon B–5
Own	Unit X	3	Sp.B	Tor-T	Timken	Semi-F.	4.75–1	32x3½	32x3½	Opt	Cant.	Warner	Stewart	Plain 3	BR&P	Roll.	Roll.	Saxon S–4
Mechanics	Unit M	3	Sp.B	Springs	Hess	¾ Float.	4.75–1	32x4	32x4	Wood	S-E	Warner	Stewart	Plain 3	B&P.	B&R.	Ball.	Sayers
T.W.Warner	Unit M	3	Bevel	Rad-Rd	W-Weiss	¾ Float.	3.69–1 4.07–1	30x3½	30x3½	Wire	Cant.	Jacox	Stewart	Plain 3	B&P.		Ball.	Scripps-Booth G

Splash-Pres—*Splash Pressure*
Spur—*Spur Gears*
T—*T-Head*
Ther—*Thermo-Syphon*
Tor-A—*Torsion Arm*
Tor-R—*Torsion Rod*
Tor-T—*Torsion Tube*
Tr S-E—*Tranverse Semi-Elliptic*
Unit-M—*Unit with Motor*
Unit-T—*Unit with Torque Tube*
Unit-X—*Unit with Axle*
Vib-Dup—*Vibrating Duplex*
†—*Wire Extra*

EQUIPMENT

Allis-Ch—*Allis-Chalmers*
At Kent—*Atwater Kent*
A. W. T.—*American Watch Tool Co.*
Continent—*Continental*
Cut-Hammer—*Cutler-Hammer*
G.B.&S.—*Golden, Belknap & Swartz*
G. & D.—*Gray & Davis*
Gen. Elec.—*General Electric*
Hersh-Sp—*Herschell-Spillman*
Johns-Man—*Johns-Manville*
Leece-N—*Leece-Neville*
Longmare—*Longuemare*
Mass-Ph—*Massnich-Phipps*
Mer & Evans—*Merchant & Evans*
Reichbch—*Reichenbach*
Rob-Myers—*Robbins & Myers*
Shkspere—*Shakespeare*
Teet-Hart—*Teetor-Hartley*
U-S-L—*U. S. Light & Heating Corp.*
W-Weiss—*Walker-Weiss*
Ward-L—*Ward Leonard*
West-M—*Weston-Mott*

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1918 Passenger Automobiles Listed with

MAKE AND MODEL	Wheel-base	No. of Cylinders	Bore and Stroke, Inches	Piston Displacement, Cubic Inches	Make of Engine	Cylinder Shape	Cam-shaft Drive	Water Circulation	LUBRICATION		CARBURETION		IGNITION			ELECTRIC SYS.		CLUTCH	
									System	Type of Pump	Make of Carbureter	Fuel Feed	Sys-tem	Make	Con-trol	Generator Make	Voltage	Make	Type
Scripps-Booth.....H	120	8	2¾x3½	162	Ferro.....	I..	Helical..	Ther..	Pressure.....	Gear...	Zenith.....	Vacuum..	Single..	Remy.....	Atmtc	Wagner.....	6	Goodspeed..	Disk...
Seneca.....O	108	4	3½x4½	138	LeRoi.....	F..	Helical..	Ther..	Circ-Spl.....	.....	Schebler....	Vacuum..	Single..	.....	Hand.	Allis-Ch.....	6	Borg & Beck	Plate...
Shad-Wyck.....A&B	128	6	3½x5½	303	Continent.	L..	Helical..	Cent..	Splash-Pres..	Piston..	Rayf.-Miller	Vacuum..	Single..	Eisemann....	Hand.	Westinghouse	6	Warner....	Disk...
Simplex.....V	143½	6	4¾x6½	564	Own.....	L..	Chain...	Cent..	Splash-Pres..	Gear...	Newcomb..	Pressure..	Dual..	Eisemann....	Hand.	Bosch.....	12	Own.....	Disk...
Singer.....	139	6	4 x5½	414	Hersh-Sp..	T..	Helical..	Cent..	Pressure.....	Gear...	Rayfield....	Vacuum..	Single..	Bosch.....	Hand.	Westinghouse	6	Muncie.....	Disk...
Standard.....G	127	8	3½x5	332	Hersh-Sp..	L..	Helical..	Cent..	Pressure.....	Gear...	Zenith.....	Vacuum..	Single..	Splitdorf....	Hand.	Westinghouse	6	Borg & Beck	Plate...
States.....C	110	6	3 x4½	191	Own.....	L..	Helical..	Ther..	Splash-Pres..	Piston..	Shkspere...	Vacuum..	VibDup	Connecticut..	Hand.	Dyneto.....	6	Borg & Beck	Plate...
Stearns.....SKL	119	4	3½x5½	248	Own.....	K..	Chain...	Cent..	Splash-Pres..	Gear...	Schebler....	Vacuum..	Single..	Remy.....	Hand.	Westinghouse	12	Own.....	Disk...
Stearns.....SK	125	8	3½x5	332	Own.....	K..	Chain...	Ther..	Splash-Pres..	Gear...	Rayfield....	Vacuum..	Single..	Remy.....	Hand.	Westinghouse	12	Own.....	Disk...
Stephens.....	118	6	3½x4½	224	Own.....	I..	Helical..	Ther..	Pressure.....	Gear...	Stromberg..	Vacuum..	Single..	Delco.....	Hand.	Delco.....	6	Borg & Beck	Plate...
Studebaker.....SH	112	4	3½x5	192	Own.....	L..	Helical..	Cent..	Circ-Spl.....	Gear...	.....	Vacuum..	Single..	Remy.....	Hand.	Wagner.....	6	Own.....	Cone...
Studebaker.....EH	119	6	3½x5	289	Own.....	L..	Helical..	Cent..	Circ-Spl.....	Gear...	.....	Vacuum..	Single..	Remy.....	Hand.	Wagner.....	6	Own.....	Cone...
Studebaker.....EG	126	6	3½x5	354	Own.....	L..	Helical..	Cent..	Circ-Spl.....	Gear...	.....	Vacuum..	Single..	Remy.....	Hand.	Wagner.....	6	Own.....	Cone...
Stutz.....S	120	4	4¾x6	361	Own.....	T..	Helical..	Cent..	Pressure.....	Gear...	Stromberg..	Pressure..	Double.	Remy.....	Hand.	Remy.....	6	Own.....	Cone...
Templar.....445	118	4	3⅞x5½	197	Own.....	I..	Chain...	Cent..	Pressure.....	Gear...	Zenith.....	Vacuum..	Single..	Remy.....	S-A...	Remy.....	6	Borg & Beck	Plate...
Tulsa.....D	117½	4	3½x5	192	Lycoming..	L..	Helical..	Ther..	Circ-Spl.....	Piston..	Rayfield....	Vacuum..	Single..	Delco.....	Hand.	Dyneto.....	6	Borg & Beck	Plate...
Velie.....38	115	6	3½x4½	224	Continent.	L..	Helical..	Cent..	Splash-Pres..	Piston..	Rayfield....	Vacuum..	Single..	Remy.....	S-A...	Remy.....	6	Borg & Beck	Plate...
Velie.....39	124	6	3½x5½	303	Continent.	L..	Helical..	Cent..	Splash-Pres..	Piston..	Rayfield....	Vacuum..	Single..	Remy.....	S-A...	Remy.....	6	Borg & Beck	Plate...
Westcott.....	125	6	3½x5½	303	Continent.	L..	Helical..	Cent..	Splash-Pres..	Piston..	Rayfield....	Vacuum..	Single..	Delco.....	S-A...	Delco.....	6	Brown-Lipe.	Disk...
White.....	{124½ {137½	4	4½x5½	326	Own.....	T..	Helical..	Cent..	Pressure.....	Gear...	Own.....	Vacuum..	Single..	.....	Hand.	Leece-N.....	12	Own.....	Disk...
Willys.....89	120	6	3½x5½	303	Continent.	L..	Helical..	Cent..	Splash-Pres..	Piston..	Tillotson...	Vacuum..	Single..	Connecticut..	Hand.	Auto-Lite....	6	Own.....	Cone...
Willys-Knight.....88	121	4	4½x4½	240	Own.....	K	Chain...	Ther..	Splash-Pres..	Piston..	Tillotson...	Vacuum..	Single..	.....	Hand.	Auto-Lite....	6	Auto-Lite...	Cone...
Willys-Knight.....88	125	8	3½x4	286	Own.....	K	Chain...	Ther..	Splash-Pres..	Piston..	Zenith.....	Vacuum..	Single..	Remy.....	H&A..	Auto-Lite....	6	Auto-Lite...	Cone...
Winton.....33	128	6	3½x5½	348	Own.....	L..	Chain...	Cent..	Pressure.....	Piston..	Rayfield...	Vacuum..	Single..	Bosch.....	Hand.	Bijur.....	6	.....	Disk...
Winton.....48	138	6	4½x5½	525	Own.....	L..	Chain...	Cent..	Pressure.....	Piston..	Rayfield....	Vacuum..	Single..	Bosch.....	Hand.	Bijur.....	6	.....	Disk...
Wolverine.....	115	4	3⅝x6	298	Dues'nb'rg	H..	Helical..	Cent..	Circ-Spl.....	Piston..	Miller.....	Vacuum..	Single..	Bosch.....	Hand.	Bijur.....	6	Warner....	Disk...
Wolverine.....	125	4	4⅛x6	361	Dues'nb'rg	H..	Helical..	Cent..	Circ-Spl.....	Piston..	Miller.....	Vacuum..	Single..	Bosch.....	Hand.	Bijur.....	6	Warner....	Disk...
Woods Gas-Electric.....	124	4	2¾x4	95	Continent.	L..	Helical..	Ther..	Splash-Pres..	Piston..	Stromberg..	Gravity..	Single..	At Kent.....	Atmtc	Own.....	60	.....	.....
Yale.....M	126	8	3 x5	283	Colonial...	T..	Chain...	Ther..	Circ-Spl.....	Piston..	Zenith.....	Vacuum..	Single..	Remy.....	Hand.	Bijur.....	6	Detroit.....	Disk...

ABBREVIATIONS

2-pt—*Two Point*
¾ Ell—¾ *Elliptic*
¾ Float—¾ *Floating*
¾ Plat—¾ *Platform*
Amid—*Amidships*
Atmtc—*Automatic*
B & P—*Ball and Plain*
B & R—*Ball and Roller*
B R & P—*Ball, Roller and Plain*
C & C—*Cup and Cone*
Cant—*Cantilever*
Cent—*Centrifugal*
Circ-Spl—*Circulating Splash*
Dual-D—*Dual Double*
Ell—*Elliptic*
F—*F-Head*
Float—*Floating*
Fric—*Friction*
Gear—*Gear Pump*
H—*Horisontal*
H & A—*Hand and Automatic*
I—*I-Head*
Imp—*Impeller*
K—*Knight type*
L—*L-Head*
Mag—*Magnetic*
Non-Spl—*Non-Circulating Splash*
Opt—*Optional*
Plan—*Planetary*
Plat—*Platform*
Rad-Rd—*Radius Rods*
Rev-C—*Reversed Cone*
Roll—*Roller*
S-A—*Semi-Automatic*
S-E—*Semi-Elliptic*
Semi-F—*Semi-Floating*
Sp.B—*Spiral Bevel*
Sp.G—*Spiral Gear*

1918 Steam-Driven

Name and Model	Wheel-base	Type of Boiler	Boiler Location	Type of Engine	Type of Valve Gear	Type of Valves	No. of Cylinders	Bore and Stroke	LUBRICATION		Engine Location	Final Drive	Fuel
									Cylinders	Engine			
Deble.....D	135	Water Tube...	Under Hood...	Dbl. Acting....	Own.....	.....	2	5x4	.....	.....	Rear Axle...	Spur Gear...	Kerosene....
Stanley.....	130	Fire Tube.....	Under Hood...	Dbl. Acting....	Stephenson....	Slide.....	2	4x5	Plunger Pump	Splash.....	Rear Axle...	Spur Gear...	Kerosene....

These Tables are for reference and

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Their Technical Specifications—Continued

TRANSMISSION							Gear Ratio on Direct	RUNNING GEAR				Make of Steering Gear	Make of Speedometer	Crankshaft Bearings and Number	BEARINGS			MAKE AND MODEL
GEARSET			Final Drive	Torque Taken By	Make of Rear Axle	Rear Axle Type		TIRES		Wheels	Rear Spr'gs				Gearset	Rear Axle	Front Wheel	
Make	Location	Forward Speeds						Front	Rear									
T.W.Warner	Unit M...	3	Sp.B...	Rad-Rd..	Russel....	¾ Float..	{4.80-1 5.33-1	32x4	32x4	Wire....	Cant..	Own.....	Stewart.....	Plain 2...	B&P..	.....	Ball...	Scripps-Booth.....H
Detroit.....	Unit M...	3	.....	Tor-T....	Adams....	Float...	4.50-1	30x3½	30x3½	Wood†..	Cant..	Ditwiler.....	Stewart.....	Plain....	Ball...	Ball..	Ball...	Seneca.....O
Warner.....	Unit M...	3	Sp.B...	Springs...	Timken...	Semi-F..	4.45-1	33x4½	33x4½	Wire....	S-E...	Gemmer....	Van Sicklen..	Plain 3...	Ball...	Roll...	Roll...	Shad-Wyck.....A&B
Own.....	Unit M...	4	Sp.B...	Springs...	Own.....	Float...	3.00-1	Opt....	Opt....	Opt.....	S-E...	Own.....	Stewart.....	Plain 3...	Roll...	B&R..	Roll...	Simplex.....V
Muncie.....	Unit M...	4	Sp.B...	Tor-T....	Timken...	Float...	3.70-1	35x5	35x5	Wire....	Cant..	Gemmer....	Stewart.....	Plain 3...	Ball...	Roll...	Roll...	Singer.....
Grant-Lees...	Unit M...	3	Sp.B...	Springs...	Timken...	Semi-F..	4.45-1	34x4½	34x4½	Wood...	S-E...	Gemmer....	Stewart.....	Plain 3...	B&R..	Roll...	Roll...	Standard.....G
Detroit.....	Unit M...	3	Sp.B...	Tor-T....	Own.....	Float ..	4.00-1	30x3½	31x4	Wire....	Cant..	Own.....	Van Sicklen..	Plain 3...	Ball...	B&R..	Ball...	States.....C
Own.....	Unit M...	3	Sp.B...	Tor-A....	Own.....	Semi-F..	4.50-1	34x4	34x4	Wood...	Cant..	Own.....	Stewart.....	Plain 3...	B&R..	B&R..	Roll...	Stearns.....SKL
Own.....	Unit M...	3	Sp.B...	Tor-A....	Own.....	Semi-F..	4.75-1	35x4½	35x4½	Wood...	Cant..	Own.....	Stewart.....	Plain 3...	.....	.....	Roll...	Stearns.....SK
Mechanics....	Unit M...	3	Sp.B...	Springs...	Hess.....	Float...	4.75-1	32x4	32x4	Wood...	S-E...	Gemmer....	Van Sicklen..	Plain 3...	Ball...	Roll...	Roll...	Stephens.....
Own.....	Amid....	3	Sp.B...	Springs...	Own.....	Semi-F..	4.08-1	32x3½	32x3½	Wood...	S-E...	Own.....	Warner.....	Plain 3...	R&P..	Roll...	Roll...	Studebaker.....SH
Own.....	Amid....	3	Sp.B...	Springs...	Own.....	Semi-F..	4.00-1	32x4	32x4	Wood...	S-E...	Own.....	Warner.....	Plain 4...	R&P..	Roll...	Roll...	Studebaker.....EH
Own.....	Amid....	3	Sp.B...	Springs...	Own.....	Semi-F..	3.71-1	33x4½	33x4½	Wood...	S-E...	Own.....	Warner.....	Plain 4...	R&P..	Roll...	Roll...	Studebaker.....EG
Own.....	Unit X...	3	Bevel..	Tor-T....	Own.....	¾ Float..	3.50-1	32x4½	32x4½	Wire....	S-E...	Gemmer....	Stewart	Plain 3...	Ball...	B&R..	Roll...	Stutz.....S
Detroit.....	Unit M...	3	Sp.B...	Springs...	American..	Semi-F..	4.81-1	32x4	32x4	Wood...	S-E...	Jacox.....	Stewart.....	Plain 3...	B&P..	B&R..	Roll...	Templar.....445
Grant-Lees...	Unit M..	3	Sp.B...	Springs...	Salisbury..	.....	4.50-1	32x	35x	Opt.....	S-E...	C. A. S.....	Stewart.....	Plain 2...	Ball...	B&R..	Ball..	Tulsa.....D
Durston.....	Unit M...	3	Sp.B...	Springs...	Timken...	Semi-F..	4.75-1	32x4	32x4	Wood...	¾ Ell..	Gemmer....	Stewart.....	Plain 3...	Ball...	Roll...	Roll...	Velie.....38
Warner.....	Unit M...	4	Sp.B...	Springs...	Timken...	Semi-F..	4.45-1	33x4½	33x4½	Wood...	¾ Ell..	Gemmer....	Van Sicklen..	Plain 3...	Ball...	Roll...	Roll...	Velie.....39
Brown-Lipe...	Unit M...	3	Sp.B...	Tor-T....	Timken...	¾ Float..	4.45-1	35x4½	35x4½	Wood...	Cant..	Gemmer....	Warner.....	Plain 3...	B&R..	Roll...	Roll...	Westcott.....
Own.....	Unit M...	4	Sp.B...	Springs...	Own.....	Semi-F..	.....	35x5	35x5	Wood...	S-E...	Own.....	Stewart.....	Plain 3...	Ball...	Ball...	Ball...	White.....
Own.....	Unit X...	3	Sp.B...	Tor-T....	Own.....	¾ Float..	4.00-1	33x4½	33x4½	Opt.....	Cant..	Own.....	Stewart.....	Plain 3...	B&R..	B&R..	Roll...	Willys.....89
Own.....	Unit X...	3	Sp.B...	Tor-T....	Own.....	Float...	4.30-1	34x4½	34x4½	Wood...	Cant..	Own.....	Warner.....	Plain 3...	BR&P	Roll...	Roll...	Willys-Knight.....88
Own.....	Unit X...	3	Sp.B...	Tor-T....	Own.....	Float...	4.60-1	34x4½	34x4½	Wood...	Cant..	Own.....	Warner.....	Plain 2...	BR&P	Roll...	Roll...	Willys-Knight.....88
Own.....	Unit M...	4	Sp.B...	Tor-R....	Own.....	Float...	4.45-1	36x4½	36x4½	Wood...	¾ Ell..	.....	Warner.....	Plain 4...	B&R..	Roll...	Roll ..	Winton.....33
Own.....	Unit M...	4	Sp.B...	Tor-R....	Own.....	Float...	4.08-1	37x5	37x5	Wood...	¾ Ell..	.....	Warner.....	Plain 4...	B&R..	Roll...	Roll.	Winton.....48
Warner.....	Unit M...	3	Sp.B...	Springs...	American..	Float...	2.94-1	32x4½	32x4½	Wire....	S-E...	Warner.....	Warner.....	Plain 3...	Ball...	Roll...	Roll...	Wolverine.....
Warner.....	Unit M...	3	Sp.B...	Springs...	American..	Float...	4.00-1	32x4½	32x4½	Wire....	S-E...	Warner.....	Warner.....	Plain 3...	Ball...	Roll...	Roll...	Wolverine.....
Electric.....	Unit M...	....	Worm..	Tor-A....	Own.....	Semi-F..	8.25-1	35x4½	35x4½	Wood...	Cant.	Gemmer....	Stewart.....	Plain 3...	None.	B&R..	Roll...	Woods.....
Detroit.....	Unit M...	3	Sp.B...	Springs...	Timken...	Semi-F..	4.50-1	34x4	34x4	Opt.....	S-E...	Jacox.....	Stewart.....	Plain 3...	Ball...	Roll...	Roll...	Yale.....M

Splash-Pres—*Splash Pressure*
Spur—*Spur Gears*
T—*T-Head*
Ther—*Thermo-Syphon*
Tor-A—*Torsion Arm*
Tor-R—*Torsion Rod*
Tor-T—*Torsion Tube*
Tr S-E—*Tranverse Semi-Elliptic*
Unit-M—*Unit with Motor*
Unit-T—*Unit with Torque Tube*
Unit-X—*Unit with Axle*
Vib-Dup—*Vibrating Duplex*
†—*Wire Extra*

EQUIPMENT

Allis-Ch—*Allis-Chalmers*
At Kent—*Atwater Kent*
A. W. T.—*American Watch Tool Co.*
Continent—*Continental*
Cut-Hammer—*Cutler-Hammer*
G.B.&S.—*Golden, Belknap & Swarts*
G. & D.—*Gray & Davis*
Gen. Elec.—*General Electric*
Hersh-Sp—*Herschell-Spillman*
Johns-Man—*Johns-Manville*
Leece-N—*Leece-Neville*
Longmare—*Longuemare*
Mass-Ph—*Massnick-Phipps*
Mer & Evans—*Merchant & Evens*
Reichbch—*Reichenbach*
Rob-Myers—*Robbins & Myers*
Shkspere—*Shakespeare*
Teet-Hart—*Teetor-Hartley*
U-S-L—*U. S. Light & Heating Corp.*
W-Weiss—*Walker-Weiss*
Ward-L—*Ward Leonard*
West-M—*Weston-Mott*

Passenger Automobiles

Control	Fuel Feed	Type of Burner	Feed Water Control	Rear Axle Ratio	Car Drives Through	Torque Taken By	BEARINGS		Wheels		Speedometer	Rear Springs	Name and Model
							Rear Axle	Front Wheel					
Automatic...	Pressure.....	.....	.....	.....	Radius Rods...	.....	American.....	.....	35x5	35x5	.....	Semi-Elliptic...	Deble.....D
Automatic...	Pressure.....	Vaporising...	Automatic...	1.50-1	Radius Rods...	Engine Frame..	Timken.....	Timken.....	34x4	35x4½	Stewart.....	Elliptic.....	Stanley.....

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More Casting—Less Forging

High Cost of Dies and Materials Having Influence on Relative Standing of Forgings, Malleable Iron and Steel Castings

By J. Edward Schipper

THE marked trend toward the more extended use of forgings for brackets, axle parts, etc., has been somewhat checked by the abnormally high prices asked for forgings at the present time. The result of this condition has been a temporary tendency toward an increased use of malleables. It is not probable, however that this tendency is any indication of a permanent condition. Manufacturers have been forced, in some instances, to change from forgings to malleables and in a few instances from malleable to steel castings, simply because of the difficulty in obtaining delivery of certain parts.

Further than this, in view of the present prices of forgings, malleables are being used for some parts where the size is a matter of convenience rather than of structural strength. In a great many trucks which ordinarily would employ forgings, practically all of the frame brackets, spring hangers, motor brackets, etc., are of malleable iron. All parts which are in tension, and particularly those which are under shock, such as shackle links, are made from forgings if possible, and if not, from steel castings.

Forgings the Natural Choice

For the vital parts of all trucks and passenger cars forgings will continue to be used. This refers particularly to such parts as axle centers, steering connections, propeller shaft parts, etc. It is this condition which has put a check for the time being to the big trend toward forgings and stampings, but as soon as the war is over, and conditions are relieved, it is certain that the forgings and stampings will once again come into their own.

The use of forgings, where commercially possible, is a practice which engineers come to whether they go at the matter scientifically or simply by practical results. In the language of one of the prominent tractor engineers, "We use malleable, cast steel and drop forgings for different parts of trucks and tractors. If malleable castings do not stand up, we use cast steel and when cast steel does not give service, we use forgings." This is a rough and ready way of expressing the thought that forgings are not only arrived at by scientific calculation, but also by the results obtained in every-day practice.

It is not an easy matter to classify parts in such a way that by referring to a tabulation you can tell whether it is best practice to use a forging, a casting or a malleable. The question of machining and the question of strength in relation to size, and in some instances the question of weight, always must be considered. Nevertheless, practical experience affords a rough and ready classification, based on the thought that experience indicates clearly the desirability of avoiding the use of cast steel or malleable iron for any parts where the duty is in any way severe.

Many Fear Castings

There are many engineers who fear castings because they are treacherous. It is almost impossible to tell, unless they are machined all over, whether they are sound or not, and steel castings are often the worst offenders in this respect. For such brackets as the rear spring frame brackets and the front spring front end brackets, cast steel or malleable iron is fairly satisfactory from the standpoint of ability to endure in service, although the production losses, due to defective castings, are higher than they should be.

It is true that steel castings are better than they were three years ago, but there is a serious question as to whether the progress in casting has kept pace with progress in design. In other words, the duties required of the parts which have been made of castings in the past have been so increased by the requirement of lightness and other factors necessitating greater unit strength, that steel castings cannot now be used for many of these parts.

Production Losses High

Many engineers feel that there is a strong tendency to get away, as far as possible, from the use of castings for anything except housings or short, stubby brackets, as, where parts can be made of either forgings or stampings, they are much more certain to stand up in service and to be flawless when first made, thus cutting down the production losses. In fact, in estimating the costs on the comparative basis of making certain small parts from castings or forgings, one of the points which must be considered in order to arrive at a fair conclusion is whether or not the production loss, due to defective castings, will not more than overcome a difference in the first cost of the forging. The regrettable part of the losses in castings is that the flaw may not be discovered until several machine operations have been completed, so that losses include not only the material itself, but also the labor and machinery time costs as well.

Rules for Selection

A very prominent engineer in charge of motor truck construction in this country states that the following rules guide him in selecting cast steel, malleable and drop forgings for small brackets, axle parts, etc.:

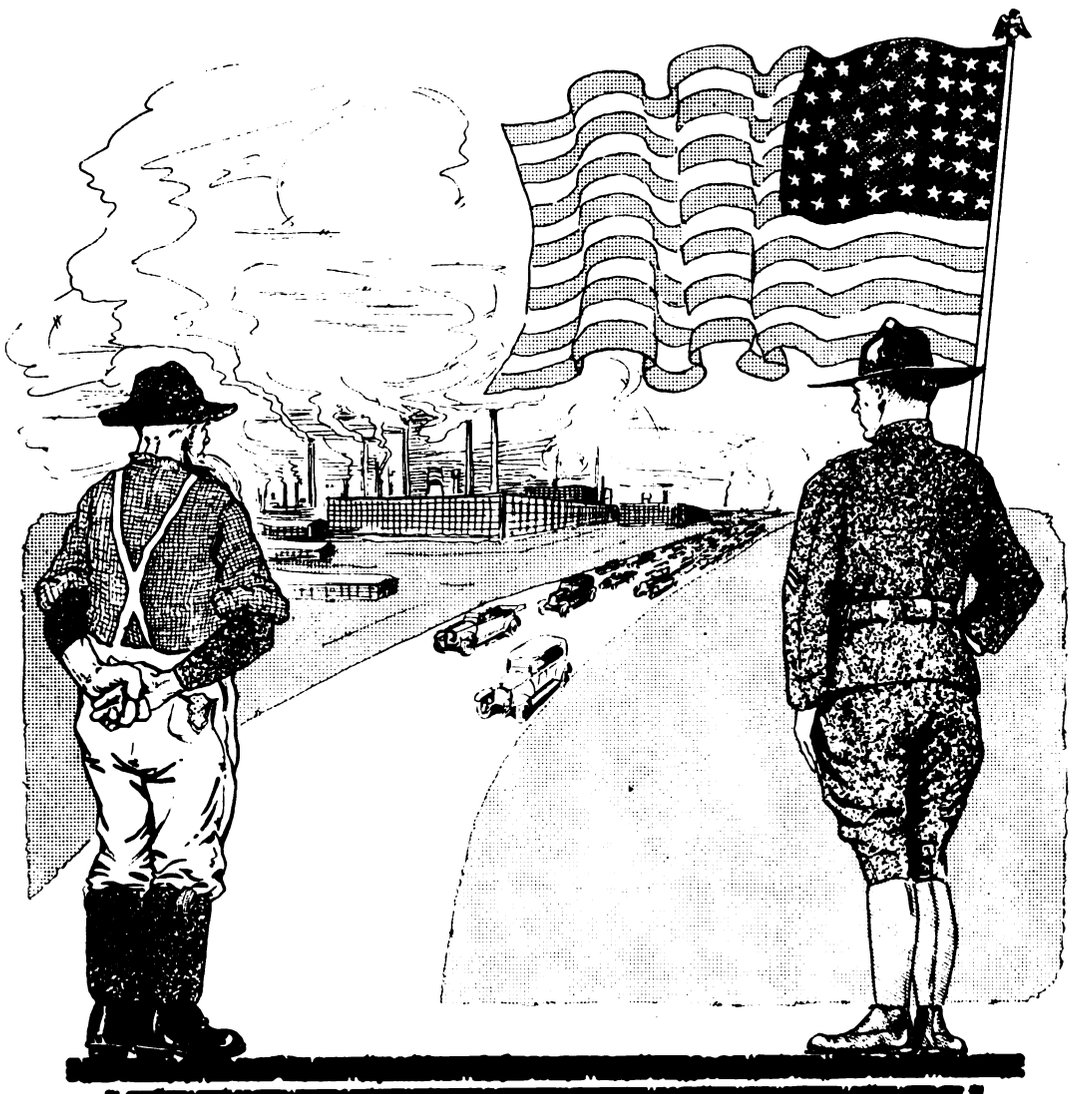
1—Cast steel is used for more important structural parts that cannot be forged. It must be made fairly heavy to allow for segregation in the castings, blow holes, etc. It should really only be used for complicated pieces.

2—Drop forgings should be used where very great strength is required, with lightness.

3—Malleable iron should be used for unimportant structural parts, such as spacers, packing pieces and the like; parts where cast iron itself would probably be strong enough as regards the actual work to be done, but not strong enough to bear transportation and rough handling.

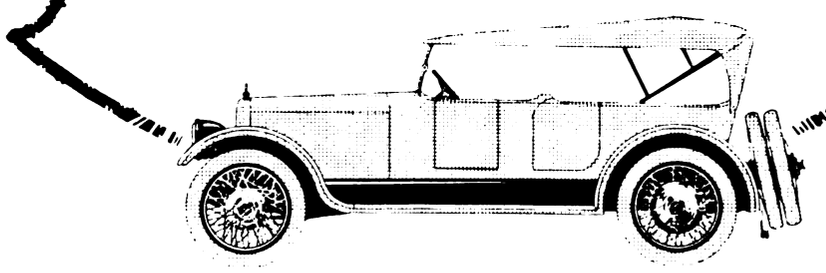
4—In general, it is a very wise rule to use forgings as much as possible, as, after the first cost of dies, they are usually found to be cheaper, much more homogeneous.

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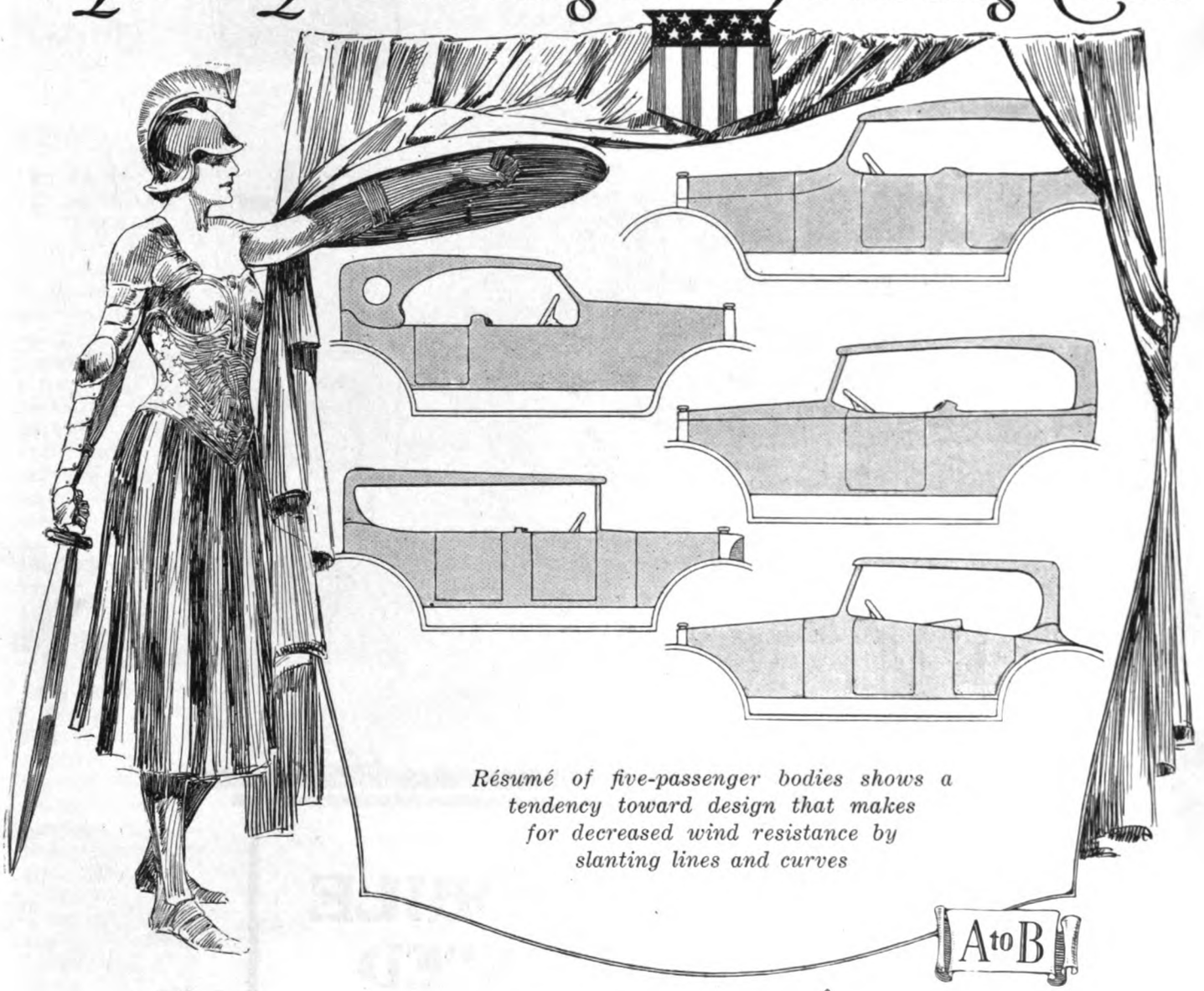
THE AUTOMOBILE ILLUSTRATED

1918 Models



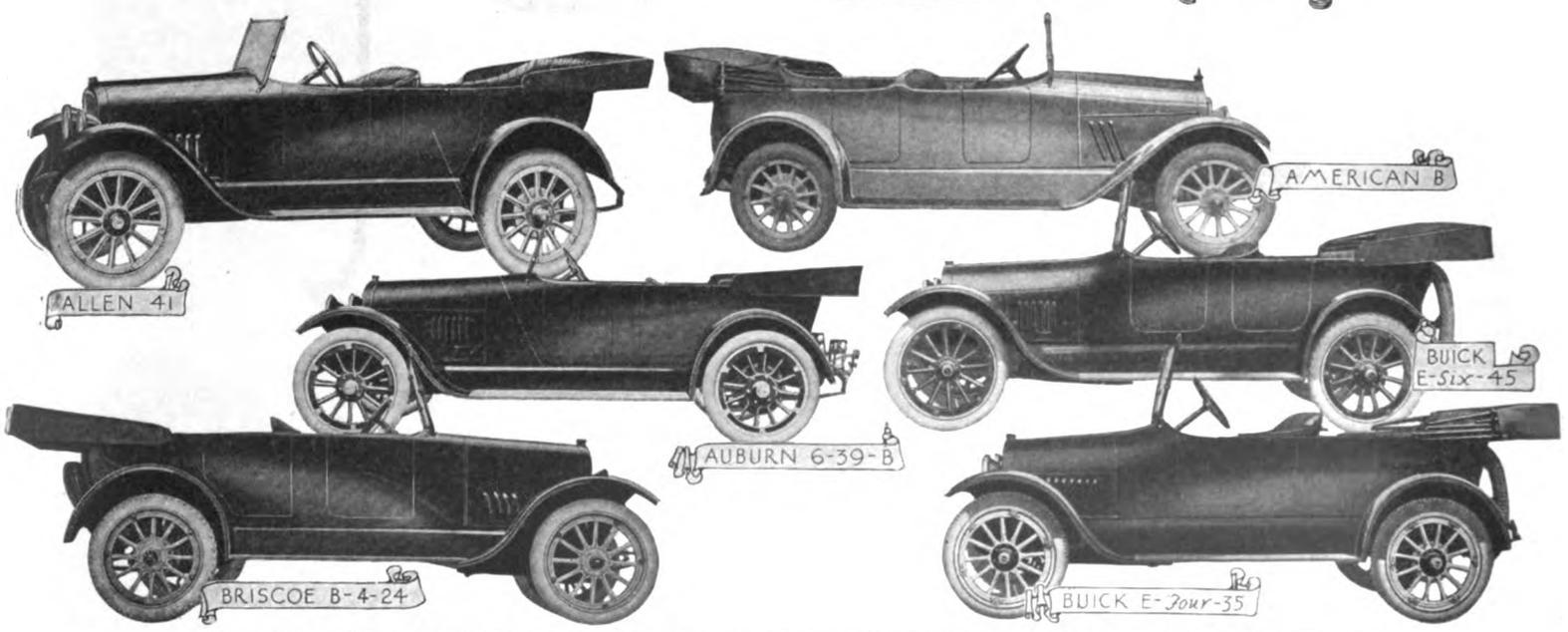
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Five-Passenger Touring Cars



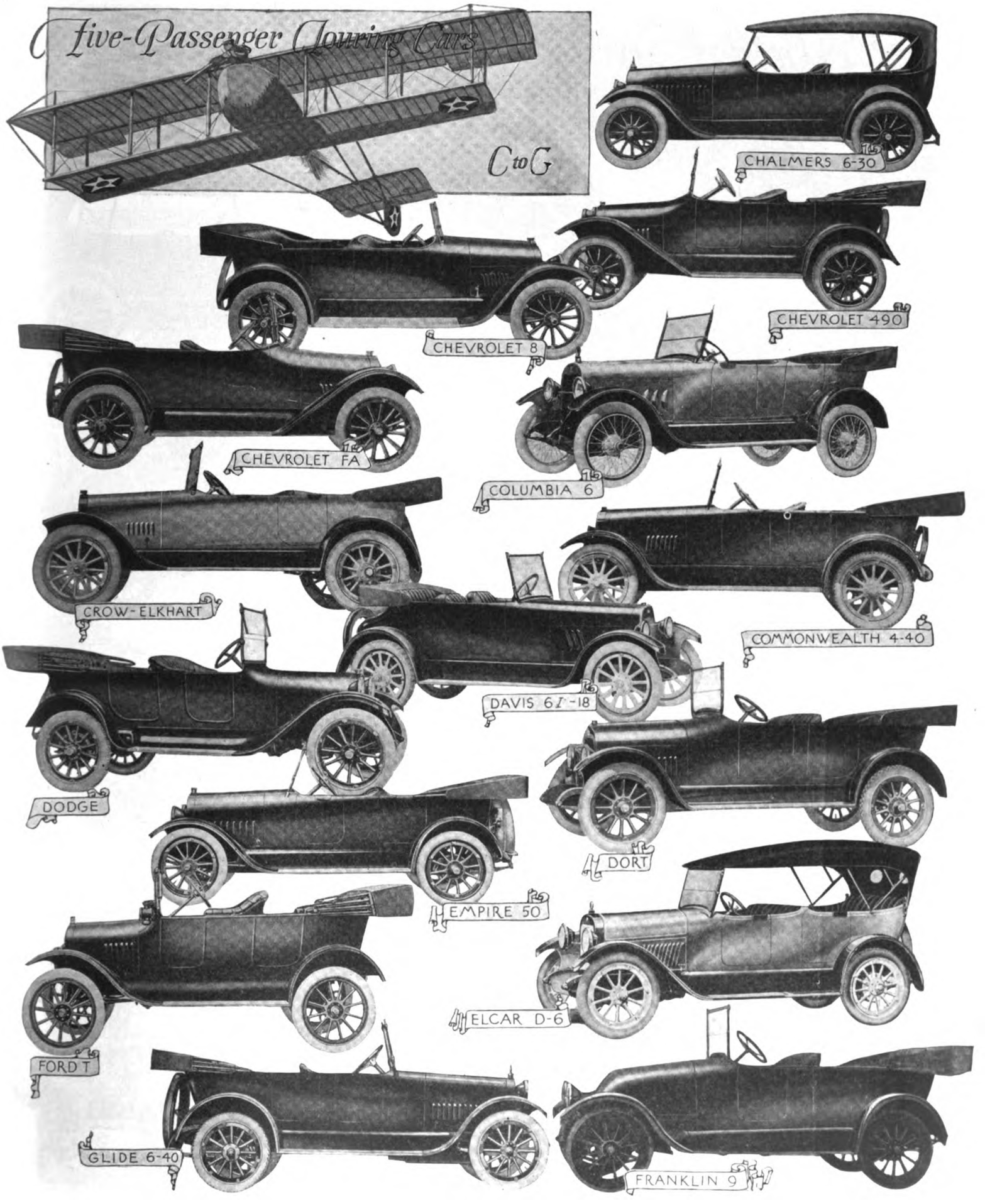
Résumé of five-passenger bodies shows a tendency toward design that makes for decreased wind resistance by slanting lines and curves

A to B



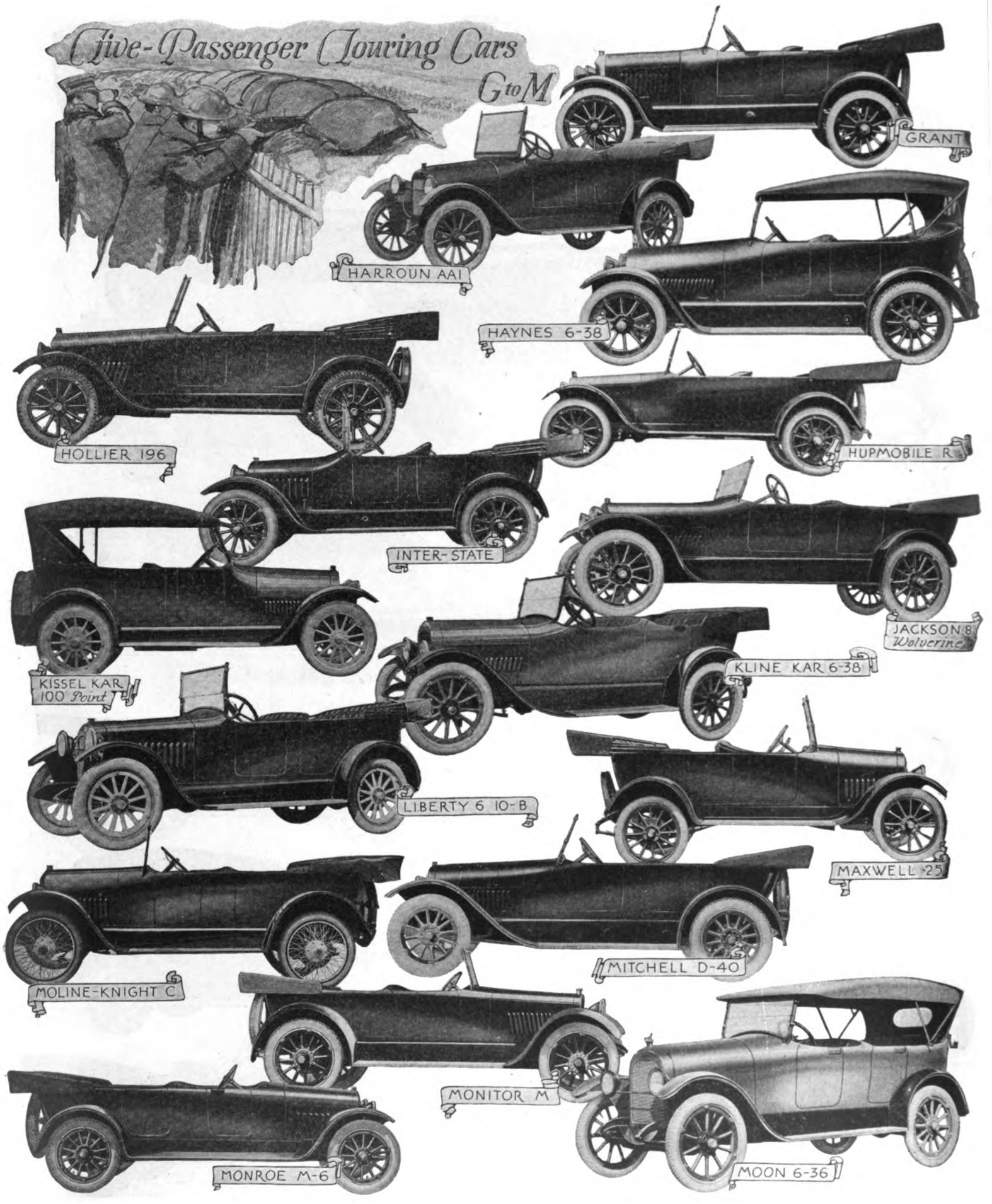
Specifications of these cars appear on pages 60 to 67; prices on pages 98 to 100.

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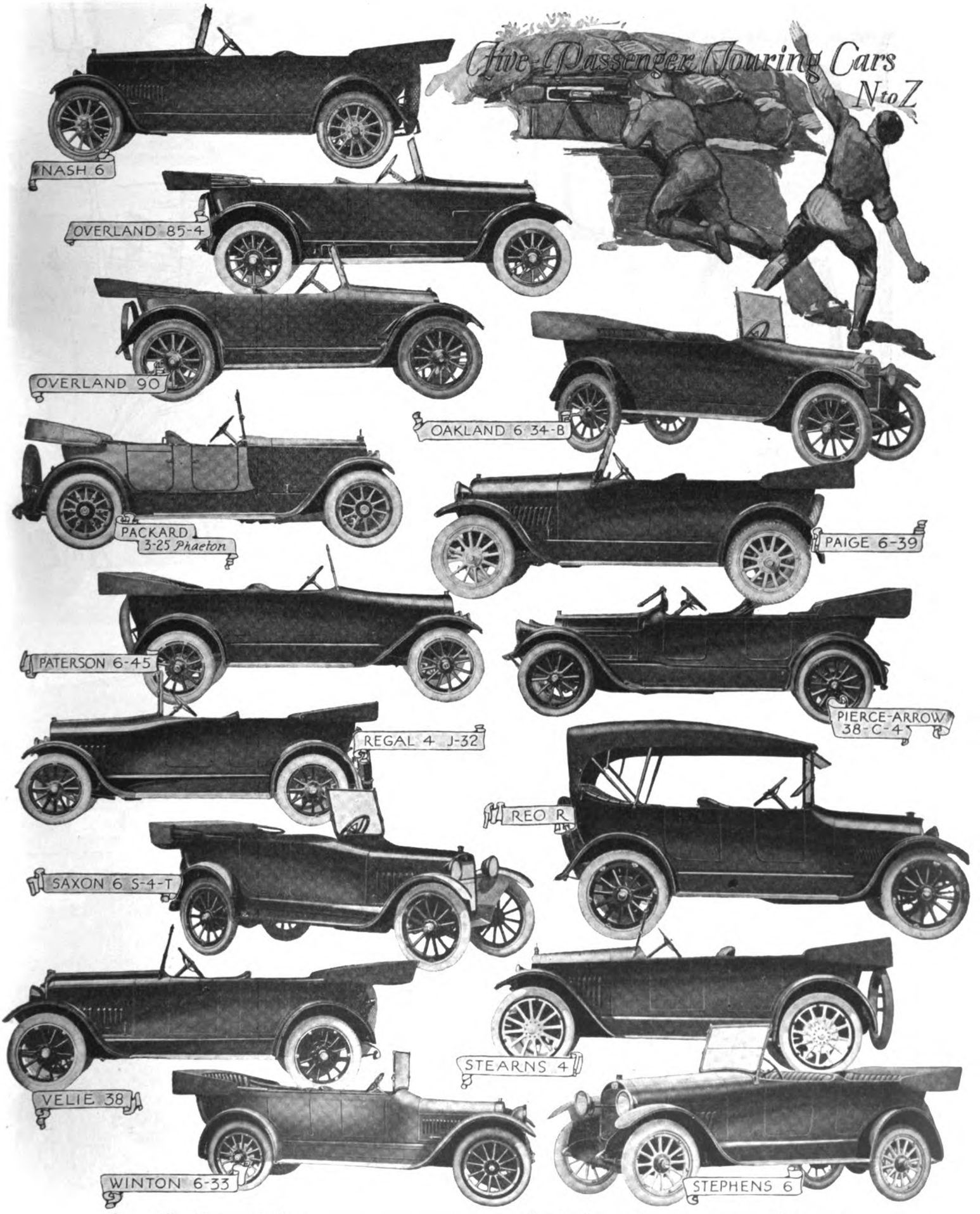
Specifications of these cars appear on pages 60 to 67; prices on pages 98 to 100.

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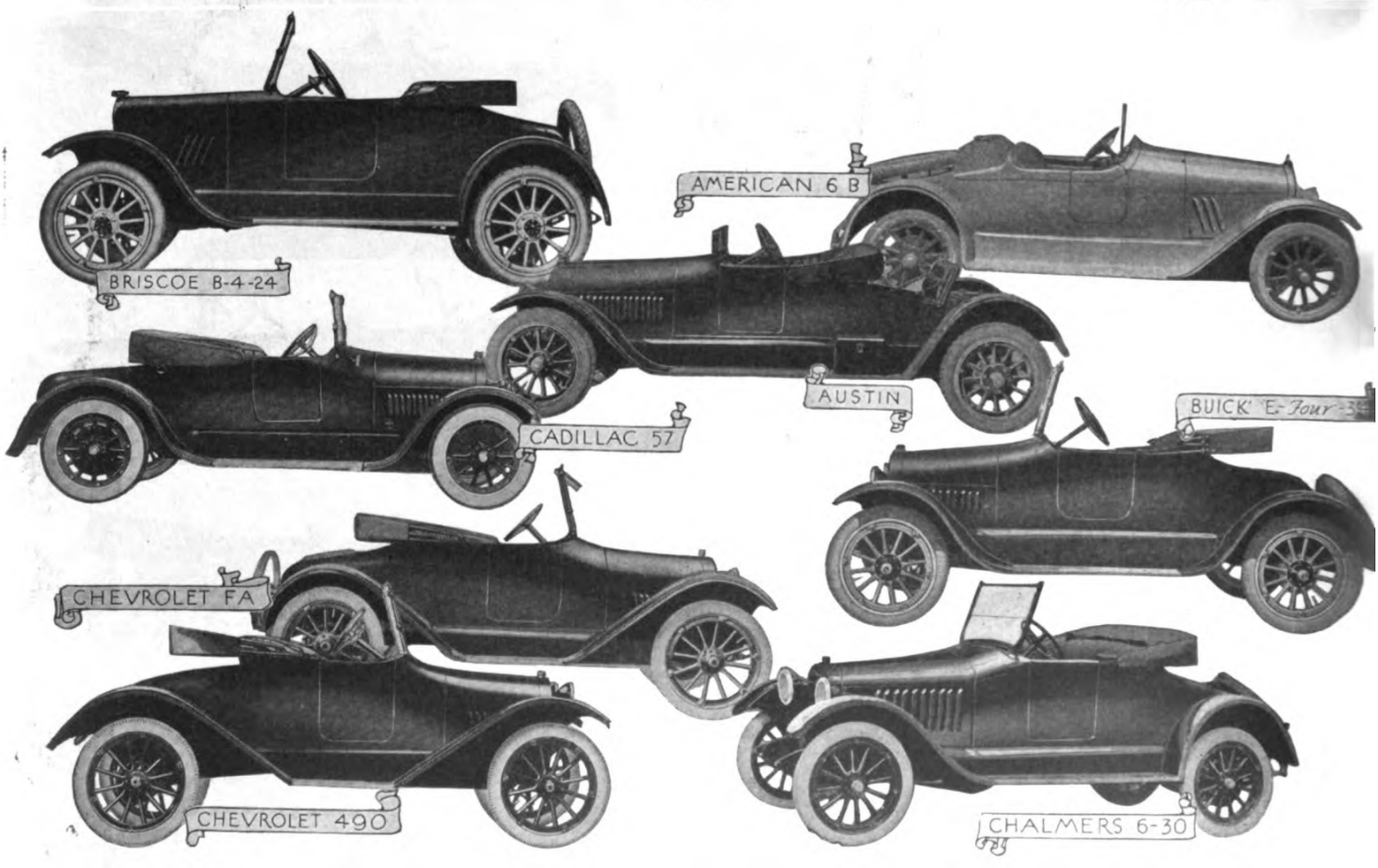
Specifications of these cars appear on pages 60 to 67; prices on pages 98 to 100.

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Modern ingenuity has devised various seating arrangements for roadster and runabout. Among them is the four-passenger, the three-passenger and the one-seat car

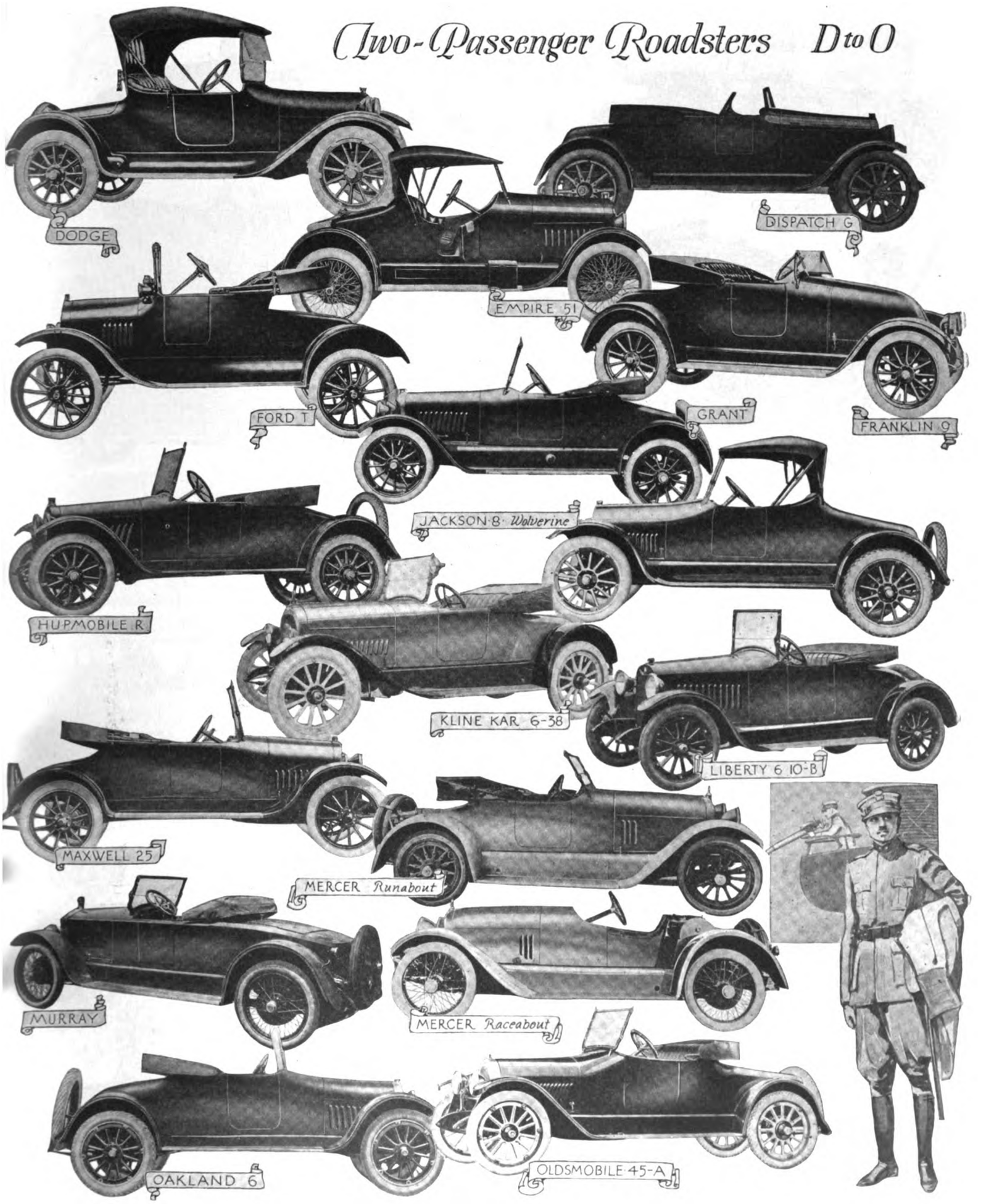
Two-Passenger Roadsters A to C



Specifications of these cars appear on pages 60 to 67; prices on pages 98 to 100.

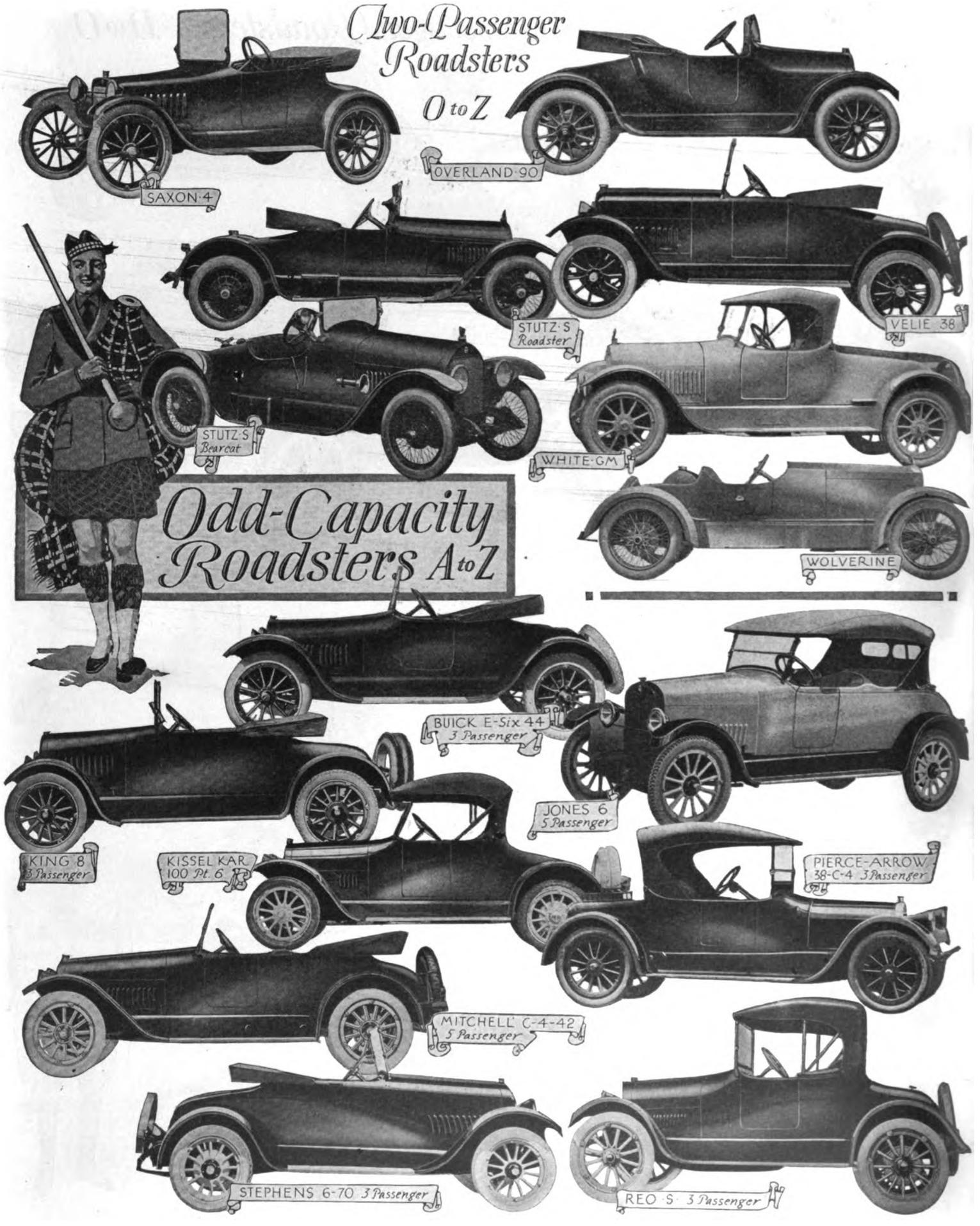
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Two-Passenger Roadsters D to O



Specifications of these cars appear on pages 60 to 67; prices on pages 98 to 100.

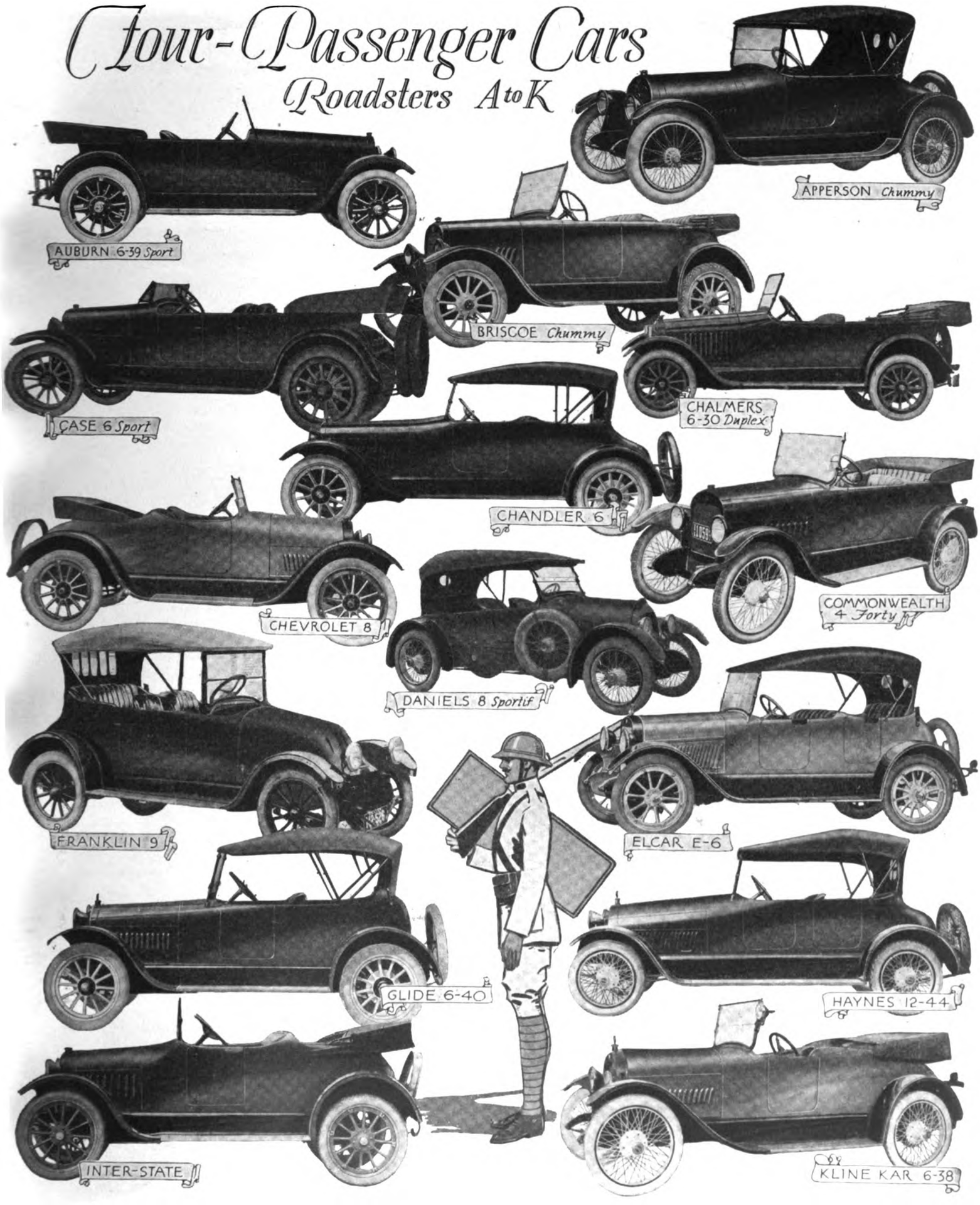
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Specifications of these cars appear on pages 60 to 67; prices on pages 98 to 100.

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Four-Passenger Cars
Roadsters A to K

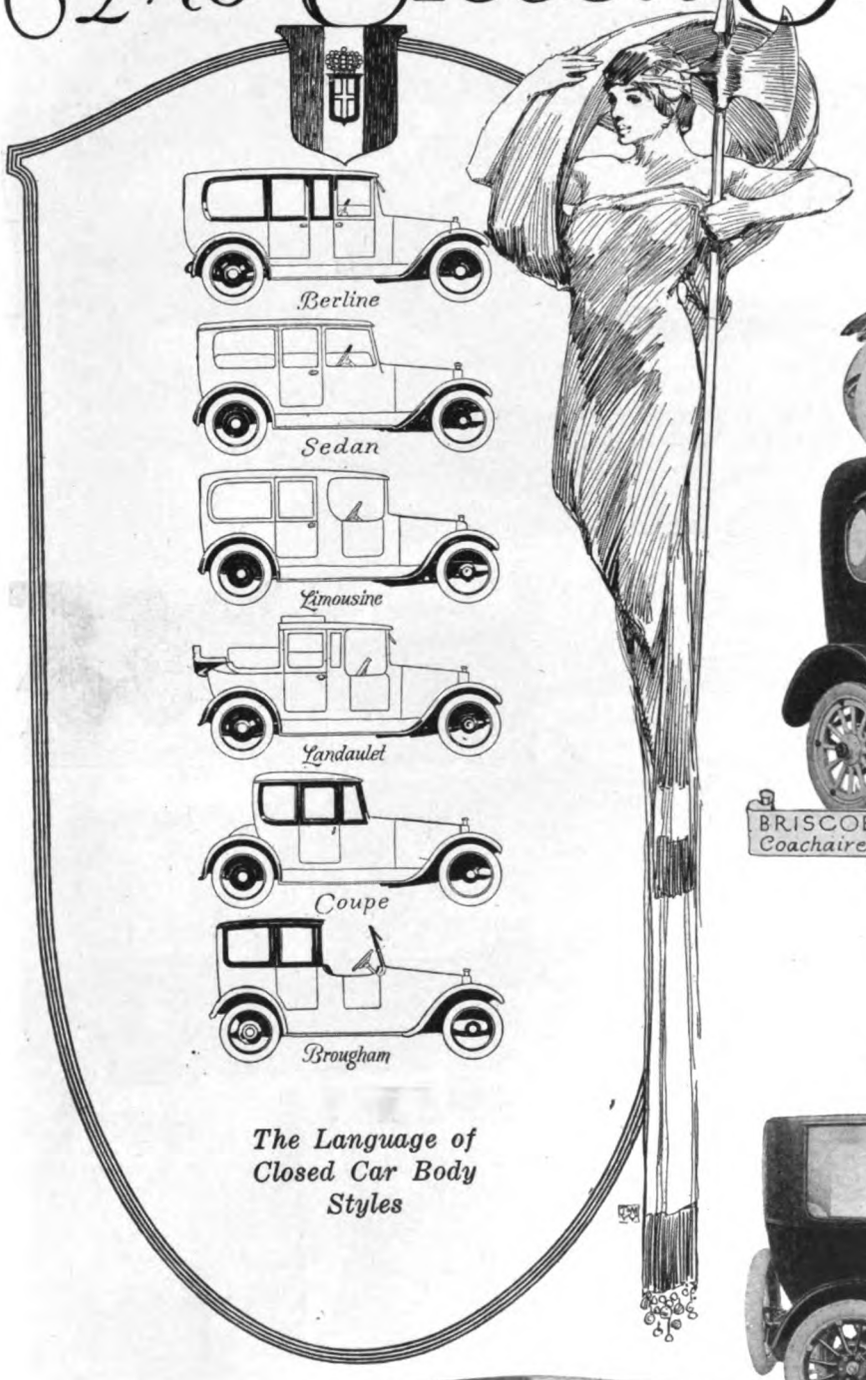


Specifications of these cars appear on pages 60 to 67; prices on pages 98 to 100.

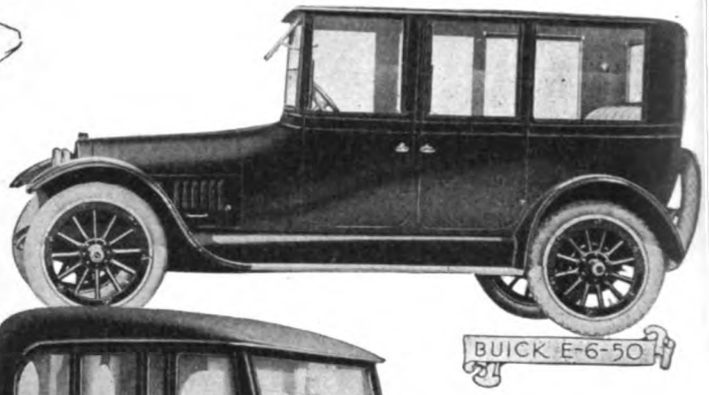
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The Closed Car Group

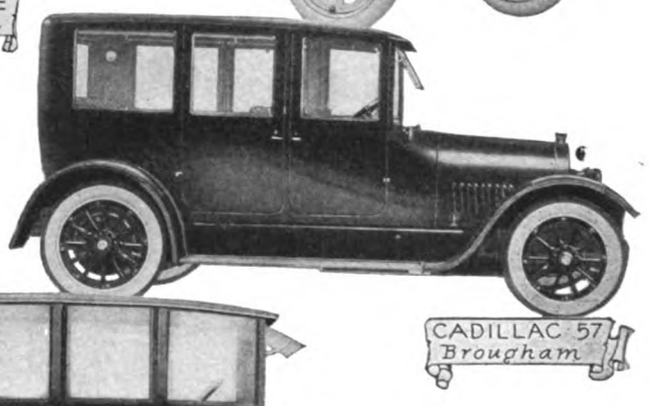
Sedans A to E

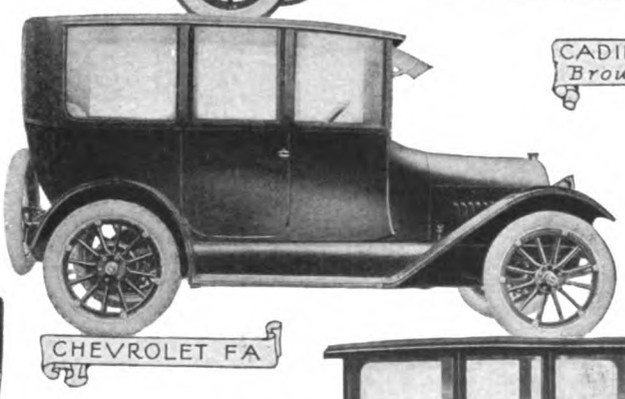


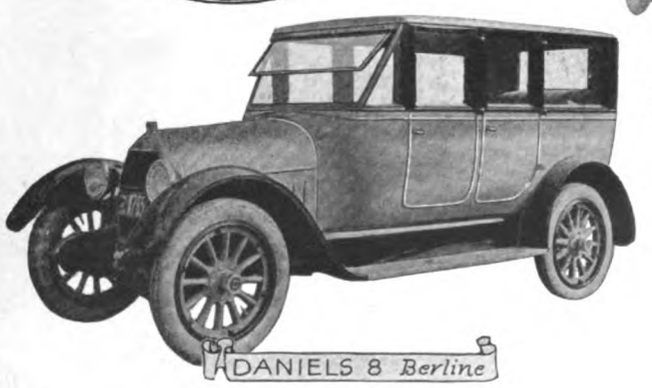
The Language of Closed Car Body Styles

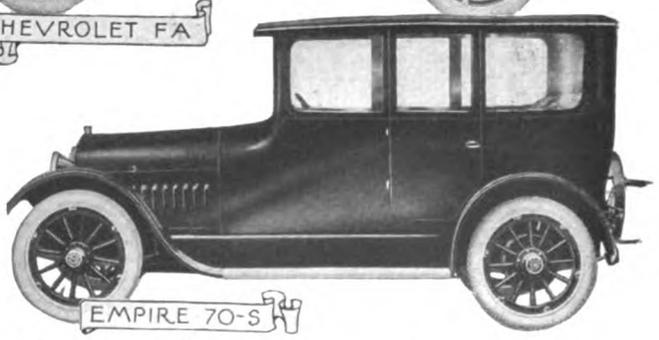






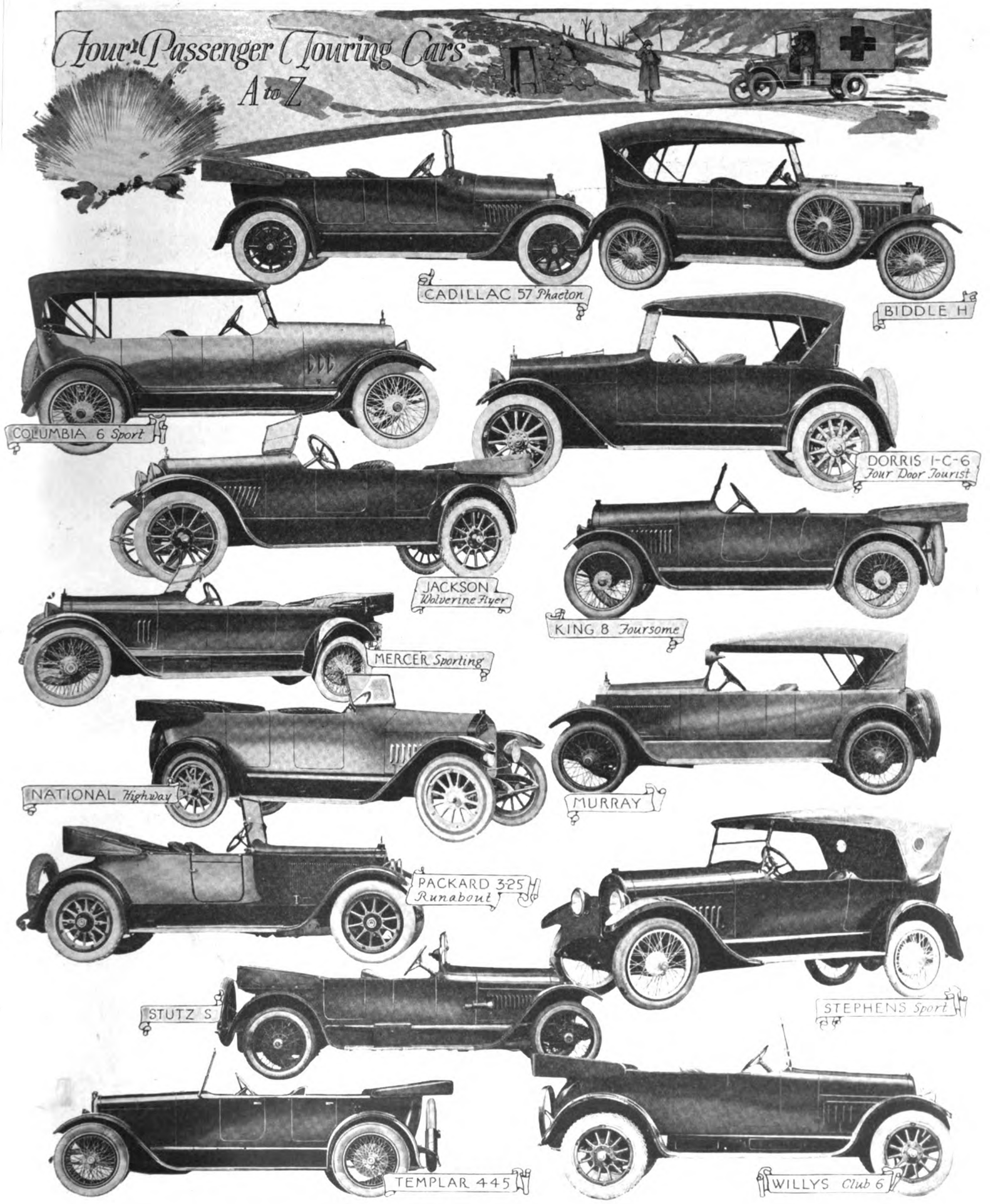






Specifications of these cars appear on pages 60 to 67; prices on pages 98 to 100.

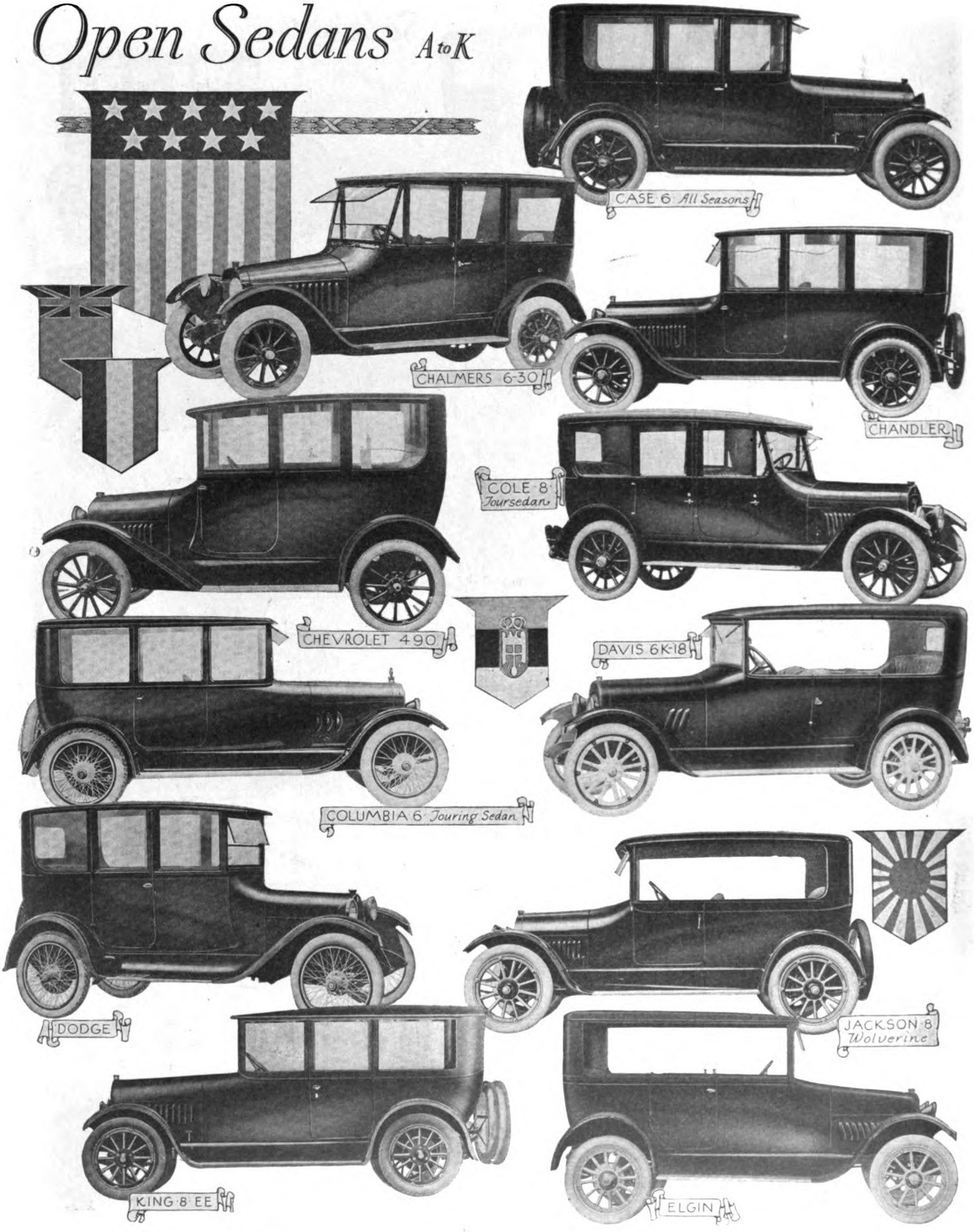
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Specifications of these cars appear on pages 60 to 67; prices on pages 98 to 100.

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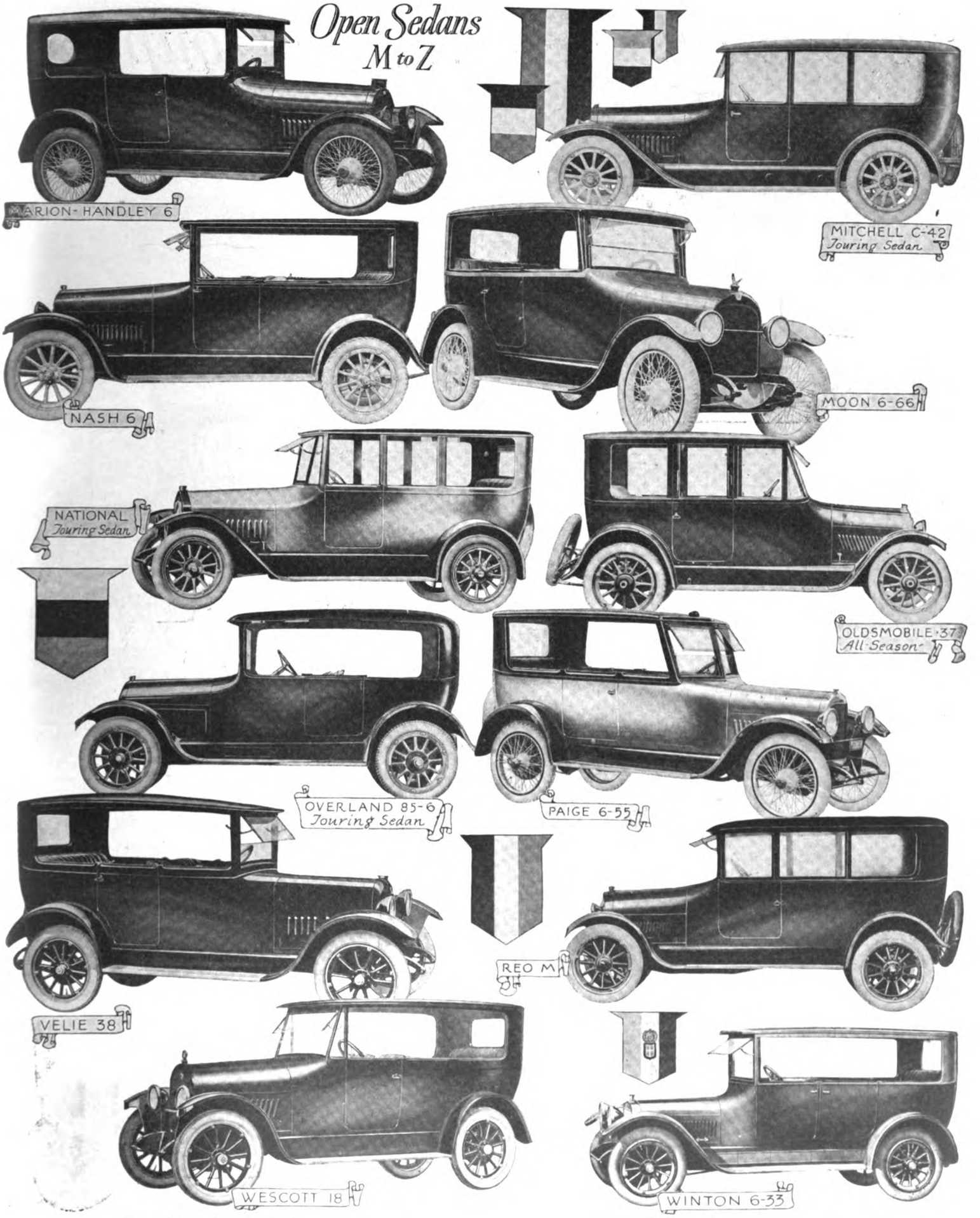
Open Sedans A to K



Specifications of these cars appear on pages 60 to 67; prices on pages 98 to 100.

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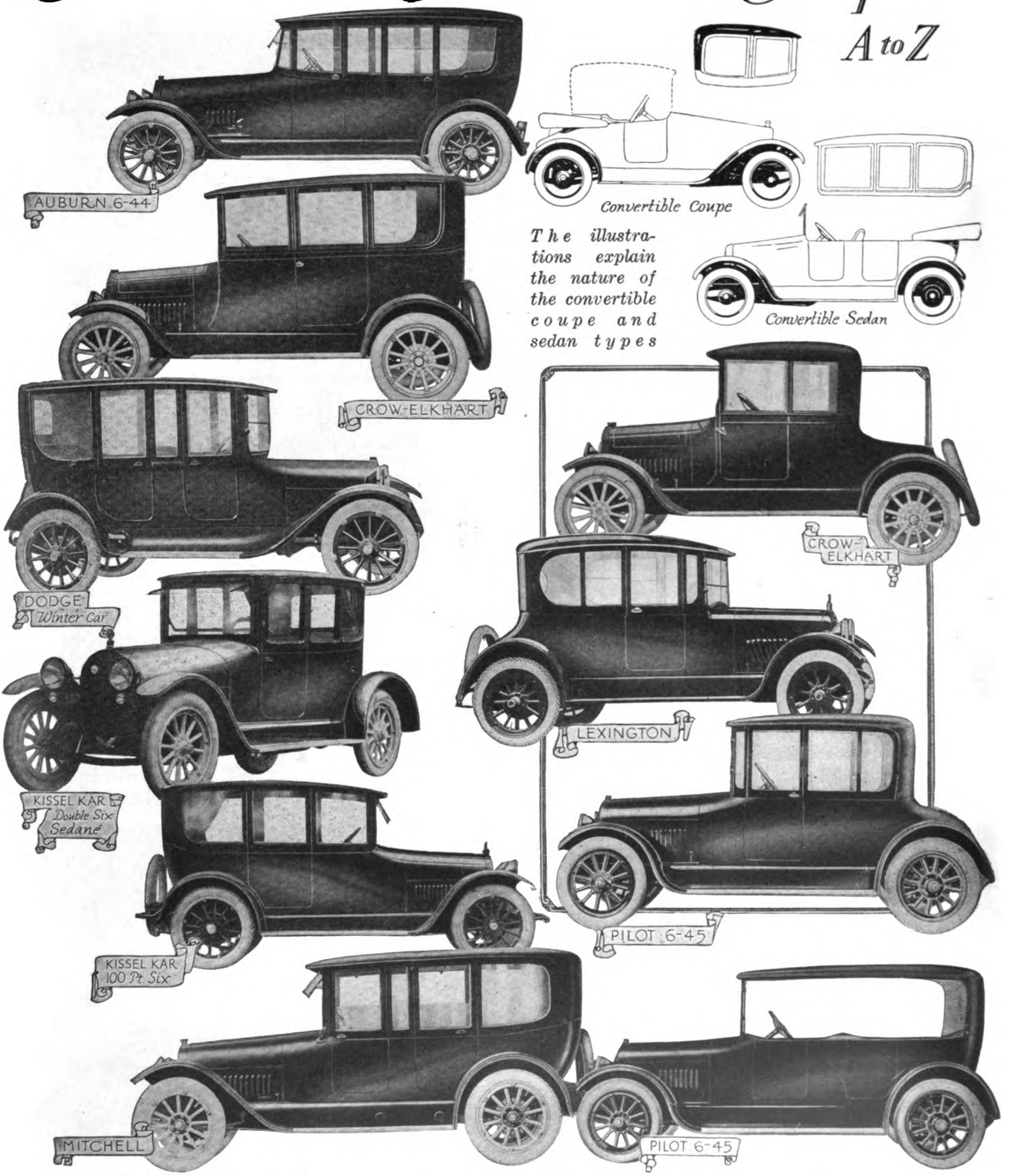
Open Sedans M to Z



Specifications of these cars appear on pages 60 to 67; prices on pages 98 to 100.

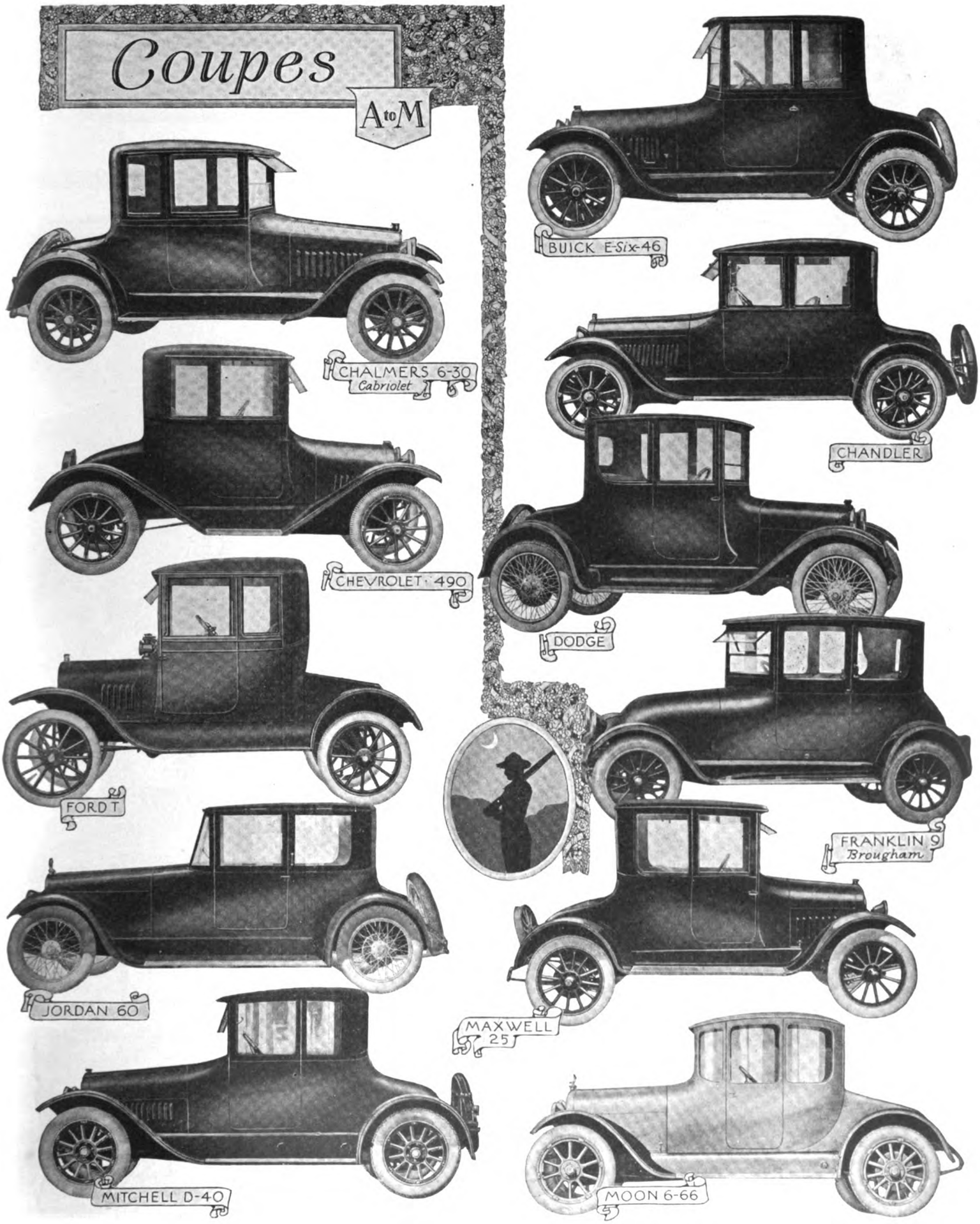
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Convertible Sedans and Coupes A to Z



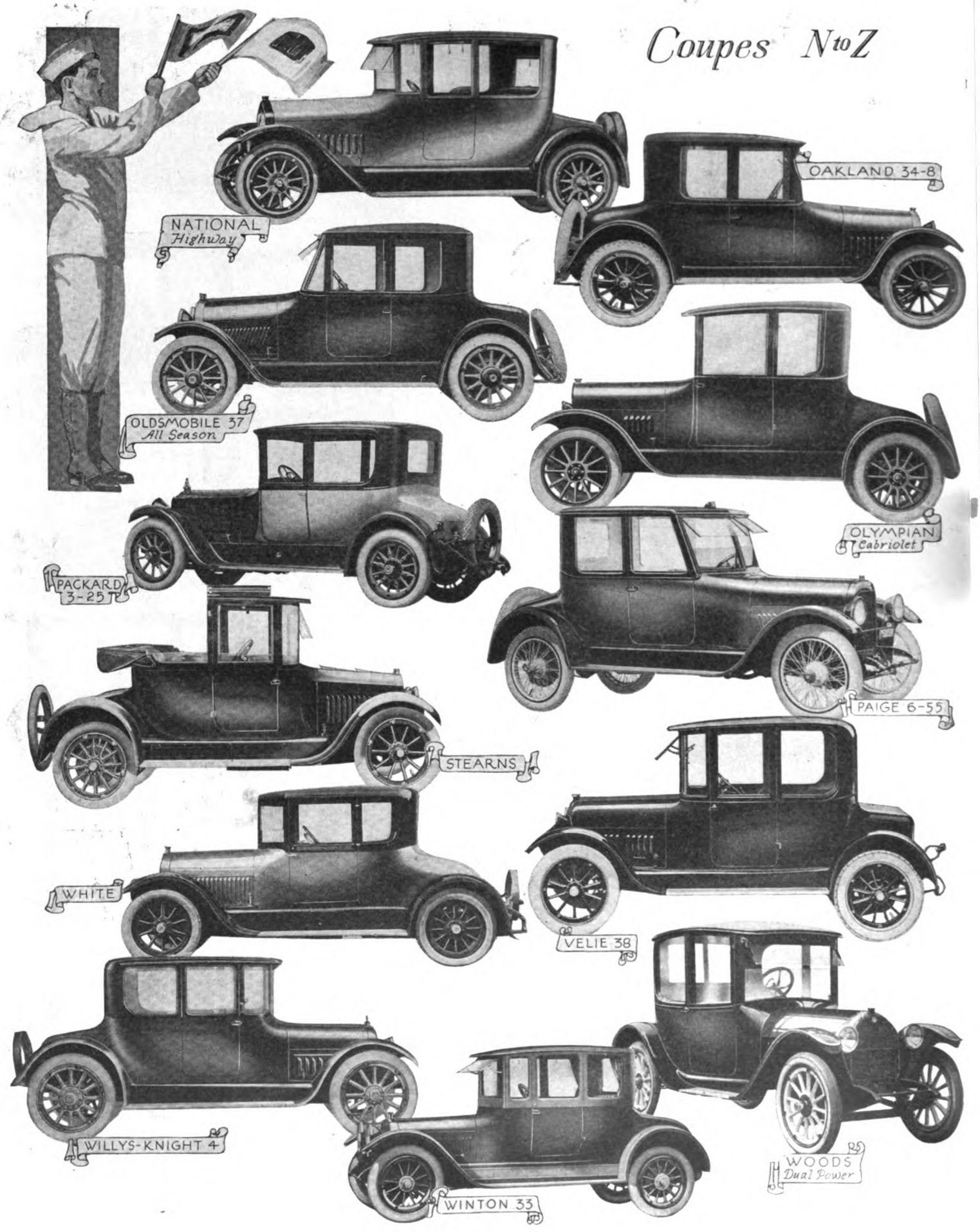
Specifications of these cars appear on pages 60 to 67; prices on pages 98 to 100.

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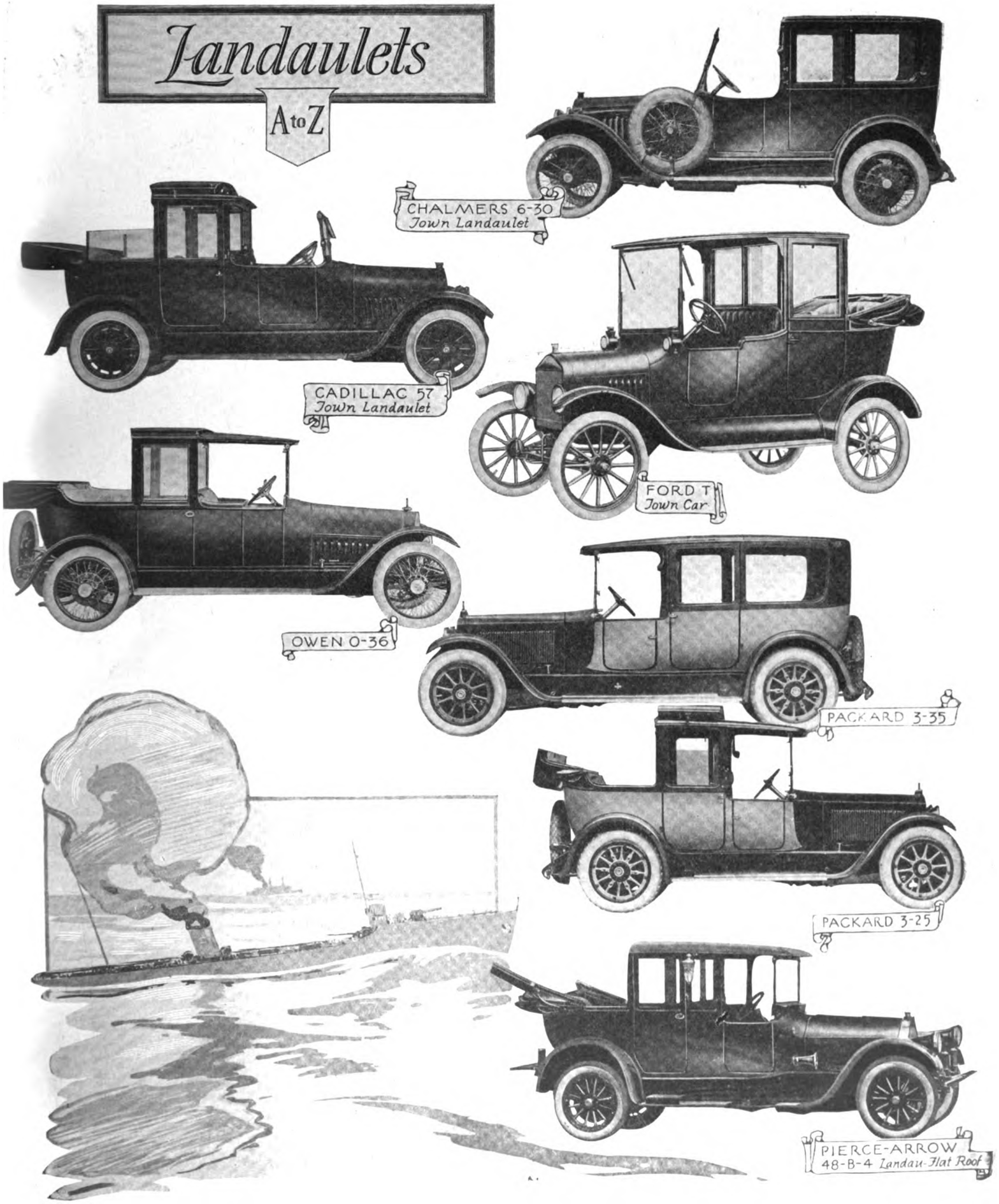
Specifications of these cars appear on pages 60 to 67; prices on pages 98 to 100.

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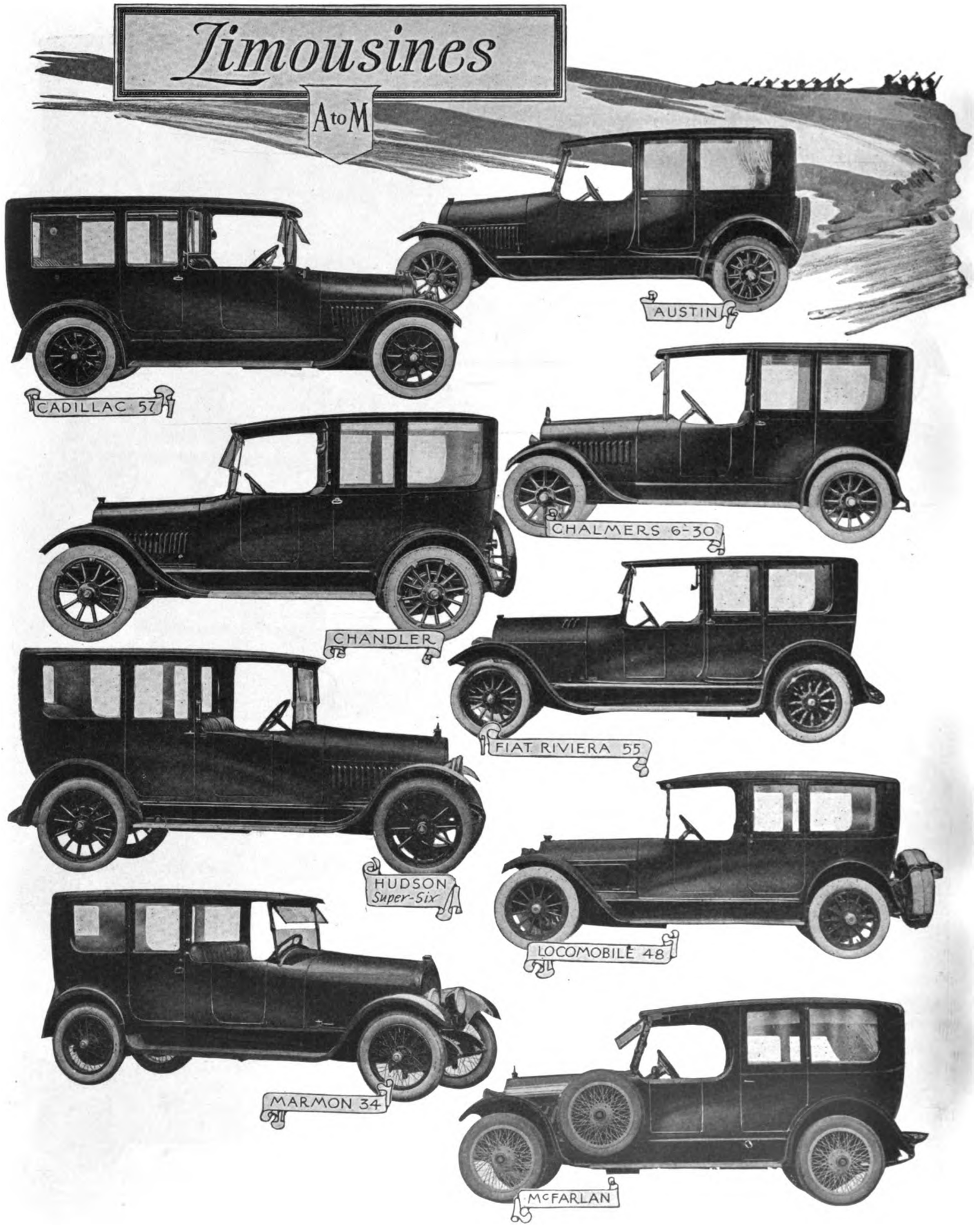
Specifications of these cars appear on pages 60 to 67; prices on pages 98 to 100.

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Specifications of these cars appear on pages 60 to 67; prices on pages 98 to 100.

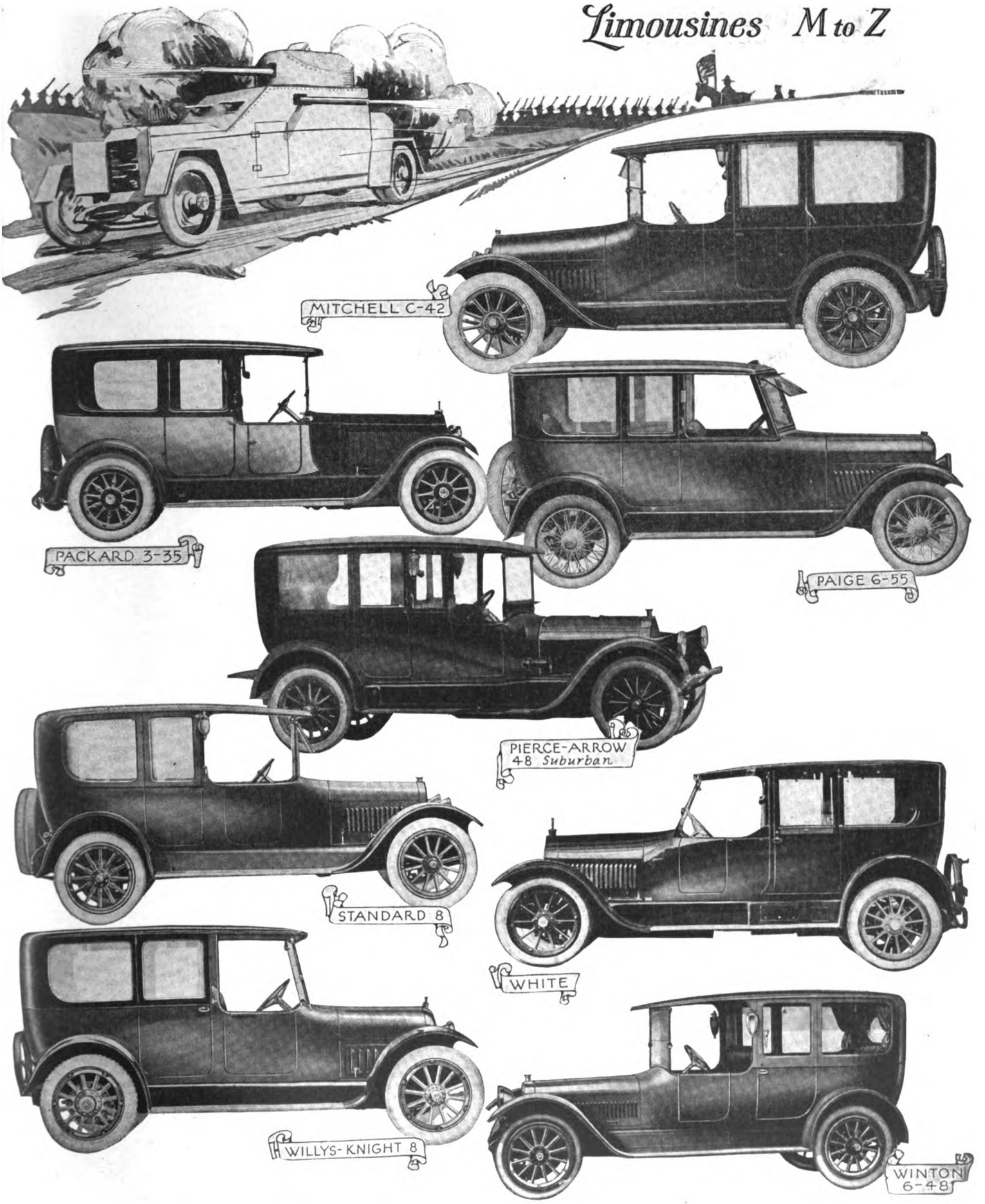
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Specifications of these cars appear on pages 60 to 67; prices on pages 98 to 100.

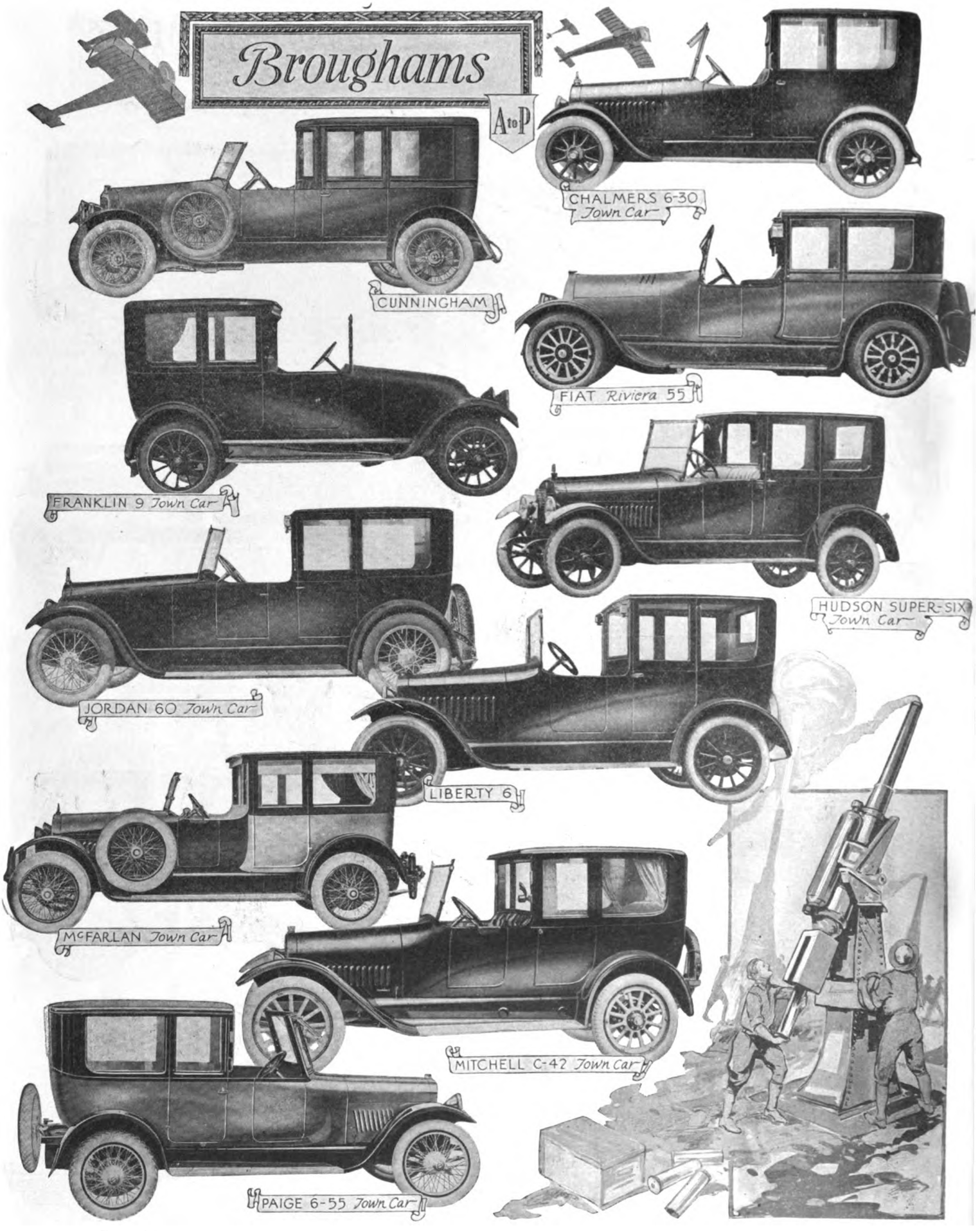
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Limousines M to Z



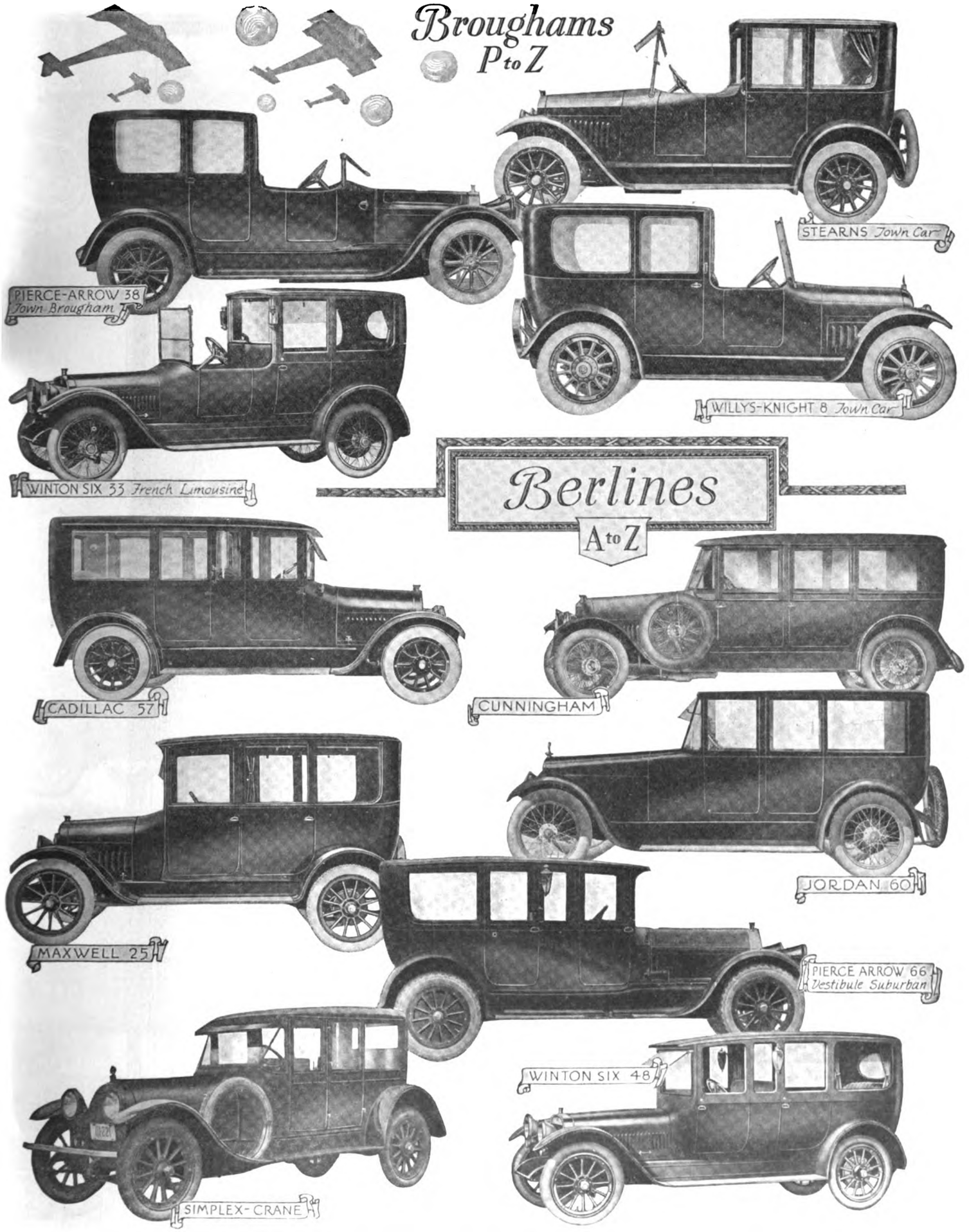
Specifications of these cars appear on pages 60 to 67; prices on pages 98 to 100.

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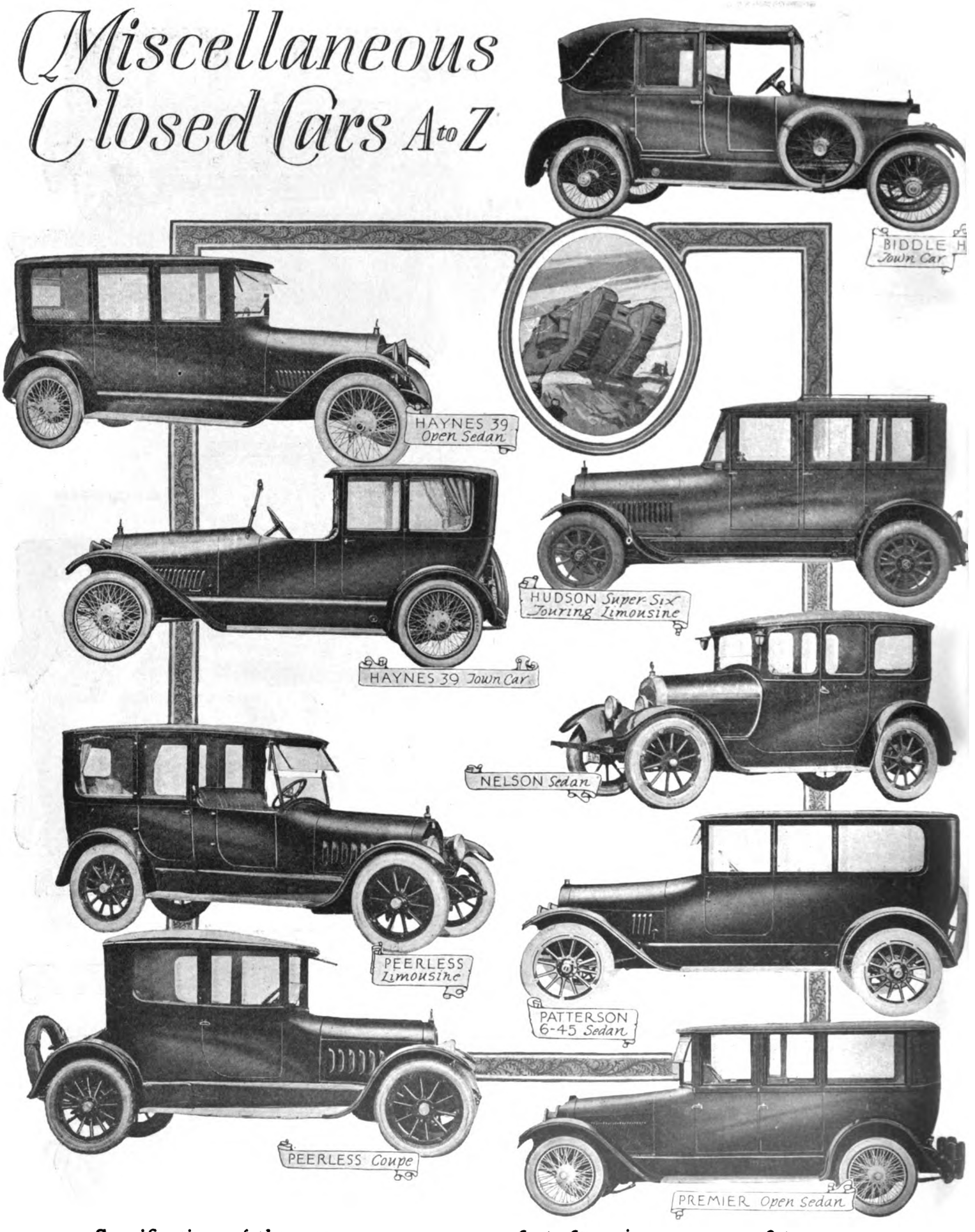
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Specifications of these cars appear on pages 60 to 67; prices on pages 98 to 100.

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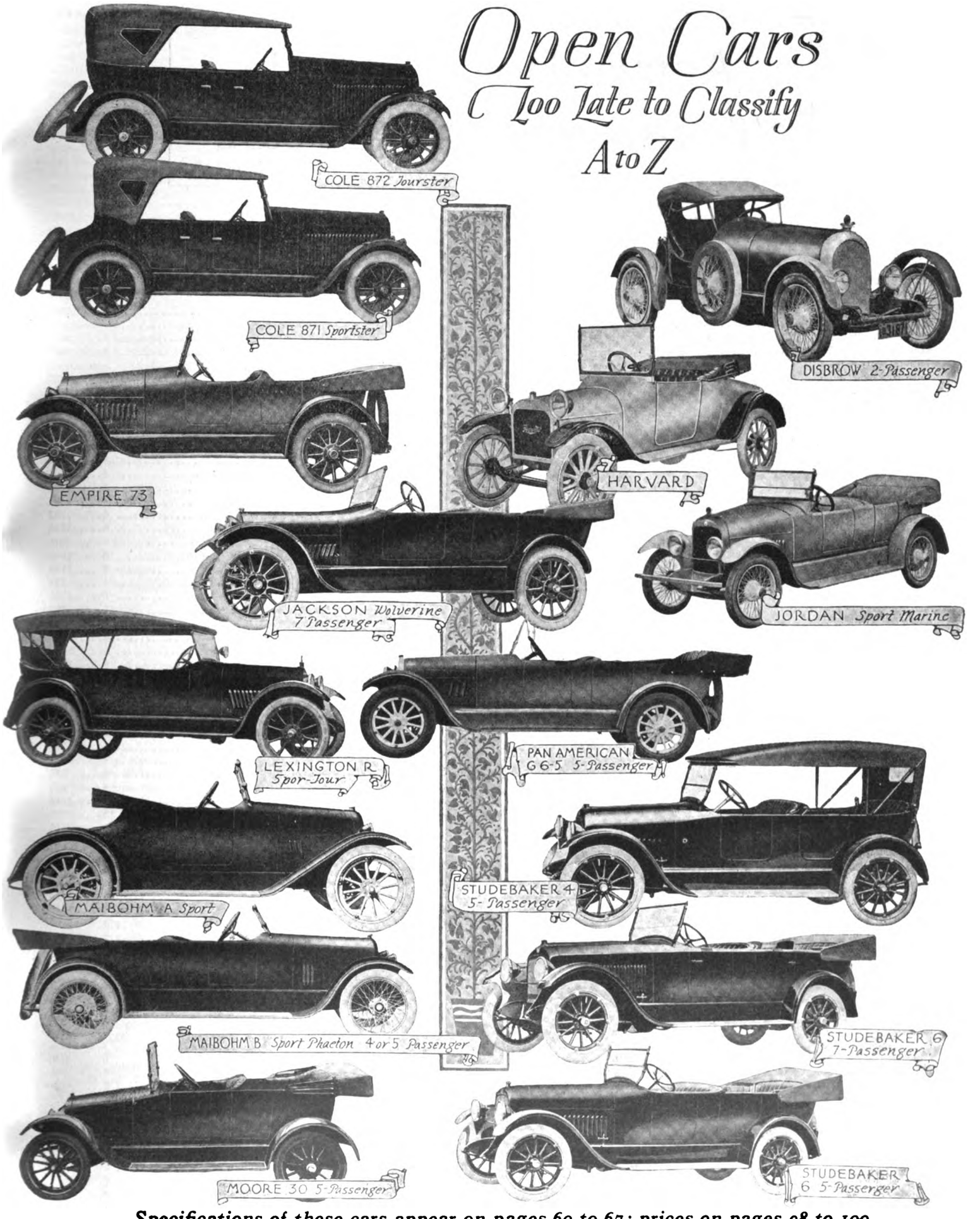
Miscellaneous Closed Cars A to Z



Specifications of these cars appear on pages 60 to 67; prices on pages 98 to 100.

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Open Cars
Too Late to Classify
A to Z



Specifications of these cars appear on pages 60 to 67; prices on pages 98 to 100.

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Annual Buyers' Guide To America's Motor Cars

This is for reference and is to be used with the pictures of 1918 cars appearing on pages 70 to 97

SEVEN-PASSENGER TOURING CARS

Name and Model	Cyl.	Price
Abbott, 6-62	6	....
Anderson, 20	6	....
Apperson, 8-18-7	8	$2550
Apperson, 6-17-7	6	2200
Auburn, 6-44	6	1685
Buick, E-6-49	6	1495
Cadillac, 57	8	2805
Case, U	6	1875
Chalmers, 6-30	6	1535
Chandler, 25	6	1595
Chandler, 17-B		
Cole, 870 Tourster	8	2395
Cole, 860	8	1995
Crawford, 18-6-40	6	2250
Cunningham	8	4750
Davis, 6-J-18	6	1785
Davis, 6-H-18	6	1485
Deering Magnetic	6	3750
Dispatch, G	4	1250
Dorris, 1-C-6	6	2785
Empire, 70-A	6	1375
Fiat, E 17	4	5500
Fiat, 55	4	5500
Hal Twelve, 25	12	3600
Haynes, 39	6	1825
Haynes, 44	12	2785
Hudson Super-Six	6	1950
Jackson, Wolverine	8	1570
Jones, 26 A B	6	1675
Jones, 26 A B, Victoria	6	1775
Jordan, 60	6	1995
King, 8-EE	8	....
KisselKar, Double Six	12	2250
Lexington, R	6	....
Locomobile, 48	6	5950
Locomobile, 38	6	5000
Marmon, 34	6	3550
Marion-Handley, B-6-60	6	1850
McFarlan, Six	6	3500
Moline-Knight, G	4	1985
Moline-Knight, G. De Luxe	4	2250
Mitchell, C-42	6	1525
Moon, 6-66	6	1850
Moon, 6-45	6	1685
Murray	8	2800
Nash, 671	6	1465
National Highway, 6	6	1995
National Highway, 12	12	2595
Oldsmobile, 45-A	8	1467
Owen Magnetic, W-42	6	....
Owen Magnetic, O-36		3950
Packard, 3-25	12	3700
Packard, 3-25, Salon	12	3700
Packard, 3-25	12	4100
Packard, 3-35, Salon	12	4100
Paige, 6-55	6	1775
Pan American, J-7	6	1885
Paterson, 6-45	6	1295
Peerless, 56	8	2340
Pennsy, 6-18	6	1425
Pierce-Arrow, 48-B-4	6	5500
Pierce-Arrow, 66-A-4	6	6500
Premier, 6-C	6	2285
Reo, M	6	1385
Singer	6	3800
Standard, 8-G	8	2450
Stearns, SKL 4	4	$1785
Stearns, SK 8	8	2575
Studebaker, 6	6	1695
Stutz, S	4	2750
Velie, 39	6	1595
Westcott, 18	6	1940
White, GM	4	5000
Willys Six, 89	6	1365
Willys-Knight, 88-4	4	1525
Willys-Knight, 88-8	8	2000
Winton Six, 33	6	3000
Winton Six, 48	6	3500
Yale, 8-M	8	1650

SIX-PASSENGER TOURING CARS

Name and Model	Cyl.	Price
Austin Highway King	12	$3750
Cunningham	8	4750
Daniels, 8	8	3100
Locomobile, 38	6	5000
Locomobile, 48	6	5950
Stutz, S	4	2750
Winton Six, 33	6	3000
Winton Six, 48	6	3500

STEAMERS

Name and Model	Cyl.	Price
Doble-Detroit, 7-pass	2	$3750
Stanley, 5-pass	2	2400
Stanley, 7-pass	2	2500
Stanley, roadster	2	2400

FIVE-PASSENGER TOURING CARS

Name and Model	Cyl.	Price
Allen, 41	4	$1095
American, 6-B	6	1375
Anderson, 20	6	....
Arbenz	4	725
Auburn, 6-39	6	1395
Bell	4	995
Bour-Davis, 18-B	6	1650
Bour-Davis, 18-A	4	1385
Brewster, I	4	7700
Briscoe, 4-24	4	725
Buick, E-6-45	6	1265
Buick, E-4-35	4	795
Campbell	4	835
Chalmers, 6-30	6	1485
Chevrolet, D-4	8	1385
Chevrolet, 490	4	685
Chevrolet, F-A	4	935
Columbia, 6	6	1350
Comet, C-50	6	1285
Commonwealth, 4-40	4	995
Crawford, 18-6-40	6	2250
Crow-Elkhart, CE-36	4	935
Crow-Elkhart, CE-36, DeLuxe	4	995
Davis, 6I-18	6	1485
Dixie	4	995
Dodge	4	885
Dort	4	....
Elcar, 4	4	1095
Elcar, 6	6	1295
Elgin	6	1095
Empire, 50	4	1125
Empire, 70-A	6	1345
Fageol, custom built	6	....
Fergus, chassis only	6	....
Ford, T	4	360
Franklin, 9	6	2050
F. R. P. chassis only	4	....
Geronimo, 6-A-45	6	1395
Geronimo	4	$895
Ghent, 6-60	6	....
Glide, 6-40	6	1495
Grant, C	6	1055
Hackett, A-L	4	....
Harroun	4	785
Haynes, 38	6	1725
Hollier, 206	6	....
Hollier, 196	6	1085
Hollier, 188	8	1285
Hupmobile, R	4	1250
Inter-State, T	4	1000
Jackson, 8, Wolverine	8	1495
Kissel, 100-point	6	1295
Kline Kar, 6-38	6	1495
Lexington, R	6	1585
Liberty Six, 10-B	6	1350
Malbohm, B	6	975
Marion-Handley, B-6-60	6	1590
Marmon, 34	6	3500
Maxwell, 25	4	745
McFarlan, 125	6	3700
Metz, 25	4	695
Mitchell, D-40	6	1250
Mitchell, C-42	6	1510
Moline-Knight, C	4	1650
Monitor	6	1195
Monroe, M-6	4	995
Moon, 6-36	6	1195
Moore, 30	4	695
Nash, 681,583	6	1295
Oakland, 34-B	6	990
Oldsmobile, 37	6	1185
Olympian	4	965
Overland, 90	4	795
Overland, 85-4	4	930
Overland, 85-6	6	1130
Packard, 3-25, Phaeton	12	3700
Packard, 3-25, Salon Phaeton	12	3700
Paige, 6-39	6	1330
Pan American, G-5	6	1500
Paterson, 6-45	6	1265
Pennsy, 18	4	1025
Pennsy, 6-18	6	1325
Pierce-Arrow, 38-C-4	6	4300
Pierce-Arrow, 66-A-4	6	6400
Pierce-Arrow, 48-B-4	6	5400
Pilot, 6-45	6	1295
Princess, 4-36	4	875
Regal, J	4	795
Reo, R	4	985
Roamer, D-4-75	4	....
Roamer, 6-54	6	2095
Roamer, 6-45	6	1950
Roamer, 6-54	6	3250
Roamer, 6-45	6	3150
Saxon, S-4	6	935
Sayers, 6	6	1495
Scripps-Booth, 6-39		
Seneca, 6	4	850
Shad-Wyck, A and B	6	2650
Seneca, A		735
States, C-18	6	995
Stearns, SKL-4	4	1785
Stephens, 6, 75	6	1425
Studebaker, 6	6	1295
Studebaker, 4	4	895

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Name and Model	Cyl.	Price
Templar, 445	4	$1985
Velie, 38	6	1340
Wescott, 18	6	1940
Westcott, S-18	6	1790
Winton Six, 33	6	2950
Winton Six, 48	6	3500
TWO-PASSENGER ROADSTERS		
Allen, 41	4	$1095
American, 6-B	6	1465
Austin	12	3750
Briscoe, 4-24, Runabout	4	....
Buick, E-4-34	4	795
Cadillac, 57	8	2805
Chalmers, 6-30	6	1485
Chevrolet, 490	4	620
Chevrolet, FA	4	935
Crawford	6	2250
Daniels, B	8	3100
Disbrow	4	2950
Dispatch, G	4	1150
Dodge	4	885
Empire, 51	4	1165
Ford, T, Runabout	4	345
Franklin, 9, Runabout	6	2000
Geronimo, 6-A-45	6	1260
Grant	6	1055
Hal, Twelve, 25	12	3600
Harvard	4	750
Homer-Laughlin, D	8	1050
Hupmobile, R	4	1250
Inter-State, T	4	950
Jackson Wolverine	8	1495
Kissel		
Kline Kar, 6-38	6	1495
Liberty Six, 10-B	6	1350
Maibohm, A. Sport	4	795
Maibohm, B	6	975
Maxwell, 25	4	745
McFarlan	6	3500
Mercer, Runabout	4	3400
Mercer, Raceabout	4	3250
Metz, 25	4	695
Mitchell, D-40	6	1250
Moore, 30	4	695
Monitor	6	1195
Murray	8	....
National, 6, Speedster	6	....
National, 12, Speedster	12	....
Nelson	4	1200
Oakland, 6, 34-B	6	990
Oldsmobile, 45-A	8	1467
Oldsmobile, 37	6	1185
Overland, 90	4	780
Peerless, 56, Sport	8	2490
Pierce-Arrow, 48-B-4	6	5400
Pierce-Arrow, 38-C-4	6	4800
Pierce-Arrow, 66-A-4	6	6400
Saxon, 4	4	445
Singer	6	4000
Standard, 8-G	8	2450
Stutz, S, Speedster	4	2550
Stutz, S	4	2550
Templar, 445	4	2255
Velie, 38	6	1340
Wolverine Speedway	4	3500
Winton Six, 33	6	2950
Winton Six, 48	6	3500
Yale, 8-M	8	1650
FOUR-PASSENGER ROADSTERS		
American Six, B, Cloverleaf	6	$1465
Apperson, 8-18-4, Chummy	8	2550
Apperson, 6-17-4	6	2200
Auburn, 6-39, Chummy	6	1345
Auburn, 6-39, Sport	6	1385
Auburn, 6-44, Chummy	6	1635
Austin Highway King	12	3750
Bell, Club	4	995
Bell, Special	4	1145
Biddle, H	4	2600
Bour-Davis, 18-A, Sport	4	1385
Briscoe, 4-24, Chummy	4	725
Case, 6, Sport	6	1875
Chalmers, 6-30, Duplex	6	1485
Chandler	6	1595
Chevrolet, 8	8	1385
Cole, 870	8	1995
Cole, 870	8	2395
Cole, 871, Sportster	8	$2395
Commonwealth, 4, Forty	4	995
Crawford	6	2250
Crow-Elkhart, CE-36, DeLuxe	4	995
Daniels, 8 Sportif	8	3100
Dispatch, Cloverleaf	4	1250
Dixie	4	995
Elcar, 4	4	1095
Elcar, 6	6	1295
Elgin	6	....
Empire	6	1360
Franklin, 9	6	2050
Ghent, 6-60	6	....
Glide, 6-40, Club	6	1395
Harvard	4	985
Haynes, 39	6	1825
Haynes, 44	12	2785
Inter-State	4	1025
Jackson Wolverine, Cruiser	8	1495
Jordan, J-60	6	1995
KisselKar, Double Six	12	2250
KisselKar, 100 Point	6	1385
Kline Kar, 6-38	6	1495
Lexington, 0, Clubster	6	1385
Liberty Six, 10-B	6	1350
Marmon, 34	6	3550
Marion-Handley, B 6-60	6	1850
McFarlan, Destroyer	6	3750
McFarlan, 124	6	3500
Moline-Knight, C	4	1650
Moline-Knight, G	4	1985
Monitor	6	1195
Moon, 6-66	6	1850
Moon, 6-36	6	1095
Moon, 6-45	6	1575
Moore, 30	4	695
Murray	8	2800
Nash 6	6	1295
National Highway, 6	6	1995
National Highway, 12	12	2595
Oldsmobile, 45-A, Speedster	8	1550
Oldsmobile, 45-A	8	1467
Olympian	4	965
Overland Country Club	4	840
Owen Magnetic, O-36	6	3950
Packard, 3-25, Runabout	12	3700
Paige, 6-39, Cloverleaf	6	....
Pan American, H-4	6	1500
Paterson, 6-45	6	1295
Peerless, 56	8	2340
Pennsy, 18	4	1035
Pennsy, 6-18	6	1335
Pierce-Arrow, 38-C-4	6	4800
Pierce-Arrow, 66-A-4	6	6400
Pierce-Arrow, 48-B-4	6	5400
Pilot, 6-45	6	1295
Premier, Foursome	6	2285
Reo, M	6	1385
Saxon, 6, Chummy	6	935
Standard, 8-G	8	2450
Stearns, SKL 4	4	1785
Stearns, SK 8	8	2575
Stutz, S	4	2650
Velie, 38	6	1340
Velie, 39, Sport	6	1850
Westcott, 18	6	1890
White, GMT, Runabout	4	5000
Winton Six, 33, Cloverleaf	6	2950
Winton Six, 48, Cloverleaf	6	3500
Yale Eight, M, Speedster	8	1650
LIMOUSINES		
Austin, Highway King	12	$5250
Brewster	4	8500
Cadillac, 57	8	4145
Chalmers, 6-30	6	2925
Chandler	6	2895
Dorris, I-C-6	6	4150
Fiat, 55	4	6500
Franklin, 9	6	3200
Hal Twelve, 25	12	5000
Hudson Super Six	6	3400
Locomobile, 48	6	7200
Locomobile, 38	6	6200
Marmon, 34	6	5250
McFarlan	6	4650
Mitchell, C-42	6	2850
Murray	8	4000
Owen Magnetic, W-42	6	$6300
Packard, 3-25	12	5250
Packard, 3-35	12	5650
Paige, 6-55	6	3230
Peerless, 56	8	3690
Phianna	4	....
Pierce-Arrow, 48-B-4, Suburban	6	6800
Pierce-Arrow, 38-C-4	6	5900
Premier, 6C	6	3285
Singer	6	4750
Standard, 8-G	8	4000
Stearns, SKL 4	4	3350
Stearns, SK 8	8	3985
White, GM	4	6200
Willys-Knight, 88-4	4	2325
Willys-Knight, 88-8	8	2800
Winton Six, 48	6	4500
Winton Six, 33	6	3950
BROUGHAMS AND TOWN CARS		
Biddle, H, Town Car	4	$4000
Biddle, H	4	3900
Brewster	4	8300
Cadillac, 57, Town Limousine	8	4160
Chalmers, 6-30, Town Car	6	2925
Cunningham	8	6000
Fiat, E-17	4	6500
Fiat, 55	4	6500
Franklin, 9, Town Car	6	3200
Hal Twelve, 21-A	12	4500
Hal Twelve, 25	12	5000
Haynes, 44, Town Car	12	3985
Haynes, 39, Town Car	6	3250
Hudson Super-Six, Town Car	6	3400
Jordan, 60, Town Car	6	3300
Liberty Six, 10-B	6	2700
Marmon, 34	6	5250
McFarlan, Town Car	6	4600
Mitchell, C-42, Tourer	6	2850
Paige, 6-55, Town Car	6	3230
Pierce-Arrow, 38-C-4	6	5900
Pierce-Arrow, 66-A-4	6	7600
Pierce-Arrow, 48-B-4	6	6600
Singer	6	5350
Stearns, Town Car	4	3400
Stearns SK 8	8	3875
Velie, 38	6	2450
White, GMT	4	6050
Willys-Knight, 8	8	2800
Winton Six, 33, French Limousine	6	3950
Winton Six, 48, French Limousine	6	4500
CONVERTIBLE COUPES		
Anderson, 20	6	....
Crow-Elkart, CE 36	3	$1195
Dodge	4	1050
KisselKar, Double Six Sedané	12	2800
KisselKar, 1u0 Pt. Six	6	1885
Lexington, O	6	1545
Maibohm, A	4	1095
Oakland, 34-B	6	1150
Pilot, 6-45	6	1520
Westcott, 18	6	2790
CONVERTIBLE SEDANS		
Auburn, 6-39	6	$1595
Auburn, 6-44	6	1985
Crow-Elkhart, CE-36	4	1275
Dodge, Winter Car	4	1050
Glide, 6-40	6	1795
Grant, G	6	1350
KisselKar, Double Six, Sedané	12	2650
KisselKar, 100 Pt. Six	6	1885
Liberty, 10-B	6	1625
Mitchell, D-40	6	1550
Paige, 39	6	1925
Pilot, 6-45	6	1945
Stearns, SKL-4	4	2525
Westcott, 18	6	2790
Winton Six, 33	6	4000
LANDAULETS		
Brewster	4	$8650
Cadillac, 57	8	4310
Cadillac, 57	8	4295
Chalmers, 6-30	6	3025
Chalmers, 6-30, Town Landaulet	6	3025
Ford, T, Town Car	4	595
Hudson, Super-Six	6	3500

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Name and Model	Cyl.	Price
Hudson, Super-Six	6	$4252
Liberty, 6,10-B	6	2700
Locomobile, 48	6	7300
Locomobile, 38	6	6300
Marmon, 34	6	5350
Owen, O-36	6	5200
Packard, 3-25	12	5300
Packard, 3-35	12	5700
Pennsy, 6-18	6	1850
Phianna	4	....
Pierce-Arrow, 48-B-4	6	6800
Pierce-Arrow, 38-C-4	6	5900
Singer	6	4850
Stearns, SK8	8	3985
Stearns, SKL 4	4	3300
White, GM	4	6200
White GMT, Town Landaulet	4	6050
Winton Six, 38	6	4200
Winton Six, 48	6	4750

BERLINES

Brewster, Inclosed Drive	4	$7900
Cadillac, 57, Imperial	8	4345
Cunningham, Inside Drive	8	6000
Hudson, Super-Six, Limousine	6	3150
Jordan, 60, Sedan	6	2650
Locomobile, 38	6	6400
Locomobile, 48	6	7400
Maxwell, 25	4	1095
McFarlan	6	4900
Packard, 3-35, Imp. Limousine	12	5850
Packard, 3-25, Imp. Limousine	12	5450
Pierce-Arrow, 66-A-4, Vestibule Suburban	6	8000
Simplex-Crane	6	10200
Winton Six, 38, Four-Door Lim.	6	4200
Winton Six, 48, Four-Door Lim.	6	4750

FOUR-PASSENGER TOURING CARS

Abbott, 6-62	6	....
Apperson, 8-18	8	$2550
Biddle, H	4	2650
Cadillac, 57, Phaeton	8	2805
Cole, 8, 872, Tourster	8	2395
Columbia, 6, Sport	6	1450
Cunningham	8	4450
Cunningham	8	4250
Daniels, B	8	3100
Dorris, I-C-6	6	2785
Elgin, F	6	1095
Empire, 78	6	1360
Hal Twelve, 25, Touring Roadster	12	3750
Hudson, Super-Six, Phaeton	6	2050
Jackson, Wolverine Flyer	8	1575
Jordan, Sport Marine	6	2375
Jordan, 60	6	1995
King, 8, Foursome	8	....
Lexington, R, Spor Tour	6	1585
Locomobile, 48	6	6050
Locomobile, 38	6	5150
Maibohm, B, Phaeton	6	975
Mercer, Sporting	4	3500
Moore, 30	4	695
Murray	8	2800
National, 6, Sport Phaeton	6	1995
National, 12, Sport Phaeton	12	2595
Nelson	4	1400
Oldsmobile, 45-A, Sportster	8	1550
Packard, 3-25, Runabout	12	3700
Princess, 4-36-E	4	875
Scripps-Booth, H	8	1595
Shad-Wyck	6	2650
Singer, Sport Touring	6	4000
Stephens, Sport	6	1550
Templar, 445	4	1985
Templar, 445, Victoria	4	2155
Wolverine	4	3750
Willys Six, Club	6	1365
Winton Six, 48	6	3500
Winton Six, 38	6	2950

ODD-CAPACITY ROADSTERS

Biddle, H, 3-pass	4	$2650
Buick, E-Six-44, 3-pass	6	1265
Chalmers, 6-30	6	1485
Davis, J1-18, 5-pass	6	1785
Davis, 1-18, 5-pass	6	1485
Dort, 11 3-pass	4	....
Grant, G, 3-pass	6	1055
Jones, 26 A B, 5-pass	6	1675
King, 18, 3-pass	8	....
KisselKar, 100 Point Six	6	$1295
Kline Kar, 6-38, 3-pass	6	1495
Maxwell, 25, 3-pass	4	745
Mitchell, D-40, Club, 5-pass	6	1280
Mitchell, C-42, 3-pass	6	1490
Mitchell, C-42, Club, 5-pass	6	1560
Monroe, M-3, Club, 3-pass	4	995
Oakland, 34-B, 3-pass	6	990
Overland, 85-4, 3-pass	4	915
Overland, 85-6, 3-pass	6	1115
Paige, 6-39, 3-pass	6	1330
Pierce-Arrow, 38-C-4, 3-pass	6	4800
Pierce-Arrow, 66-A-4, 3-pass	6	6400
Pierce-Arrow, 48-B-4, 3-pass	6	5400
Princess, 3-pass.	4	875
Reo, R, 3-pass	4	985
Scripps-Booth, G, 3-pass	4	935
States, C-18, 3-pass	6	995
Stephens 6-70, 3-pass	6	1485
Winton Six, 38, 3-pass	6	2950
Winton Six, 38, 3-pass Cloverleaf	6	2950

COUPES AND CABRIOLETS

Abbott, 6-62	6	....
Buick, E-6-46	6	$1695
Cadillac, 57	8	3205
Chalmers, 6-30, Cabriolet	6	1775
Chandler, 25	6	2195
Chevrolet, 490	4	1060
Cunningham, cabriolet	8	6000
Deering Magnetic	6	4350
Dispatch	4	1400
Dodge	4	1350
Dorris, I-C-6	6	3325
Ford, T	4	560
Franklin, 9, Cabriolet	6	2850
Franklin, 9, Brougham	6	2900
Grant, G	6	1575
Haynes, 39	6	2535
Haynes, 44	12	3335
Jordan, 60, Brougham	6	3000
Maibohm, A	4	1095
Maibohm, B, Cabriolet	6	1375
Maxwell, 25	4	1095
Mitchell, D-40	6	1850
Mitchell, C-42, Cabriolet	6	1960
Mitchell, C-42	6	2135
Moon, 6-66	6	2550
Moon, 6-66, Cabriolet	6	2350
Moon, 6-45, Cabriolet	6	2350
Murray	8	3600
National Highway, 6	6	2645
National Highway, 12	12	3245
Oakland, 34-B	6	1490
Oldsmobile, 37	6	1595
Olympian, Cabriolet	4	1340
Overland, 85-6	6	1420
Overland, 85-4	4	1285
Packard, 3-25	12	5050
Paige, 6-55	6	2850
Peerless, 56	8	2850
Phianna	4	....
Pierce-Arrow, 38-C-4	6	5700
Pierce-Arrow, 66-A-4	6	7400
Pierce-Arrow, 48-B-4	6	6400
Standard, 8-G	8	3500
Stearns, SKL 4	4	2400
Stearns, SK 8	8	3200
Stutz, S	4	3250
Velie, 38	6	1900
Velie, 38, Cabriolet	6	1850
White	4	6050
White, G. M. Cabriolet	4	6400
Willys-Knight, 88-4	4	2175
Winton Six, 38	6	3950
Winton Six, 38, Coupelet	6	3265
Winton Six, 48	6	4500
Winton Six, 48, Coupelet	6	3750
Woods Dual Power	4	2950

SEDANS

Anderson, 20	6	....
Apperson	8	$3400
Auburn, 6-44	6	2450
Austin	12	4950
Biddle, H	4	4100
Briscoe, 4-24, Coachaire	4	850
Buick, E-6-50	6	2175
Cadillac, 57, Brougham	8	$3650
Chandler, 25	6	2295
Comet	6	2150
Chevrolet, FA	4	1475
Crawford	6	2750
Daniels, B, Suburban Berlin	8	....
Davis, K-18	6	1850
Deering Magnetic	6	4500
Dispatch, G	4	1500
Dorris, I-C-6	6	3350
Dort, II	4	1095
Elcar, 4	4	1625
Elcar, 6	6	1795
Empire, 70-S	6	1685
Ford, T	4	695
Franklin, 9	6	2950
Ghent, 6-60	6	....
Hackett	4	....
Inter-State, T	4	1325
Jones, 26, A. B.	6	2550
Jordan, 60, Sport Limousine	6	3500
Liberty, 6, 10-B	6	1925
Marmon, 34	6	4950
Maxwell, 25	4	1095
McFarlan	6	4600
Moline-Knight, L	4	2280
Monroe, M-6	4	1850
Moon, 6-66	6	2650
Nelson	4	1800
Owen Magnetic, W-42	6	6300
Packard, 3-25, Brougham	12	5300
Packard, 3-25, Brougham	12	5400
Packard, 3-35, Brougham	12	5800
Paterson, 6-45	6	1795
Pennsy, 6-18	6	2250
Pierce-Arrow, 38-C-4	6	5900
Saxon, S-4	6	1395
Templar, 445	4	....
White, GMT	4	6050
Winton, Six, 38	6	4200
Winton Six, 48	6	4750

OPEN SEDANS

Case, All Season	6	$2375
Chalmers, 6-30, Tour.-Sedan	6	1950
Chevrolet, 490	4	1060
Chevrolet, FA	4	1475
Cole 8, Toursedan	8	....
Columbia, 6, Tour.-Sedan	6	....
Davis, 6K-18	6	1850
Dodge	4	1350
Dort 11, Sedanet	4	....
Elgin, A	6	1645
Grant, G	6	1595
Hal Twelve, 25	12	4500
Haynes, 39	6	2585
Haynes, 44	12	3385
Hudson, Super-Six	6	2750
Jackson Wolverine	8	2195
Jordan, 60	6	2750
King, EE	8	....
Kline Kar, 6-38	6	2195
Maibohm, B	6	1375
Marion-Handley, 6	6	....
Maxwell, 25	4	1095
Mitchell, D-40, Tour.-Sedan	6	1950
Mitchell, C-42, Tour.-Sedan	6	2275
Mitchell, C-42, Club Sedan	6	2185
Moon, 6-66	6	2650
Murray	8	4000
Nash, 6	6	1985
National, 6, Tour.-Sedan	6	2820
National, 12, Tour.-Sedan	12	3420
Oakland, 34-B, Tour-Sedan	6	1190
Oldsmobile, 37, All Season	6	1695
Olympian	4	1565
Overland, 90, Tour.-Sedan	4	1240
Overland, 85-6, Tour.-Sedan	6	1620
Paige, 6-39	6	....
Paige, 6-55	6	2850
Peerless, 56	8	2990
Premier	6	3285
Reo, M	6	1950
Standard, 8-G, Touring Sedan	8	3500
Stephens, 6	6	1985
Velie, 38	6	1885
Westcott, 18	6	2790
Willys Six, Tour.-Sedan	6	2045
Willys-Knight, 88-8, Tour.-Sedan	8	2700

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National

TWELVE CYLINDER CARS



ANSWERING THE NEED *of* TODAY

THE nation-wide urge for basic soundness in economy and service is nowhere answered more sincerely than in this new twelve-cylinder National Sedan.

By perfection of material and careful construction it has been given an endurance and low operating cost that bring unusually high return on the owner's investment.

To this true economy is added its superiority as an all-season vehicle.

Luxurious and dignified as a limousine, it is equipped with studied reference to the complete utility essential in an all-purpose car.

The adoption of the smooth, twelve-cylinder, airplane-type motor has given ample power for all tasks—it is as able upon hills and country roads as upon smooth city streets.

Ease and simplicity of operation, constant reliability, roominess—it seats seven passengers—and its unfailing comfort have made it a favorite with women as with men.

This new National Sedan affords the full scope of automobile use—comfortable travel in all seasons, under all weathers and over all roads.

Its conversion from a closed car to an open one is instant and easy and in either model the beauty of its lines is preserved.

For the purchaser it offers that long term of service that is the final element in determining true value and economy—to the dealer it brings the advantage that accompanies year 'round sales opportunities.

NATIONAL MOTOR CAR & VEHICLE CORPORATION . INDIANAPOLIS
Eighteenth Successful Year

National Dealers Now Offer Complete Range of Body Styles in Both

Six and Twelve Cylinder Models

7-Passenger Touring Car, 4-Passenger Sport Phaeton
4-Passenger Roadster, 7-Passenger Convertible Sedan

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"There doubtless are other good bearing bronzes, but I *know* Non-Gran is good and I *know* Non-Gran is uniform."

The man and engineer who spoke those words is known to every Automotive Engineer not only of this Country but of the entire World. You know him, as does everyone else, as easily one of the first five Automotive Engineers of America. In those few words hasn't this man expressed the majority opinion of the entire American Automotive Industry?

HIGH SPEED
NON-GRAN
BEARING BRONZE

American Bronze Corporation

Berwyn Pennsylvania

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At the New York Show

You can see the various models of Waltham Clocks that have become standard equipment for the following makes of cars:

Anderson 6-40
Apperson
Brewster
Cadillac
Chalmers
Cole
Crane
Cunningham
Detroit-Electric
Doble
Fergus
Franklin
Haynes
Hal
Hudson Super-Six
Jordan
Kissel
Locomobile
Marmon
Mercer
Murray
Owen-Magnetic
Packard
Pierce-Arrow
Rauch & Lang
Rolls-Royce
Simplex
Stearns
Studebaker
Willys-Overland
Winton

Over 250,000 Now in Use as Standard Equipment



The Waltham Automobile Clock

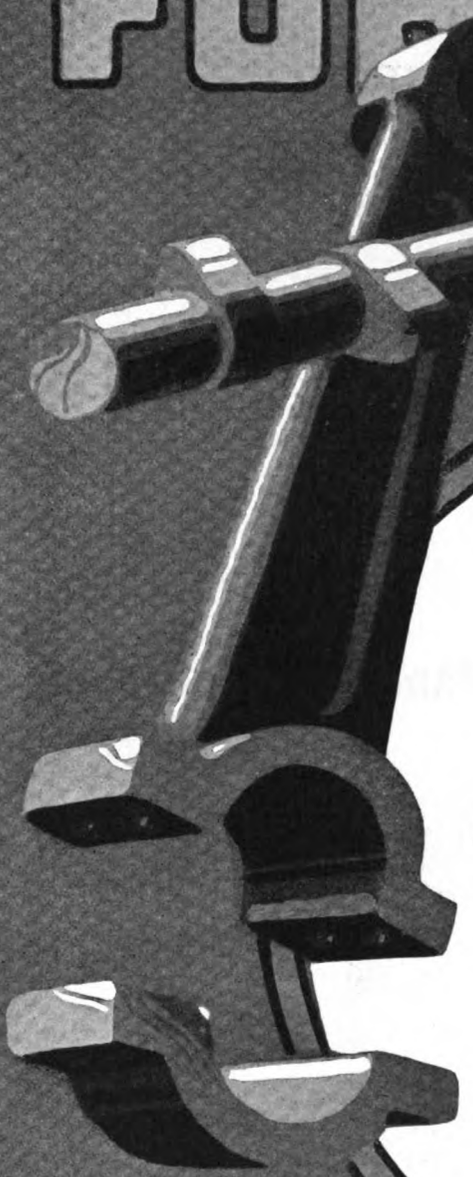
has two mainsprings and is stoutly and scientifically built to resist the shocks of road travel and the extremes of temperature. It is the **only** clock so built and so adjusted. It tells the right time. It is splendidly durable.

In appearance it conforms with the luxurious cars that use it. A red signal on the dial shows when the clock needs winding. The presence of a Waltham in a car has become an index that points to the car's class.

WALTHAM WATCH COMPANY, WALTHAM, MASS.

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FORGINGS



While You Are in New York

Drop in to see us about your forgings.

We can offer you prompt delivery in large quantities and helpful co-operation in the satisfactory completion of special or unusual forging jobs.

A call upon us may result in saving you money, time and trouble.

GRANT HAMMOND MFG. CORP.
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Conn.

GRANT HAMMOND
MANUFACTURING CORPORATION

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NORDYKE & MARMON COMPANY

Present The

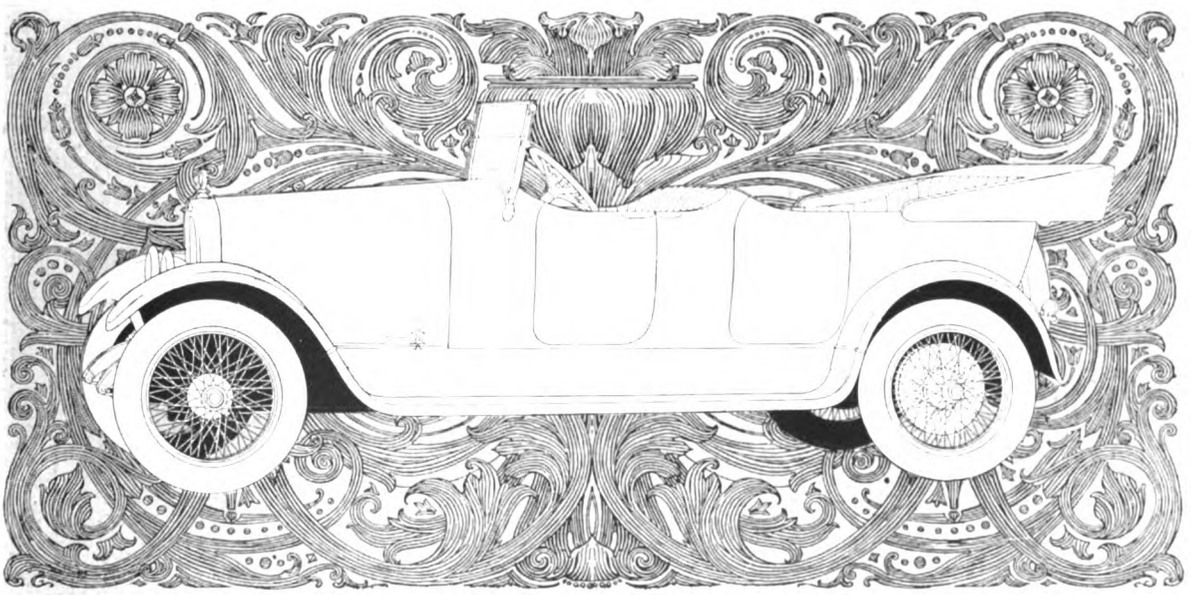
NEW SERIES

MARMON 34

To Be Seen At The Principal Motor Shows

THE distinguishable differences between this and the preceding series are the wider seats and the deeper sides. There are, in addition, numerous refinements not readily perceptible but none the less effectual in making this celebrated car even more comfortable, luxurious and convenient than before.

On the following page—an invitation to dealers.



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MARMON 34

Advanced Engineering

An Invitation To All Automobile Dealers Who Will Attend The Motor Shows.

THE Marmon Exhibit will include four models of the new series Marmon 34. They will comprise not only interesting attractions from the car buyer's standpoint, but will constitute a factor of first import to dealers.

There will be shown the Marmon open cars that are a half-ton lighter than those of equal size and power, and the Marmon enclosed cars that weigh less than open cars of competitive build.

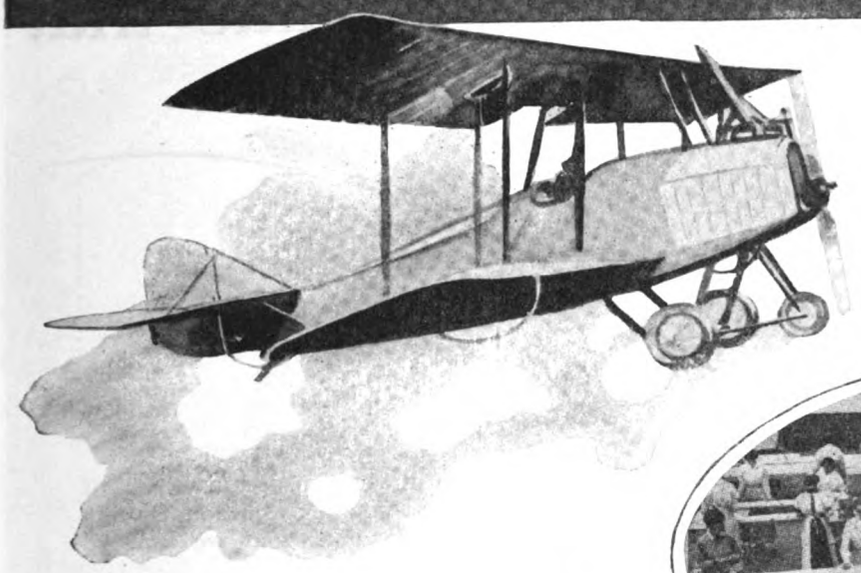
The Marmon Chassis will be found to be the same for all types of bodies-wheelbase 136 inches.

May we not hope to have the pleasure of showing you the new Marmon excellencies as a matter of interest to you and of pride with us?

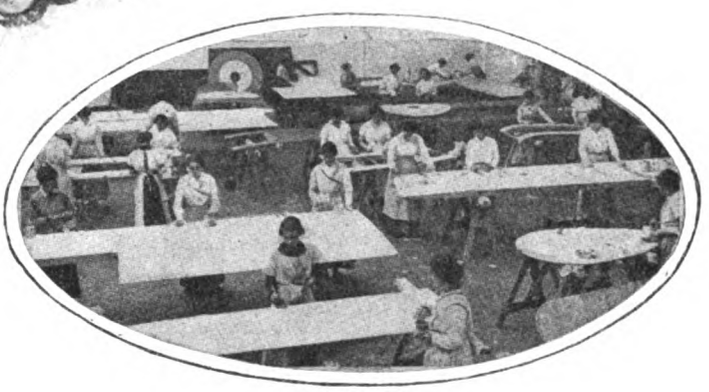
NORDYKE & MARMON COMPANY

Established 1851 : INDIANAPOLIS

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Weather-Proofing the Airplane



Here is a new—almost an unknown—field. The airplane presents not only difficult, but most exacting requirements. Varnishes, Japans and Enamels, on airplane parts, are called upon to withstand the most extraordinary changes in temperature, from summer heat to winter cold in a few minutes; sudden changes from arid dryness to heavy moisture; tremendous winds, unusual strains in every conceivable direction.

Bring Your Finishing Troubles to Us.

We maintain what we call a "Better-the-Finish" Laboratory, which is devoted to the thorough study of individual finishing problems put up to us by various manufacturers.

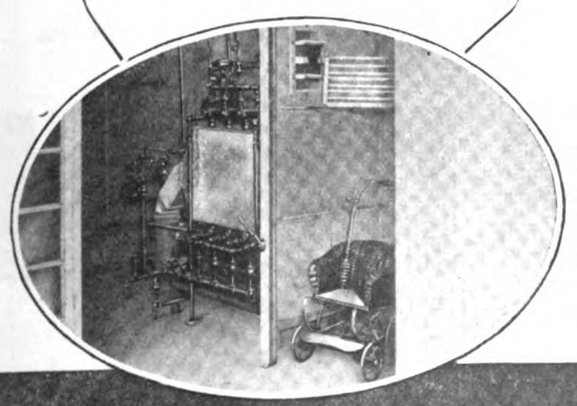
Perhaps we can save you time and money, and also improve the appearance and wearing qualities of the finish on your products.

Motor Cars, Trucks, Trailers, Tractors, Motorboats, Airplanes, and their parts and accessories are receiving our particular attention.

It will cost you nothing to get the benefit of our special knowledge and experience in this line. And it may save you time and money.

Manufacturers handling government work should bear in mind that our experience in co-operating with firms handling similar work is at their disposal.

Automatic Drying Ovens of a type suited to airplane wings, fusilage, auto bodies, etc.



HILO

Varnishes—Enamels—Japans

Our "Better-the-Finish" Laboratory is co-operating with the Society of Automotive Engineers in developing Standard Specifications for Airplane Varnishes, Baking Japans, and Colored Enamels.

Let us co-operate with you in the solution of your finishing problems. Write for our Bulletin No. 1 on Black Enamels and Japans. It contains information of value to you whether you use our material or not.

MOLLER & SCHUMANN CO.

54 years making HILO Enamels, Japans, Varnishes

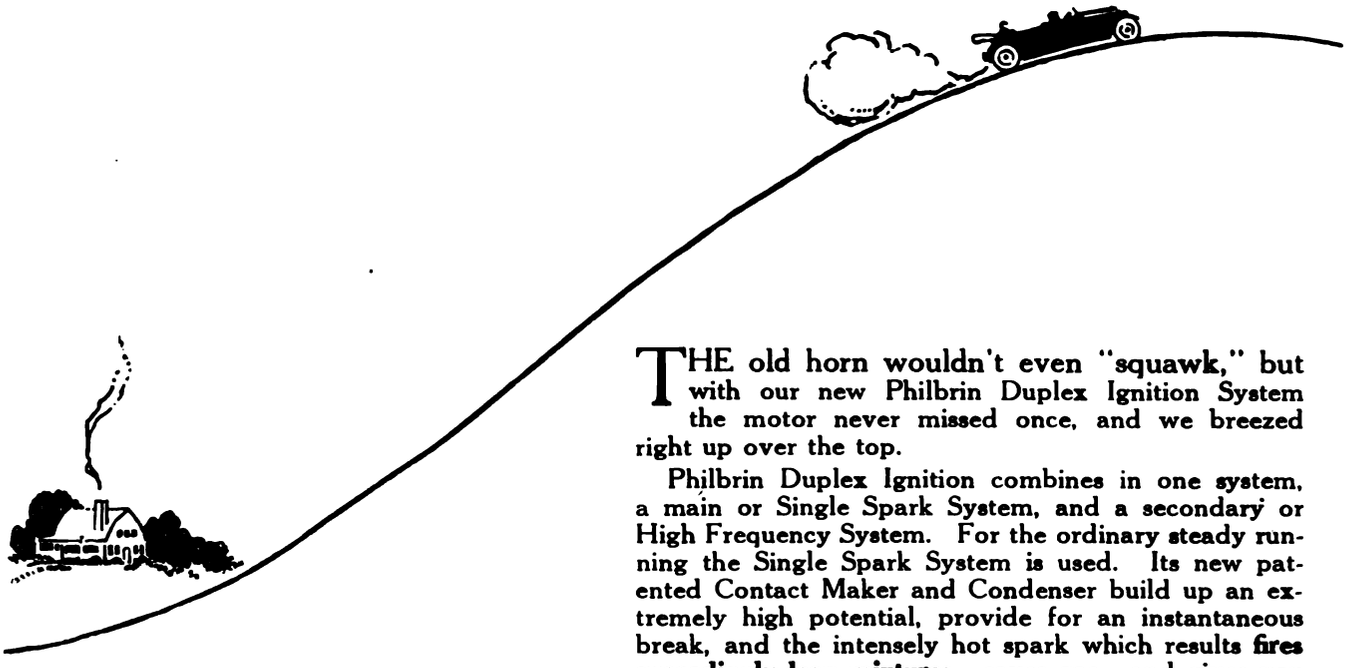
443 Marcy Ave. Brooklyn, N. Y.

Branch Office: 110 N. Desplaines Street, Chicago, Ill.

Pacific Coast Representative: The Brininstool Co., Los Angeles, Calif.

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"—and with the battery so weak that it wouldn't blow the horn, we made that hill on high."



THE old horn wouldn't even "squawk," but with our new Philbrin Duplex Ignition System the motor never missed once, and we breezed right up over the top.

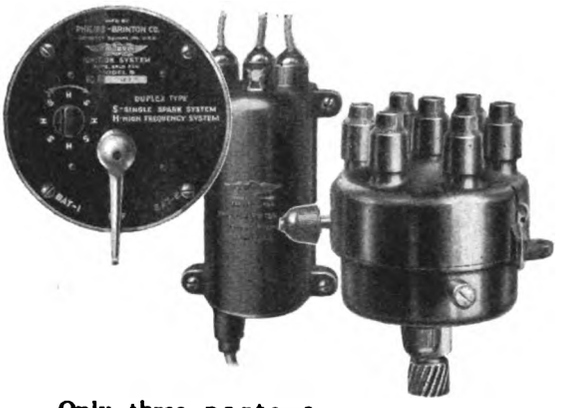
Philbrin Duplex Ignition combines in one system, a main or Single Spark System, and a secondary or High Frequency System. For the ordinary steady running the Single Spark System is used. Its new patented Contact Maker and Condenser build up an extremely high potential, provide for an instantaneous break, and the intensely hot spark which results **fires exceedingly lean mixtures**—saves gas—and gives you added power and flexibility, with greatly increased economy, both of gas and current.

But for abnormal conditions, when you are troubled with poor gas, fouled spark plugs, cold cylinders, or poor carburetion, just turn the switch to "H," and the resulting stream of hot, intense sparks from the High Frequency System relieves all ignition troubles—**spurs the motor to super-service.** You can easily take the steepest grades, or slide along on high as smoothly at four miles as at forty.

Philbrin Duplex Ignition is more dependable than any single system could possibly be, and each separate system or unit is also vastly superior in performance to all other systems.

Philbrin Duplex is the last word in Ignition, and Philbrin Systems are made for any car for replacement of single spark systems, magnetos, and also for first installation.

Dealers: Write for our exclusive sales proposition. Valuable territory is still open.



Only three parts—a combined switch and magnetic interrupter, a coil, and a distributer

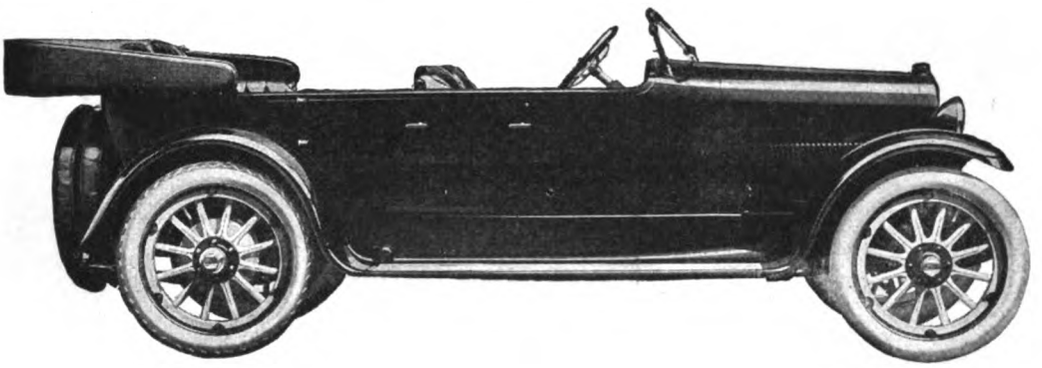
See our exhibits at the Automobile Shows
Booth D-183, New York Show and Both 87, Chicago Show

PHILIPS BRINTON COMPANY
501 SO. BROAD ST. KENNETT SQUARE, PA.

PHILBRIN
DUPLEX IGNITION
—with a second system to spur the motor to super-service.

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CASE SIX



Three Fine Models

The New Case Offering

EACH is the latest creation—each a pattern to set new standards. Such are the New Case Sixes—in a Touring Car, a Sport Model, a Sedan. Each combines beauty and mechanical excellence. Each typifies new-day ways of manufacture. Each embodies the Case idea of including all the wanted features. An expert has wisely named this the "All-Feature" Car.

The New Case Six is our latest triumph. Case Engineers have surpassed all previous efforts. The trade confirms it. And the public confirms it.

This New Case Six is the best, the finest, the handsomest car we ever built. In dozens of ways, experience has directed our designers and builders. This is a speedier, more powerful car. It is easier to drive, more comfortable to ride in. It has grace and beauty. It has appointments rarely found in cars of equal price. We offer the open models of this new car for $1875. Men say they would bring more. The brisk demand indicates wide appreciation.

To a few dealers who command a clientele of motor-wise buyers, we have an attractive proposition to offer. *If you are interested, please advise.*

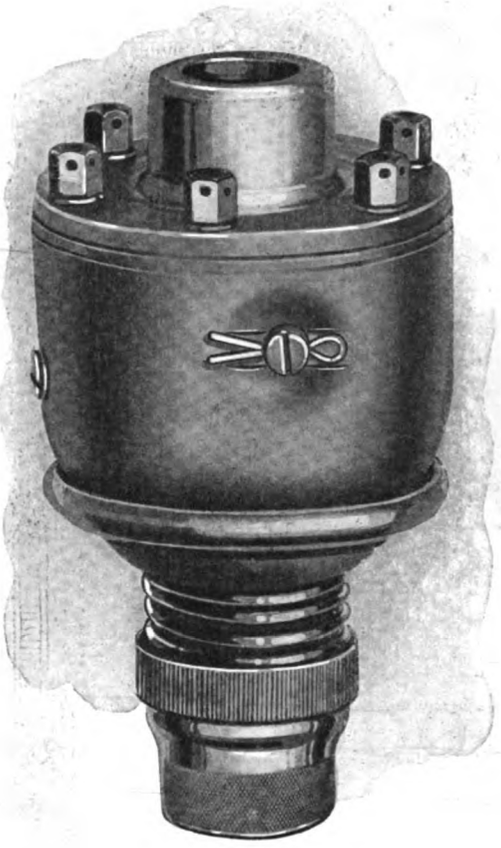
Family Model, a 7-Passenger Touring Car, color dark blue, $1875; Sport Model for four people, color periscope green, $1875; All-Seasons Model, Springfield Type, for 7 or 5 people, color dark blue, $2375.

J. I. CASE T. M. CO., INC., 204 Liberty St., Racine, Wis.

(*Founded 1842*)

The New Case Six in three models will be exhibited at the New York and Chicago Shows

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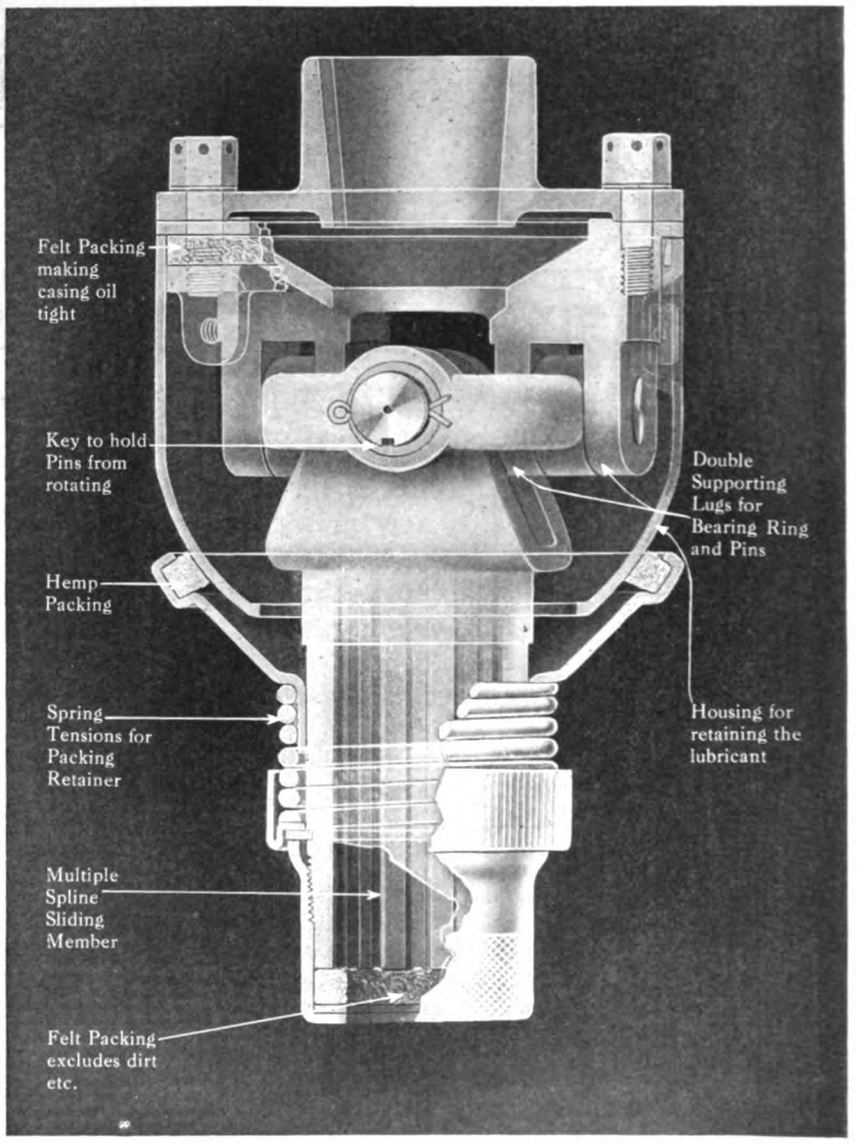
Hartford

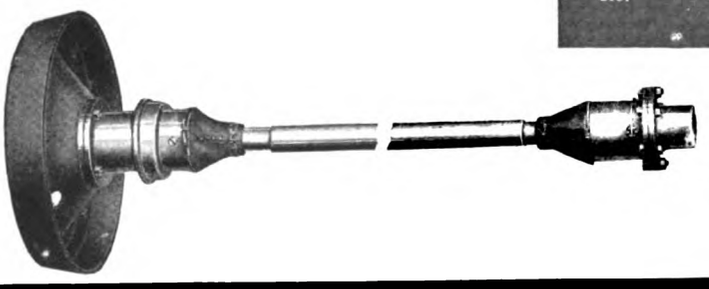
Quality, Service Courtesy

Universal Joints

Cone Clutches

Capable, Dependable and Interchangeable





ESTABLISHED 1906

THE

Hartford Automobile Parts Co.

HARTFORD, CONN.

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Reliability
Quality
Economy

KEEP YOUR CAR YOUNG 1918

Seven
Auto
Necessities

with

JOHNSON'S AUTO PRODUCTS

Freeze-Proof
Carbon Remover
Prepared Wax
Liquid and Paste
Stop-Squeak Oil
Radiator Cement
Cleaner
Auto-Lak
Black-Lac



OF THE four and a quarter million cars in service, 95% are cared for by owners themselves. And a large percentage of these owners use some of the Johnson Products shown on the following pages.

These products are auto necessities—every one of them. If you try to get along without them, you not only sacrifice something of pleasure and pride, but you also pay more for the neglect.

Here's a good New Year's Resolution; Resolve to Keep Your Car Young. Keep it bright and shining on the outside and keep the motor quiet, powerful and snappy. A little care will increase its market value 15% to 25%.

Try these products—all of them—at the first opportunity. Order direct from us if you can't buy locally. Write for our free booklet, "KEEP YOUR CAR YOUNG".

To The Trade

Hundreds of jobbers and thousands of dealers are sharing in the Johnson profits. Don't invest your capital in unknown brands when you can get these sure selling, fast moving Johnson products.

We deliver the customers to you. Will you deliver the goods to them? Get our proposition.

S. C. JOHNSON & SON, Dept. A, RACINE, WIS.

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Prevents Frozen Radiators



Does Not Evaporate

JOHNSON'S FREEZE-PROOF

Johnson's Freeze-Proof is put up in packages containing 6½ lbs. net which retail at $1.50 each in the U. S. A. One package will protect a Ford from freezing at 5° below zero. For larger cars use two packages to protect to 5° below zero, and three packages to protect to 20° below zero.



THE only way you can be positive that your radiator won't freeze up in winter is to use a non-evaporating, anti-freeze preparation. The present high price of Alcohol—its low boiling point—and quick evaporation make it impractical. Besides, you are asked to conserve the supply of Alcohol for use in explosives.

Does Not Evaporate

Johnson's Freeze-Proof does not evaporate so one application is sufficient for the whole winter unless the solution is weakened by leakage of the radiator or hose connections, through the overflow pipe, or by boiling over.

Absolutely Harmless

Johnson's Freeze-Proof contains no oil and does not interfere with the cooling system. It will not injure rubber, cloth, packing or metal of any kind. It does not rust or corrode any metal. Johnson's Freeze-Proof is economical and easy to use and it raises the boiling point of water 12° to 25°.

Johnson's Freeze-Proof should be used wherever you wish to prevent water from freezing—in automobiles, gas engines, tractors, electro-lighting and heating plants, traction companies, etc. One box will prevent 3½ gallons of water from freezing at 5° below zero. For lower temperatures increase the proportions of Freeze-Proof.

S. C. JOHNSON & SON, Dept. A, RACINE, WIS.

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Increases Power



Saves Gasoline

JOHNSON'S CARBON REMOVER

REGULAR use of Johnson's Carbon Remover—once every 500 or 1000 miles—will cure 80% of your engine troubles, and keep the engine right up to the top notch of efficiency all the time. It will increase your power, save 12% to 25% of the gasoline and reduce maintenance expense.

Johnson's Carbon Remover puts new life in your engine. It cleans out carbon, stops knocking and pounding, gives more power on the hills, improves the "pick-up" and restores the original "pep" and smoothness.

With proper carbon removal, you'll have better compression and less valve grinding, less ignition trouble and lower oil consumption. Johnson's Carbon Remover is easier, quicker, less expensive and more effective than any other method—more effective because it is thorough and because you won't neglect to use it often after the first trial.

Do It Yourself — No Trouble

Simply pour an ounce of Johnson's Carbon Remover into each cylinder in the evening. Over night it soaks into the accumulated carbon and leaves it a soft inflammable mass. When you start your engine the next morning this mass burns, pulverizes and is blown out with the exhaust in powder form.

S. C. JOHNSON & SON, Dept. A, RACINE, WIS.

Pints.....$1.00
Half-pints .65

If your dealer cannot supply you, order direct and we will prepay the express to any point in the U. S. A. east of the Rockies.



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Preserves the Finish



Keeps Cars New

JOHNSON'S PREPARED WAX
Liquid and Paste

Prepared Wax Liquid

Quarts	$1.40
Pints	.75
Half-pints	.50

CLEANER

Auto Size (8 oz. net) $ .35

If your dealer cannot supply you with Johnson's Prepared Wax and Cleaner we will prepay the express to all points in the U. S. east of the Rockies.



YOU can't thoroughly enjoy your car unless you are proud of it and you can't be proud of it unless it always looks clean and bright. This is a difficult problem when you consider the severe exposure—sun, wind, rain, snow, mud, dust—to which a car is constantly subjected. No ordinary furniture polish will do.

But Johnson's Prepared Wax is no ordinary polish. In paste form it has for years been the standard preparation for using on fine furniture, pianos and hardwood floors. Now the same preparation in liquid is coming into its own as the standard of automobile polishes.

Johnson's Prepared Wax Liquid is very easy to apply and polish—very little rubbing is necessary. Apply it with cloth, brush or spray. Quickly removes road oil. It preserves the varnish and protects it from the weather, adding years to its life and beauty. It covers up mars and scratches—prevents checking—sheds water and is absolutely dust-proof. A wax polish stays clean longest.

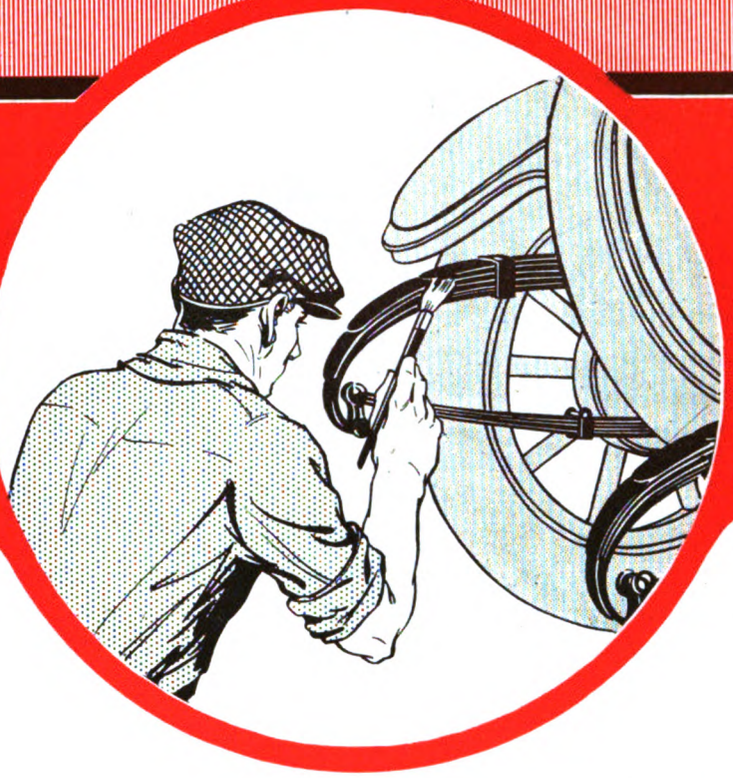
JOHNSON'S CLEANER

If your car is covered with spots and stains which washing will not remove, clean it with Johnson's Cleaner before waxing. Johnson's Cleaner really cleans. It removes spots, stains, tar, alkali, etc. Even those spots that are ground in—mud freckles—and surface scratches you thought were permanent—will dissappear like magic under Johnson's Cleaner.

S. C. JOHNSON & SON, Dept. A. RACINE, WIS.

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Makes Springs Lively



Stops Rust and Squeaks

JOHNSON'S STOP-SQUEAK OIL

STOPPING the squeaks is only one purpose of Johnson's Stop Squeak Oil. Its chief use is to make cars ride easily—to make them float instead of bump and jolt along. Its chief characteristic is its ability to penetrate—to seep in between the spring leaves as kerosene permeates a lamp-wick. It penetrates and still it acts as a heavy-bodied lubricant.

You don't have to jack up the car and pry the spring leaves apart to apply this oil. Paint it on the sides of the springs with a brush, or squirt it on with an oil can. It goes right to the spot where it is needed and stays there.

Stop-Squeak Oil prevents rust between the spring leaves. It makes them slide easily on one another so that every jolt and jar is absorbed by the springs. Reduces liability of spring breakage.

You'll never realize how sensitive and effective your springs are until you have them properly lubricated. You'll never realize what an easy riding car you have until then.

Johnson's Stop-Squeak Oil will remove squeaks of all kinds—in springs, shackle bolts, body fenders, top, etc. Just locate the squeak and touch it with Johnson's Stop-Squeak Oil.

S. C. JOHNSON & SON, Dept. A RACINE, WIS.

Quarts ..... **$ .85**
Pints ..... **.50**

Write for our booklet entitled **"Keep Your Car Young"**—we will send it to you free and postpaid. The information in this booklet will enable you to greatly improve the appearance and performance of your car.



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Mends Leaky Radiators



No Tools Required

JOHNSON'S RADIATOR CEMENT

A NEW and efficient way of mending leaky radiators is with Johnson's Radiator Cement. It is quicker more economical and more satisfactory than any other method.

Flaxseed, meal, oat meal and bran which are used by many motorists, do not actually stop leaks they merely decrease them for a short time and these substances invariably stop up the regular water passages and are very difficult to clean out.

Johnson's Radiator Cement does not clog the tubes, it finds every leak no matter what part of the radiator or connections it is in, seals it up strong from the inside making it absolutely water tight. It does not injure the radiator, connections or rubber in any way.

If you allow the radiator to leak, trouble is sure to follow. Besides with a leaky radiator it is impossible to get proper circulation of water through the cooling system, thereby causing an overheated engine, scored cylinders and numerous other troubles.

Easy To Apply

Johnson's Radiator Cement comes in liquid form and is very easy to use. First drain the radiator, mix the cement with warm water and pour into radiator, run the engine for ten minutes then every leak in the radiator, water jacket and connections will be permanently stopped. The surplus cement left in the water, closes automatically new leaks that may develop from time to time.

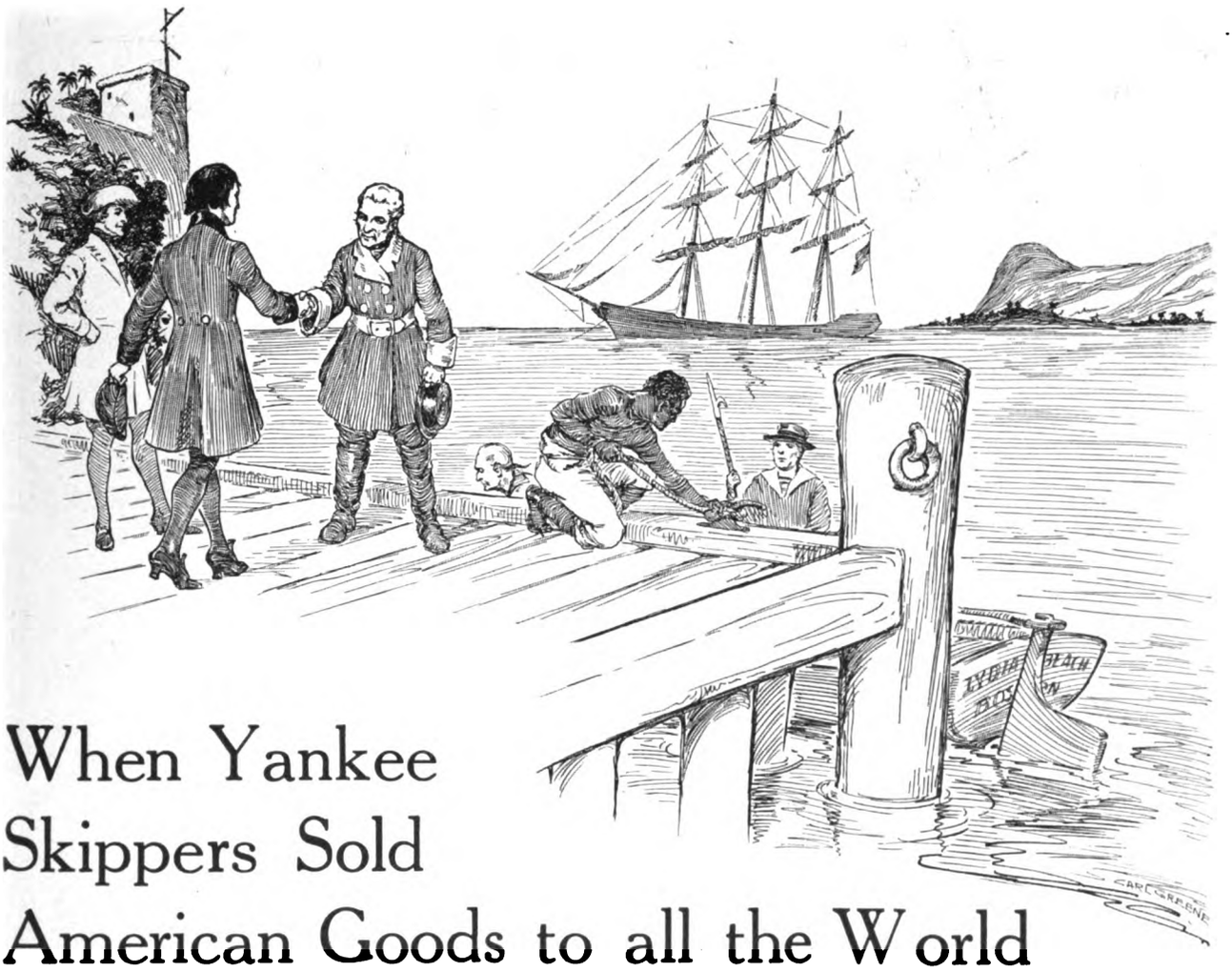
S. C. JOHNSON & SON, Dept. A RACINE, WIS.

Pints..... $1.00
Half-pints... .65

Insist upon your dealer supplying you with Johnson's Radiator Cement. Do not accept any substitute. If he is unable to supply you send your order direct to us and we will prepay the express to any point in the U.S. east of the Rockies.



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When Yankee Skippers Sold American Goods to all the World

They provided the most satisfactory export service imaginable. They trimmed off all the non-essentials in their dealings with the New England manufacturer and with their customers overseas. They paid cash for the goods they took abroad and, with their cargoes below decks, they sailed for the ports where the market was ripe.

It was their part to do the selling and adjustment of credits and exchange, leaving the American manufacturer undisturbed in the skillful production of his goods. Through the efforts of these early traders, many of our great manufacturing plants received the timely support that made them what they are today.

The Federal Export Corporation does business on this old Yankee plan. It is a ship-operating, selling and financing company, and through the magnitude of its organization it has facilities for selling motor cars, trucks or tractors that no house specializing solely in one class of goods can possess. Its commercial policy of strict compliance with local customs abroad makes it easier to introduce and maintain the sale of motor vehicles.

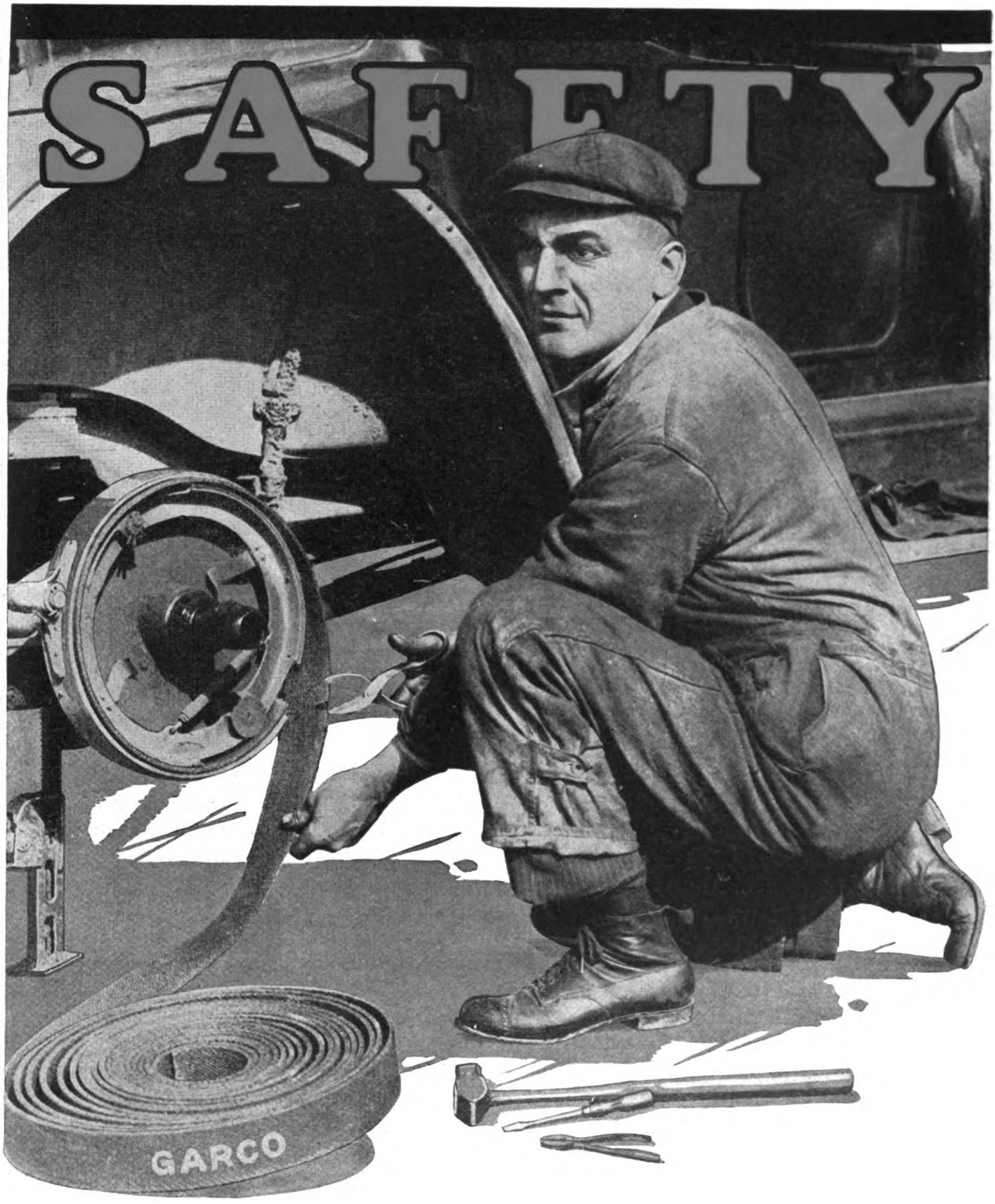
We invite your inquiry as to adapting the Fedex sales system to your own products.

AUTOMOTIVE DEPARTMENT

FEDERAL EXPORT CORPORATION

115 BROADWAY, NEW YORK

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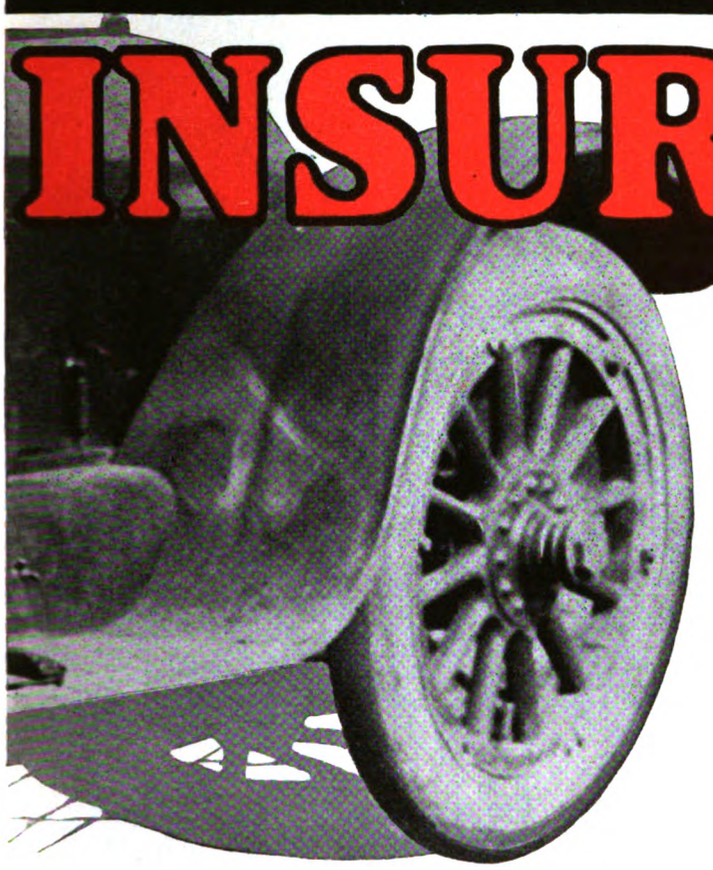


Largest Manufacturers of Asbestos Textile Products in the World

Please mention Automotive Industries when writing to Advertisers

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INSURANCE



DONT think of the brake lining you sell as representing merely a certain sale—a certain profit. Look past this to the big, vitally important purpose that brake lining must serve and to the responsibility it must assume. And think in how great degree this responsibility comes back to you!

GARCO BRAKE LINING

is real *Safety Insurance*. It is an essential. And because it protects the life of the man who drives a car the question of price does not altogether determine his choice. Garco Dealers make fair profits because they do not have to cut the price.

Garco does not fail. Our pledge of highest quality is back of every foot of it. Solidly woven from high grade long-fibre asbestos; re-enforced by hundreds of brass wires woven into each foot, Garco holds with giant grip down to the last shred.

Back of Garco Brake Lining we have put an unusually complete line of sales helps supplied to all dealers free of charge. Write us today—let us tell you about them.

Garco Brake Lining is sold by all Jobbers. Ask yours to quote you on your requirements. We also manufacture a full line of asbestos automobile specialties, Transmission Lining for Fords, etc.

GENERAL ASBESTOS & RUBBER CO., MAIN OFFICES and FACTORIES **Charleston, S. C.**

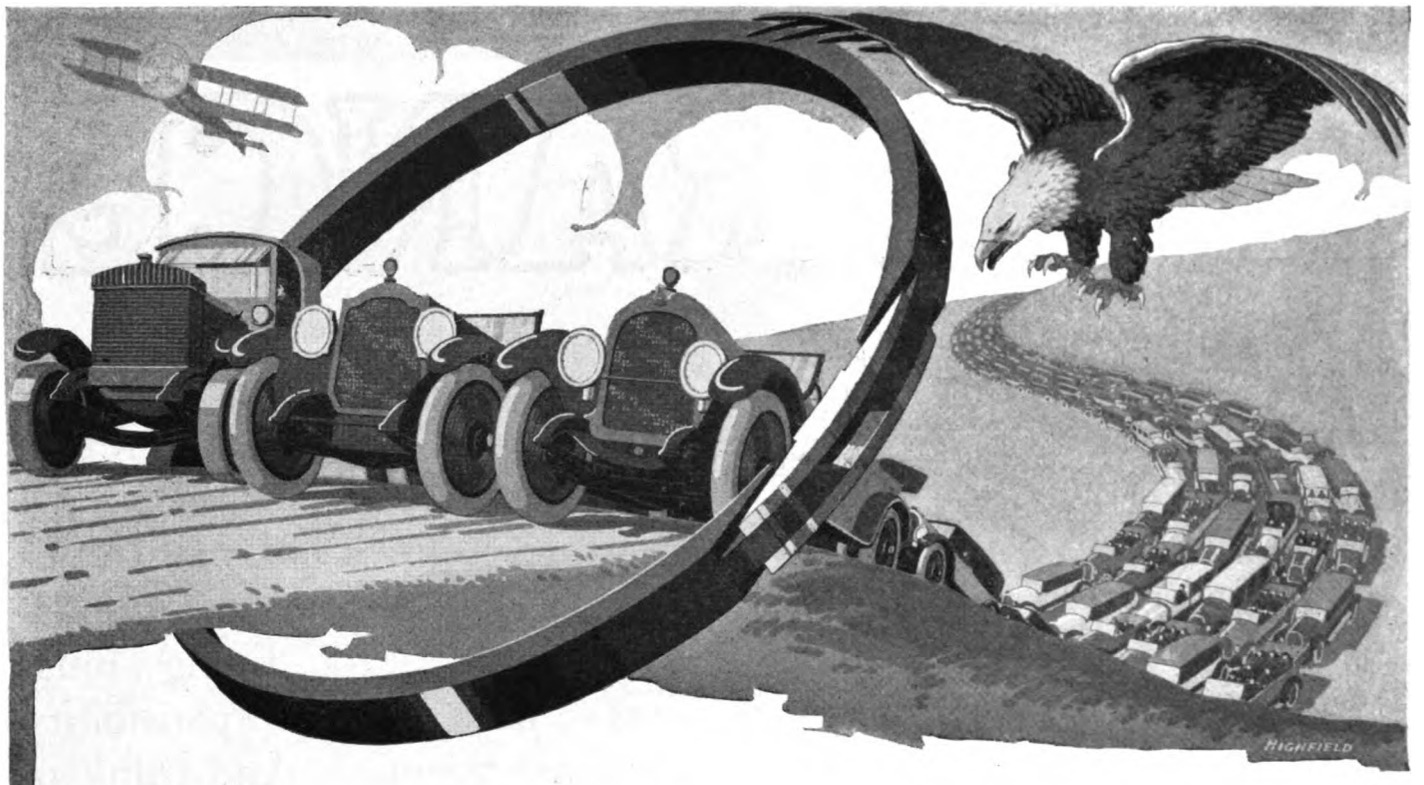
Branches and Complete Stock: 58 Warren Street, New York · 311 Water Street, Pittsburgh
106 West Lake Street, Chicago

Pacific Coast Distributors, HUGHSON & MERTON, INC., 77 O'Farrell Street, San Francisco,
LOS ANGELES, 1229 South Olive Street · PORTLAND, 326 Ankeny Street · SEATTLE, 806 East Pike Street

cturers o estos ex ro icts e o

Please mention Automotive Industries when writing to Advertisers

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The Piston Ring That Guarantees Satisfaction

WHEN you equip a car with Burd High Compression Piston Rings, you know you have made a satisfied customer. No motor car owner can fail to note the improvement these rings have made in his motor car's performance. He finds his car has more power than it ever had before. It uses less gasoline and oil. It has more speed and compression. The cylinders are never choked with carbon.

BURD High Compression Piston Rings

Burd High Compression Piston Rings cannot leak. They enable the motor to deliver every possible bit of generated power.



The Burd Guarded Opening makes Burd Rings fit tight and ***stay*** tight. There is no gap through which the power can escape as in the ordinary rings.

At all times, the rings are in perfect contact with the cylinder walls. ***The guard seals the power in the cylinders.***

This Guarded Opening is a patented feature. No other ring has it. No other ring ***can*** have it.

And if you want your customers to get the extra power, economy, and complete satisfaction from their cars that this Guarded Opening makes possible, you must equip their cars with Burd High Compression Piston Rings.

BURD HIGH COMPRESSION RING COMPANY
Rockford, Ill.

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The Advertising Service That Guarantees Sales

A NATION-WIDE advertising campaign, supplemented by a complete dealer service, tells motor car owners just where Burd Rings excel and why. This nation-wide campaign will educate motor car owners to the necessity of selecting their piston rings with the greatest care, and will also sell them Burd High Compression Piston Rings.

BURD High Compression Piston Rings

The first full-page advertisement appeared in The Saturday Evening Post on January 5th.

This will be followed with other full-page, equally forceful and selling advertisements.

But our dealer service does not stop there. It goes much farther.

A supplementary dealer advertising service, including booklets, letters, wall cards, show case displays, etc., is furnished you absolutely free.

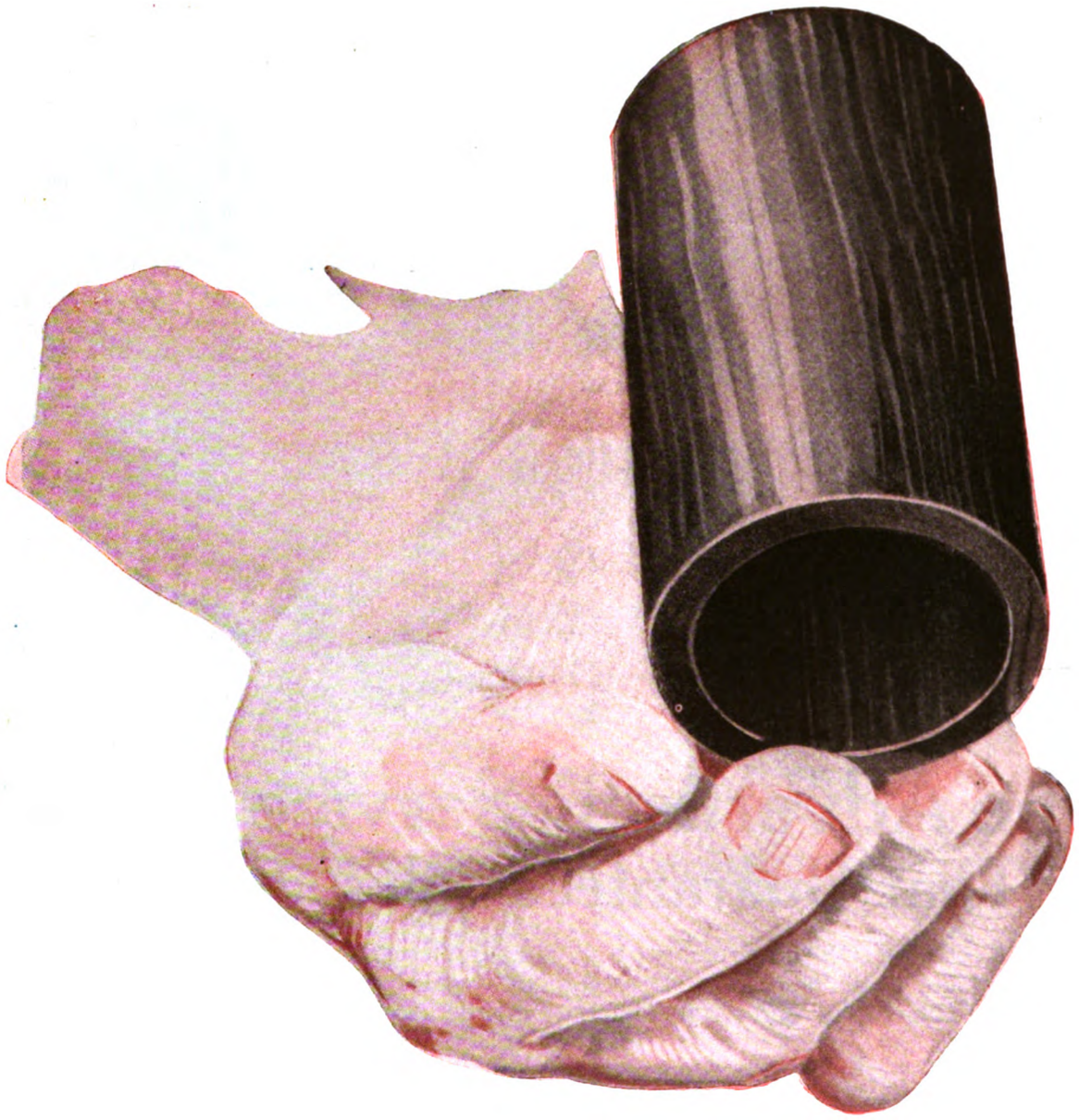
Accessory dealers and garagemen are every day finding more motor car owners insisting on BURD Piston Rings.

Many more thousands are bound to be won over by our nation-wide campaign. Are you ready to meet this insistent demand? If not, write your jobber, or direct to us today for full information and prices.



BURD HIGH COMPRESSION RING COMPANY
Rockford, Ill.

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NIGRUM

TRADE MARK REG. U. S. PAT. OFF.

IMPREGNATED WOOD OIL-LESS BUSHINGS

YOU see illustrated on these pages two different kinds of *self-lubricating* bushings.

They are everywhere known by machinery-wise men as "Genuine Graphited *Oil-less* Bushings."

Millions are installed each year in hundreds of widely different types of machinery.

They are used and endorsed by the United States Government for use in Battleships, Destroyers, Submarines and Aeroplanes.

They are used and endorsed by the leading manufacturers of automobile trucks, passenger cars, airplanes, tractors, pumps, windmills, gas engines, farm, textile, shoe, mine, confectionery and many other types of machinery.

Truck and Car Manufacturers are using these Oil-less Bushings in certain places about their products. They find this a very practical method of prolonging the service life of those products, for the following reasons:

Grease and Oil Cups are placed on bushings for the obvious purpose of oiling them. A Bushing that fails to receive proper lubrication wears out quickly.

It is not a question of how good the bushing is or how carefully it is installed. If it is not kept properly lubricated, it will wear out *fast*, thereby causing the owner considerable annoyance, possible accident, and frequent overhauling expenses.

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BOUND BROOK

TRADE MARK REG. U. S. PAT. OFF.

GRAPHITE AND BRONZE OIL-LESS BUSHINGS

There are many bushing places about motor cars and trucks which are continually liable to neglect because of their inaccessible location.

As a matter of fact, three out of four drivers do neglect to keep the vital, but inaccessible, bushings properly lubricated.

So, far sighted manufacturers use *oil-less* bushings at such inaccessible points—bushings that run smoothly and last a long time with or *without* continuous lubrication, and *in spite of* neglect.

Genuine Graphited Oil-less Bushings safeguard machinery. They contain within themselves sufficient lubricant to last their lifetime. Oiled or not oiled, attended to or neglected, they continue to run smoothly and efficiently, keeping machinery on the job, in good order, that otherwise might be held up or completely out of service.

All Genuine Graphited Oil-less Bushings have always been made at Bound Brook, U. S. A.

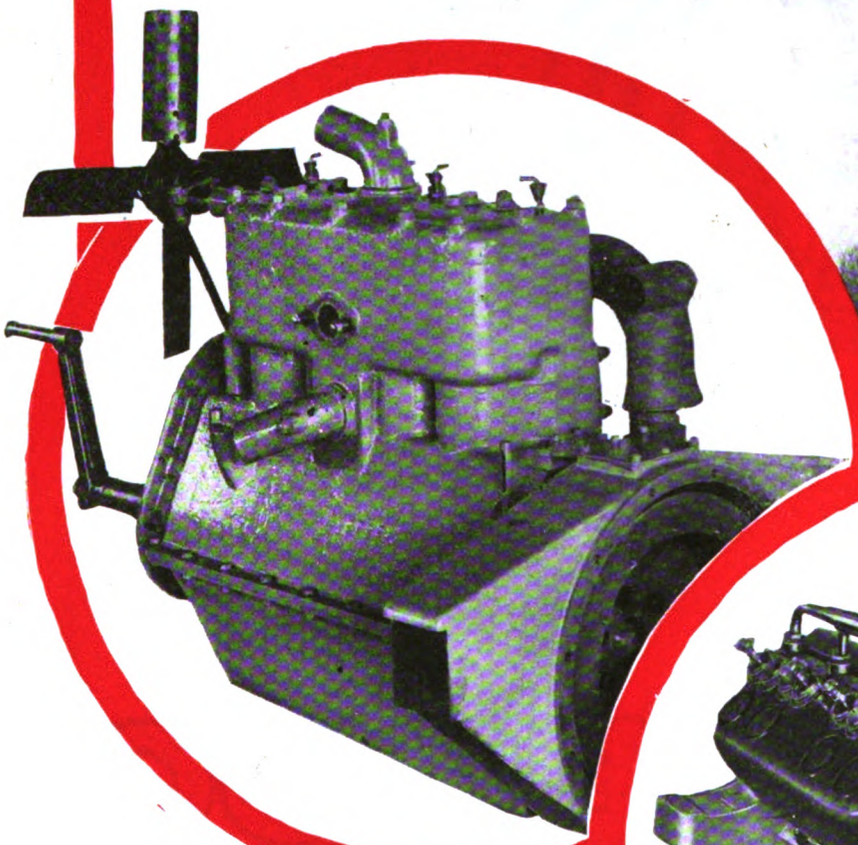
Bound Brook Oil-less Bearing Company

Specialists in the manufacture of Oil-less Bushings for more than a Third of a Century

Bound Brook, New Jersey

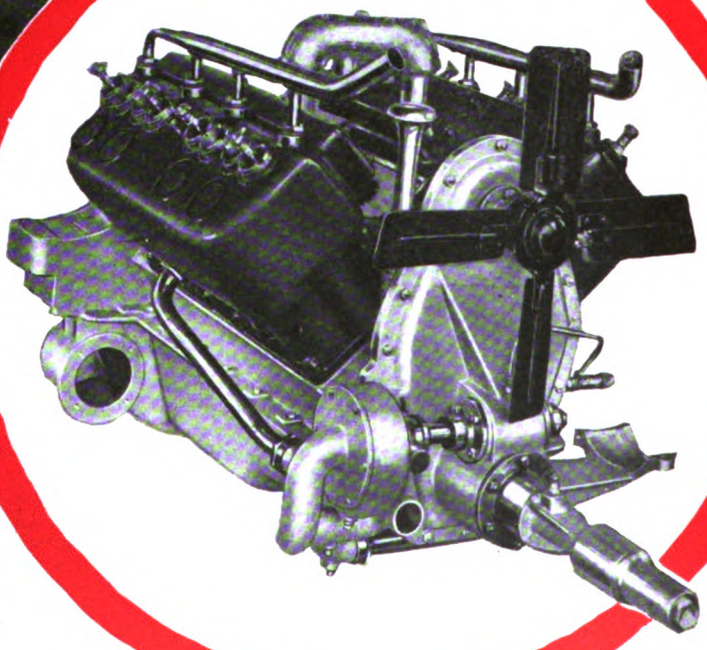
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SPIL



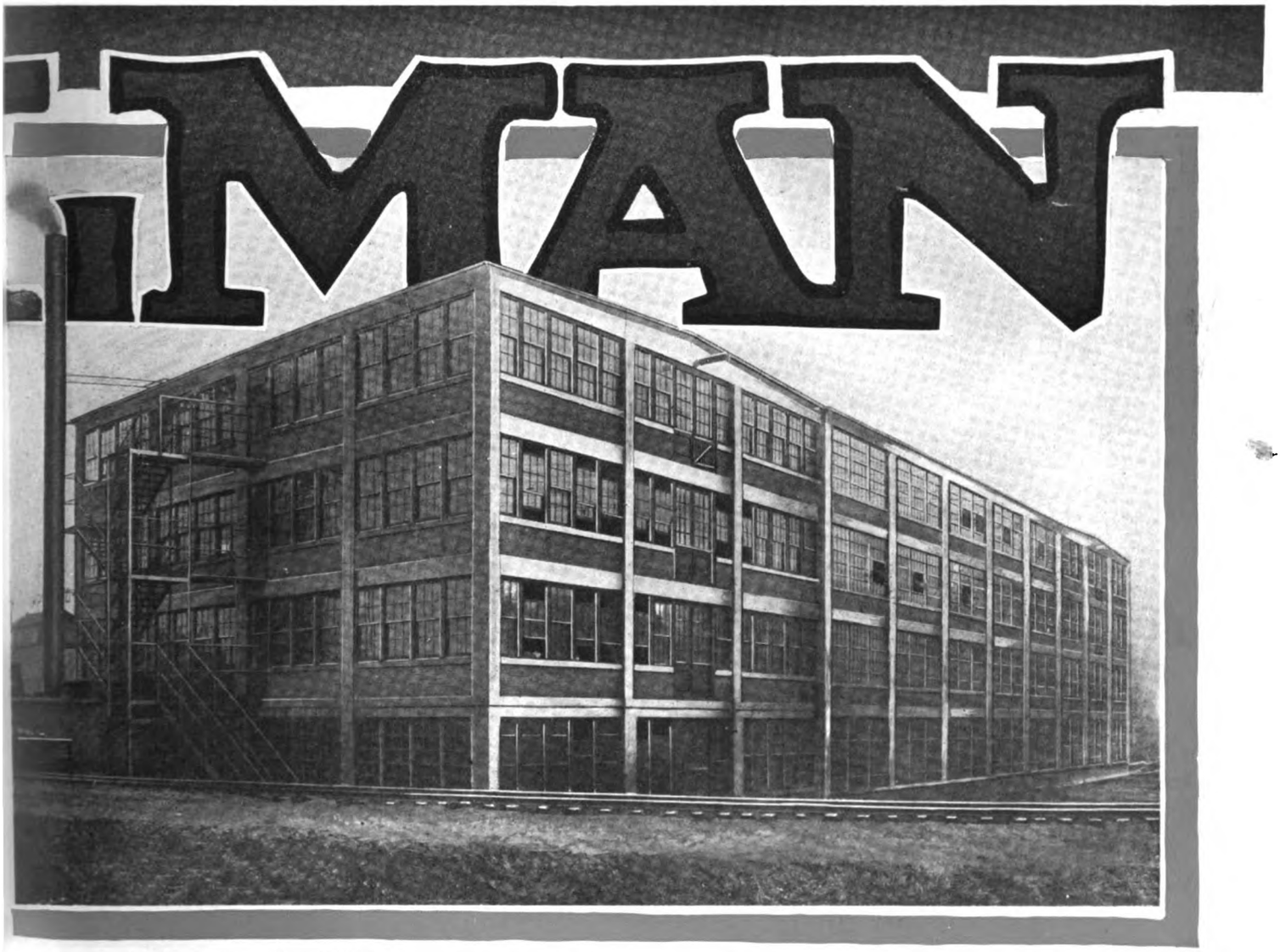


The Spillman "4." For speed, flexibility and hill climbing, unequalled by any other motor in its class



The Spillman "8." This motor has brought the 8-cylinder reputation up to its present high standard of excellence

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Partial view of the Herschell-Spillman plant at North Tonawanda, N. Y. There has been no time during the last 18 months when some new addition to our plant was not under construction

Spillman Motors reflect in full measure today's supreme accomplishment in the development of gasoline engines for passenger cars and kerosene commercial vehicles.

Great power—flexibility—absolute lubrication in Spillman Motors are facts—not approximations.

No disappointments are built into a Spillman Motor

HERSCHELL-SPILLMAN COMPANY

North Tonawanda, New York

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Make Your Ford "Ride Like a Young Packard"

"WE find them eminently satisfactory, making a Ford ride like a young Packard." Those are the words of one enthusiastic user of Aitchandee Shock Absorbers. Another says, "If every Ford owner would try your Absorbers for fifty miles over rough roads, I venture to say you would be unable to fill your orders."

"Save tires, and enough wear and tear on the car to pay for themselves in the first three or four months," says an Aitchandee owner in Brooklyn, New York. A Tennessee man says, "My Ford rides like a car with a long wheelbase, equipped with your Shock Absorbers."

Over 150,000 Ford owners are enjoying the advantages of the Aitchandee.

How about you?

Can you afford to suffer the discomfort, to wear out tires, to weaken your Ford, when Aitchandee Shock Absorbers would, at small cost, immediately change the entire situation?

AITCHANDEE

"TRADE-MARK REGISTERED"

Shock Absorbers

On the Ambulances in France

Back of the lines, where roads are broken up by shell holes, Aitchandee Shock Absorbers on the ambulances are protecting wounded soldiers against the jolts and jars. Aitchandee Shock Absorbers never would have been used unless their merit had been proved beyond question.

Why don't *you* take advantage of Aitchandee comfort?

The cantilever principle, first developed in Aitchandees, gives a different tension on the upward and downward thrust.

This Aitchandee cantilever eliminates a sharp rebound. The Aitchandee cantilever carries the body forward on practically a straight line while the wheels follow the contour of the road.

That is why the Aitchandee Shock Absorbers make a Ford ride like a long wheelbase — Pierce-Arrow, Locomobile and Packard.

Make *your* Ford ride like a car with a wheelbase of 140 or 150 inches.

Ask for the facts today. Read below.



"Iron" the Roads for Fords

When you put Aitchandees on your car, you've made it over as far as comfort is concerned. Just a few hundred yards driving anywhere will convince you. Whether you test Aitchandees on rough roads or city pavement, *you'll notice the difference.*

Why don't you put Aitchandee Shock Absorbers on your car? The expense is practically nothing when you consider the results in comfort, tire saving, and protection to the mechanism of the car.

Remember that Aitchandee Shock Absorbers have tremendous endurance. The springs are made of the best spring wire steel. Specially annealed malleable iron affords practically unbreakable arms. Lock bolt construction makes oiling unnecessary. Aitchandees are easily applied. No holes to bore. Appearance of car is not marred. Aitchandees once on are scarcely visible.

Hundreds of Miles More From Every Tire

Vibration and shocks are so perfectly absorbed by Aitchandees that the tires have less strain and consequently last longer. Aitchandees will quickly save their cost in tire protection alone.

And tires are a bigger item than ever before in the operation cost of your Ford.

Make Your Ford Last Longer

through the cushioning effect of Aitchandees.

Road gulleys and ruts destroy the finest steel. Motor, bearings, transmission, all suffer.

But Aitchandees reduce these hammer blows so that the Ford stands up better. Fewer breakdowns, lowered repair cost, longer life. 150,000 other Ford owners know this to be true. You must equip with Aitchandee Shock Absorbers if you really want to get the longest service from your Ford.

WRITE—We'll Put Big Car Comfort Into Your Ford—Get Facts—No Obligation

Find out at once what Aitchandee Shock Absorbers will do for you. A postal will bring you the facts. We'll prove to you Aitchandee results *conclusively.* If we don't you're under no obligation in any way.

We'll tell you where you can inspect Aitchandee Shock Absorbers and see for yourself how they operate and why they give greater comfort, economy and long life to your Ford. Write us at once.

The H. & D. Co., Inc., Goodland, Indiana

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STUDEBAKER

Presents

THREE NEW CARS

The Four - The Light Six - The Big Six

Beautiful in design
Thoroughly modern
Mechanically right



The BIG SIX

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THE NEW SERIES 19 STUDEBAKER CARS, in three models, embody our long experience together with the latest and greatest achievements of some of the ablest and most experienced engineers and production experts in the automobile industry. These cars are *new throughout*, with improved motors, intermediate transmission, new axles, bodies, tops, windshields, radiators, hoods, fenders, etc. They are beautiful in design, thoroughly modern and mechanically right.

Before finally approving these cars for production, experimental models of each car were driven 30,000 miles under the severest conditions, through the mountains and country roads of the United States and Canada, and finally over the Chicago Speedway. Never were we better satisfied with the performance of any cars, in power, speed, endurance and riding comfort. To make assurance doubly sure, the experimental cars, now running on the Chicago Speedway, will be kept running continuously until they negotiate 50,000 miles or more, about twice the distance around the earth. These cars are the masterpieces of the Studebaker organization.

The new cars include three models, all entirely different and each with an individual appeal. *We know* these cars will give our customers maximum service and economy, with practically no expense for repairs except from wear and tear or in the case of accidents.

The LIGHT-FOUR Five-Passenger, shipping weight 2,400 lbs., wheelbase 112 inches, tires 32"x3½", 35 H.P. motor, 3½"x5", hot spot manifold, intermediate transmission, improved semi-floating rear axle, Studebaker blue body finish, applied in twenty-four operations, French plaited upholstery. Price for touring car or roadster, $895 f.o.b. Detroit.

The LIGHT-SIX Five-Passenger, shipping weight 2,800 lbs., wheelbase 119 inches, tires 32"x4", 50 H.P. motor, 3½"x5", hot spot manifold, intermediate transmission, improved semi-floating rear axle, either blue or maroon body finish, applied in twenty-four operations, French plaited upholstery. Price for touring car or roadster, $1295 f.o.b. Detroit.

The BIG-SIX Seven-Passenger, shipping weight 3,000 lbs., wheelbase 126 inches, tires 33"x4½", 60 H.P. demountable head motor, 3⅞"x5", hot spot manifold, intermediate transmission, improved semi-floating rear axle, either chrome green or maroon body finish, applied in twenty-four operations, French plaited upholstery. Price for touring car, $1695 f.o.b. Detroit.

During 1915, 1916 and again in 1917, more Studebaker cars were registered and operated in the city of Detroit—the city which knows automobiles and the standing of manufacturers—than any other make of car selling over $500. The lesson is obvious.

Studebaker factories at Detroit, South Bend, Chicago and Walkerville, occupy 168 acres, contain 4,704,118 square feet of floor space, and represent an investment of over $15,000,000. There are no "assembler's" profits in the prices of Studebaker automobiles, because we design and manufacture our parts in our own plants, saving our customers from twenty to thirty per cent.

We commend these cars to the public and seek their patronage, in confidence that they will be entirely pleased with their purchase.

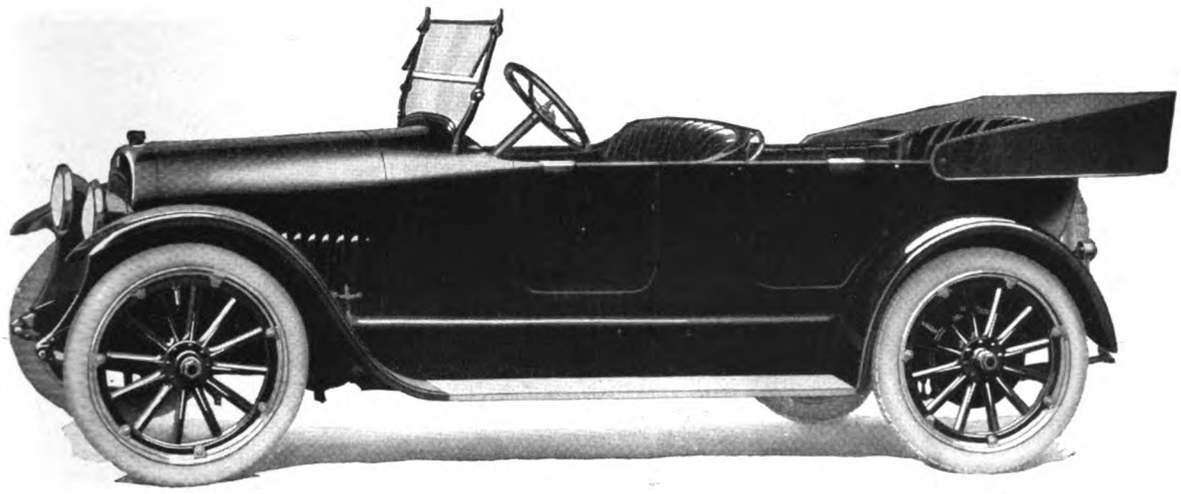
THE STUDEBAKER CORPORATION OF AMERICA,

A R Erskine

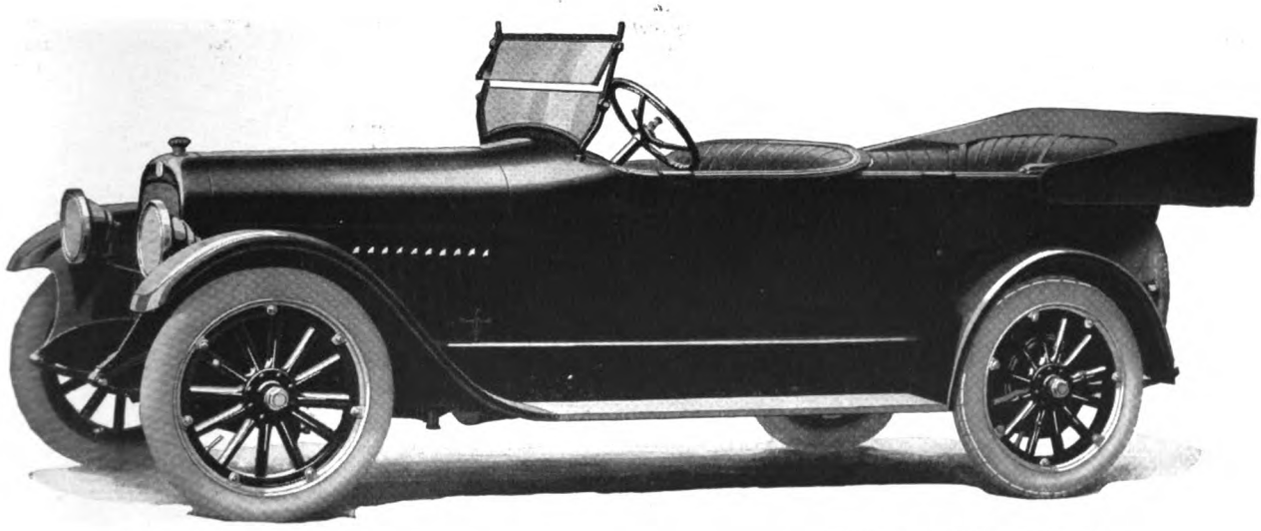
President.

South Bend, Indiana,
January 3d, 1918.

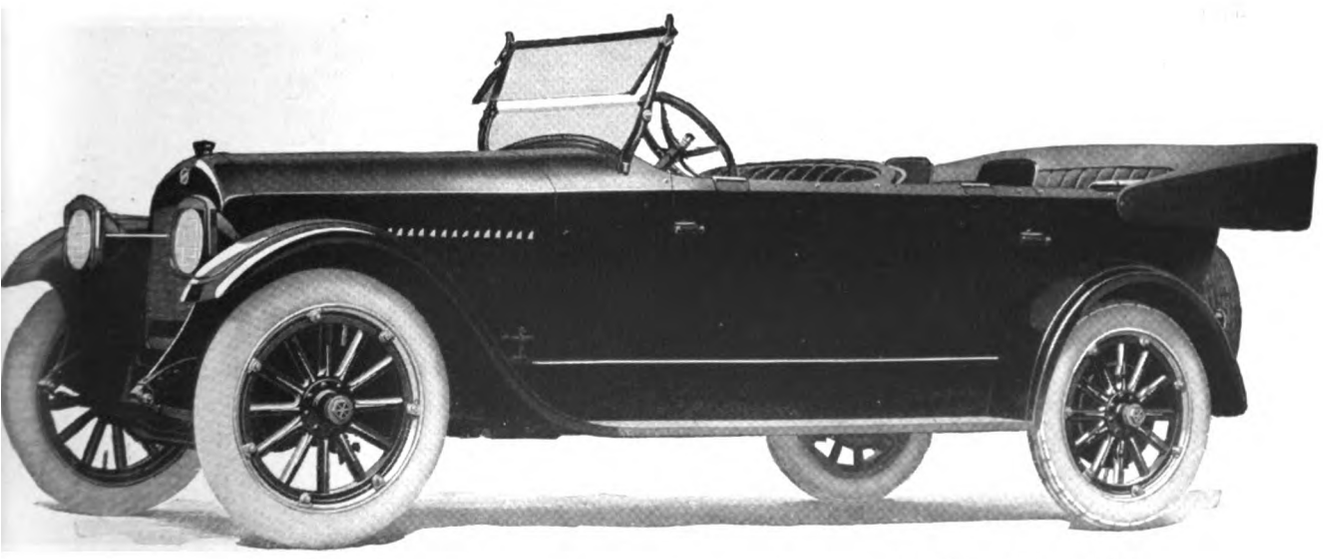
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The FOUR

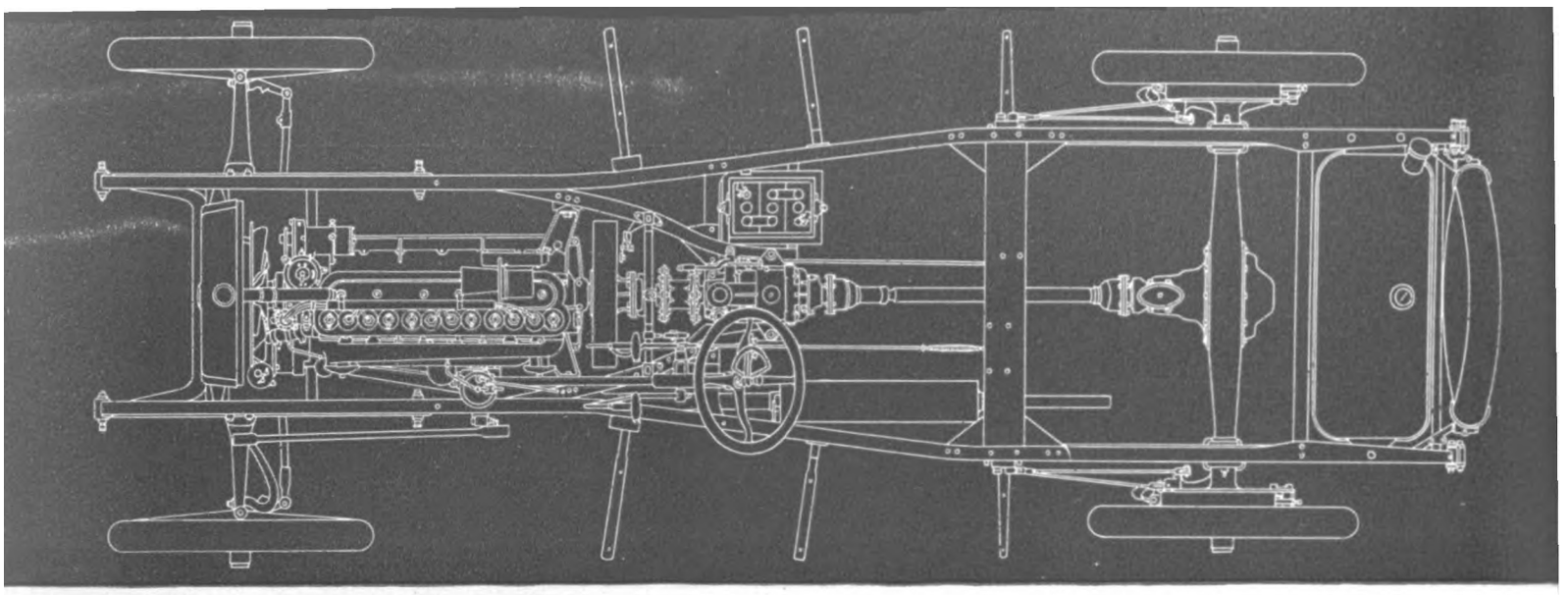


The LIGHT-SIX



The BIG-SIX

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SPECIFICATIONS—Series 19—Studebaker Cars

The FOUR

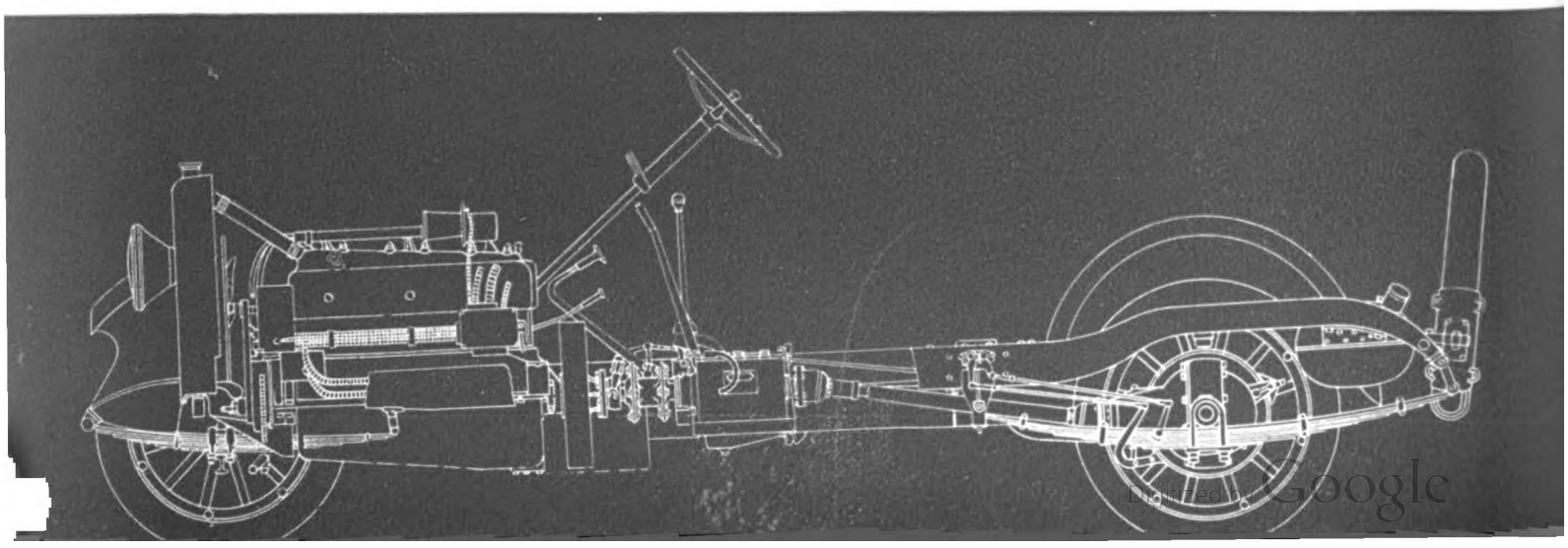
Seating Capacity, five passengers. *Wheelbase*, 112 inches. *Motor*, four cylinders, cast en bloc, L-head type, 3½" x 5"; 35 h. p. *Lubrication*, splash and positive distribution. *Cooling System*, centrifugal force pump circulating system; tubular radiator; 18", six-blade fan. *Carburetion*, Schebler carbureter, with new type hot spot intake manifold. *Gasoline System*, 14-gallon tank in rear; vacuum feed. *Electric System*, two-unit Studebaker-Wagner. *Ignition*, generator-storage-battery ignition, with Remy coil and distributor. *Electric Lights*, large headlights with improved deflecting and diffusing lenses, speedometer light, tail light. *Clutch*, aluminum leather-faced cone clutch with dampening brake. *Transmission*, intermediate—three speeds forward, one reverse. *Gear Ratio*, 4 to 1. *Rear Axle*, Studebaker, improved semi-floating, spiral bevel gear drive, full Timken bearing equipment. *Drive*, Hotchkiss. *Springs*, front and rear semi-elliptic; front 34½ x 1¾, 7 leaves; rear, 50¼ x 2, 7 leaves, underslung. *Tires*, 32 x 3½; safety tread on rear. *Fenders*, heavy pressed steel, crowned. *Upholstery*, French plaited. *Top*, leatherized, one-man type; Blackmore storm door curtains. *Equipment*, rain vision slanting windshield; 3½" carpet-covered footrest in tonneau; complete set of tools; electric horn; electrically-lighted instrument board on which are mounted Stewart-Warner Speedometer—driven from propeller shaft—oil indicator, ignition and lighting switch, carbureter adjusting devices; combination nickel robe and hand rail extending full width of front seat; gasoline gauge on tank in rear. *Color*, Studebaker blue. *Price* for touring car or roadster, $895 f.o.b. Detroit.

The LIGHT-SIX

Seating Capacity, five passengers. *Wheelbase*, 119 inches. *Motor*, six cylinders, cast en bloc, L-head type; 3½" x 5"; 50 h. p. *Lubrication*, splash and positive distribution. *Cooling System*, centrifugal force pump circulating system; tubular radiator; 18", six-blade fan. *Gasoline System*, 17-gallon tank in rear. Vacuum feed system. *Carburetion*, Schebler carbureter, with new type hot spot intake manifold. *Electric System*, two-unit Studebaker-Wagner. *Ignition*, generator-storage-battery ignition, with Remy coil and distributor. *Electric Lights*, large headlights with improved deflecting and diffusing lenses, speedometer light, tail light. *Clutch*, aluminum leather-faced cone clutch with dampening brake attachment. *Transmission*, intermediate—three speeds forward, one reverse. *Gear Ratio*, 4 to 1. *Rear Axle*, Studebaker improved semi-floating, spiral bevel gear drive, full Timken bearing equipment. *Drive*, Hotchkiss. *Springs*, front and rear semi-elliptic; front, 38 x 2, 7 leaves; rear, 56 x 2, 8 leaves, underslung. *Tires*, 32x4; safety tread on rear. *Fenders*, heavy pressed steel, oval crown design. *Upholstery*, French plaited. *Top*, leatherized one-man Gypsy type, bevel French plate glass windows in rear; Blackmore storm door curtains. *Equipment*, rain vision slanting windshield; 3½" carpet-covered footrest in tonneau; complete set of tools; electric horn; electrically-lighted mahogany instrument board on which are mounted Stewart-Warner Speedometer—driven from propeller shaft—oil indicator, ignition and lighting switch, carbureter adjusting devices; combination nickel robe and hand rail extending full width of front seat; mahogany glove box, with lock, in back of front seat; gasoline gauge on tank in rear. *Colors*, choice of blue or maroon. *Price* for touring car or roadster, $1295 f.o.b. Detroit.

The BIG-SIX

Seating Capacity, seven passengers. *Wheelbase*, 126 inches. *Motor*, six cylinders, cast en bloc, L-head type, demountable head; 3⅞" x 5"; 60 h. p. *Lubrication*, splash and positive distribution. *Cooling System*, centrifugal force pump circulating system; tubular radiator; 18" six-blade fan. *Gasoline System*, 17-gallon tank in rear. Vacuum feed. *Carburetion*, Ball & Ball carbureter, with new type hot spot intake manifold. *Electric System*, two-unit Studebaker-Wagner. *Ignition*, generator-storage-battery ignition, with Remy coil and distributor. *Electric Lights*, large headlights with improved deflecting and diffusing lenses, speedometer light, tonneau light with convenient extension; tail light. *Clutch*, aluminum leather-faced cone clutch with dampening brake attachment. *Transmission*, intermediate—three speeds forward, one reverse. *Gear Ratio*, 3.7 to 1. *Rear Axle*, Studebaker improved semi-floating, spiral bevel gear drive, full Timken bearing equipment. *Drive*, Hotchkiss. *Springs*, front and rear semi-elliptic; front 38" x 2", 8 leaves; rear, 56" x 2", 9 leaves, underslung. *Tires*, 33" x 4½"; safety tread on rear. *Fenders*, heavy pressed steel, distinctive crown design. *Upholstery*, French plaited. *Top*, leatherized one-man Gypsy type, bevel French plate glass windows in rear; Blackmore storm door curtains. *Equipment*, rain vision slanting windshield; 3½" carpet-covered footrest in tonneau; complete set of tools; electric horn; electrically-lighted mahogany instrument board on which are mounted Warner Speedometer—driven from propeller shaft—oil indicator, ignition and lighting switch, carbureter adjusting devices, ammeter and Waltham clock, combination nickel robe and hand rail extending full width of front seat; mahogany glove box with lock, on back of front seat; gasoline gauge on tank in rear. *Colors*, choice of chrome green or maroon. *Price* for touring car, $1695 f.o.b. Detroit.



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The Everlasting Battery

Never before in the history of the automobile industry has there been offered a battery with such an inherent capacity for long, satisfactory service.

PERMALIFE BATTERIES, in every process of manufacture, from the forming of the specially designed lead grids to the last thorough test in the Permalife Laboratory, bespeak permanency.

THE LIFE OF A BATTERY is in the plates and here lies the fundamental reason for Permalife superiority.

PERMALIFE PLATES are *packed—not pasted*—with an active material of such density as to make them well-nigh indestructible. And yet, this active material presents a surface to the electrolyte which insures quick and free chemical action—and a resultant rapid current output.

The **harmful sulphation,** which is the prevailing disease among other makes, **is completely prevented in Permalife Batteries.** Barring abusive treatment Permalife Batteries are positively non-sulphating.

DEALERS—The Permalife merchandising plan presents a unique opportunity to capture and keep the bulk of your local battery business. It is of vital importance to you because it insures a permanent battery service to your patrons and gives you their permanent patronage.

Let us show you the profit getting possibilities of Permalife.

Write for this AT ONCE

Permalife Storage Battery Co., Inc.,
POUGHKEEPSIE, N. Y.



Permalife
LASTS FOREVER

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COE-STAPLEY

Our Announcement

COE-STAPLEY is a name well and favorably known to car manufacturers and the large jobbers because of its many years of straight dealing.

Previously, all our attention has been devoted to supplying good hand pumps to large-volume buyers—principally car makers.

With this announcement we enter the jobbers' field, intending to do business with all recognized jobbers on a basis justified by their requirements.

We shall sell only to jobbers—because we feel that through jobbing channels we find the most economical means of distribution. Thus our merchandise will cost both dealer and consumer less.

We shall co-operate with all of our jobbers by advertising to the dealers, who are the jobbers' *consumers*—and to car owners throughout the country.

We shall co-operate even more intelligently, however, with all four factors in the distribution of automobile accessories—manufacturer, jobber, dealer and consumer—by selecting the articles we shall manufacture and sell on the basis of demand, suitability, novelty, appearance and economy.

For the rest, the Coe-Stapley Mfg. Corporation is an organization whose financial resources are, for all practical purposes, unlimited, and whose manufacturing requirements will be amply taken care of by our splendidly equipped plants at Bridgeport, Conn., and Brooklyn, N. Y.

We shall soon present to the trade a diversified line—our pumps, a jack and several other items we have in view. The first item for which we ask your consideration is presented on the opposite page. We selected the Peteler Auto Jack from the field as the one lifting jack whose design, quality and future warranted us in putting behind it the reputation, the resources and the selling effort of the Coe-Stapley organization.

E. B. Shoemaker

Secretary-Treasurer.

Coe-Stapley Mfg. Corporation

Executive Offices: 115 Broadway, New York

Factories: Bridgeport, Conn., and Brooklyn, N. Y.

See us at the New York Show—Space D-13, Grand Central Palace, Jan. 6-13, 1918

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Manufacturing Corporation

$6 for the best Jack in the world

Peteler AUTO JACK

$6 for the best Jack in the world

The new Peteler Jack is the best Jack in the world—even better than the previous model Peteler Jack.

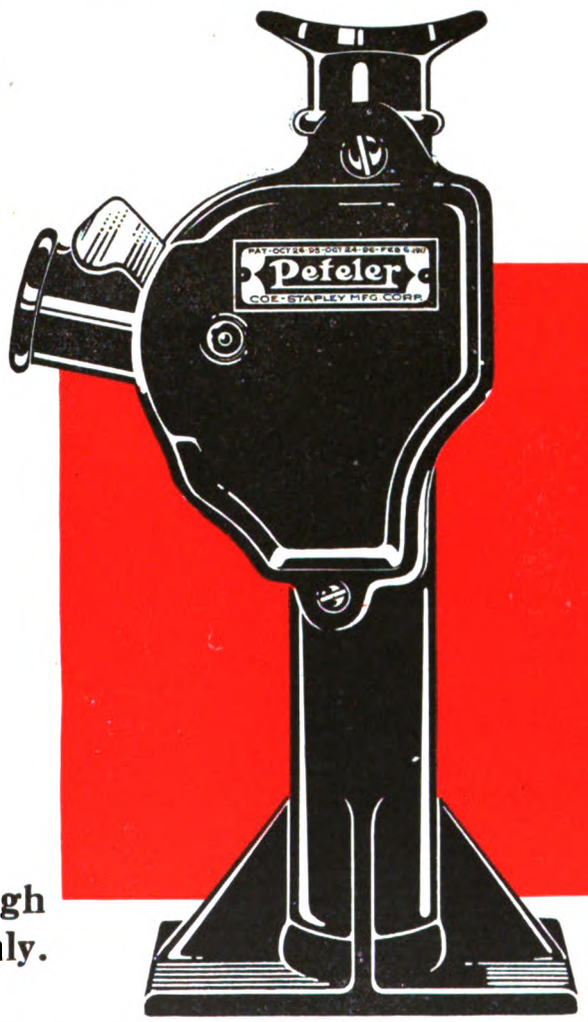
It's simple—a few moving parts and nothing to get out of order.

It's sturdy—the working parts are of the finest tool and cold rolled steel, the case of malleable iron.

It's powerful — capable of raising 3000 lbs.—a half ton of overstrength.

It's efficient—does everything a Jack could be asked to do and without effort.

It's fast—and no waste of time.



The Peteler Jack is greatest in action.

It has a long telescoping handle—can be slid under the car without kneeling.

It has a short stroke—can be slid way under and yet operated.

It raises the load easily—quickly.

It lowers with the same facility—a simple turn of the handle operates a pinion and reverses from the upward to the downward action.

Relieved of the load—a lift of the handle allows the rack to drop down and the Jack can be withdrawn.

The best Jack in the world.

Sold through jobbers only.

Orders filled in rotation.

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Read What Car Owners Say:

Rev. H. Voisin, Red Deer, Albta, Canada.
So far your carburetor has given me good satisfaction; several times I have averaged 30 miles to the gallon. Sept. 17, 1917.

Methodist Episcopal Church, Gustave A. Frodle, Pastor, Blunt, South Dakota.
Some time ago I ordered a Ford size carburetor from you. After a good test I find it to be THE Carburetor. Sept. 8, 1917.

W. T. Thompson, Maricopa, Cal.
I have purchased one of your carburetors and I like it fine and would like to take the agency for them for the State of California or if not for the whole state would like for Kern County. Please send me your lowest price and all your particulars as soon as possible as I have three sales in view. August 30, 1917.

P. H. Grace, Los Angeles, Cal.
The carburetor received and I make 35 miles to the gallon of distillate. Sept. 12, 1917.

Chas. H. Wishmeier, Indianapolis, Ind.
Carburetor received and after attaching on Saturday last I drove the car 128½ miles, part of this trip through Brown County, the hilliest part of Indiana. Almost all the hills were very rough, making it impossible to attempt them on high, one especially being three miles over, took us a half hour to cross, all of which was run on low. I was following a friend of mine who also had a Ford standard carburetor and found that when we came to a hill where the roads were good I would have to lie back about a quarter of a mile behind him, as even with this distance between us I would almost always catch him before he got to the top, then have to follow him up the rest of the way on low. My wife used to be afraid of every little hill but after putting on the SUNDERMAN she said she is willing to go any place now. When we got home after this 128½ mile run I found that I had used just 5 gallons of gas, almost 26 miles per gallon. I certainly was well pleased as I made no effort to run the car to save gas. The best I have ever done before was 22 miles per gallon all on a level road. August 6, 1917.

Edw. G. McCarthey, Denver, Colo.
I received and installed your carburetor yesterday; after two hours test I found it to be just as you claimed. I would like your agency proposition as I have a large order for you.
Sept. 18, 1917.

John L. Bradley, 243 W. 50th St., N. Y. C.
Since having your carburetor attached to my car I have increased mileage very near double, that is from about 14 I was getting to close to 28 miles with it on. I have out of necessity had to put this car through the severest tests demonstrating our shock absorbers, and you can see from this that the saving in gasoline alone is really remarkable, and with this the increased power I have received makes it an *ideal* carburetor. Sept. 28, 1917.

Standard Poster Advertising Co., E. T. Broderick, Gen. Mgr., New Rochelle, N. Y.
I want to say right here if it wasn't the best I could find, price and all considered, that I would not have anything to do with it, and here in New Rochelle I have an Oakland 40 and three Fords using the carburetor and in Peekskill two Fords, and am anxious to get it on the Cadillac.
Oct. 10, 1917.

W. H. Fisher, Grand Rapids, Mich.
The writer has now used one of your carburetors a little over one year and am more than pleased with the results as I am getting very good mileage, and it gives me more power and speed. Made a trip down in Ohio a couple of weeks ago and averaged a little better than 27 miles to the gallon. Oct. 17, 1917.

R. F. Sturgeon, Empress, Alberta, Canada.
The carburetor you sent me is doing great work. Have got as high as 30 miles on a gallon with my 1913-Buick. I used to think I was doing fine if I got 15 miles out of the old one. I just put in new cylinders in the car as the old ones were scored, so there is no telling what I will get now, as I made the 30 with the scored cylinders. I made one trip 155 miles actual mileage (not speedometer) on 5 gallons (Imperial) of gasoline with three badly scored cylinders and a lot of oil working through above the pistons. Am perfectly satisfied with the carburetor. Sept. 20, 1917.

Elmer McKee, Richmond, Indiana.
I am using one of your carburetors with very good satisfaction on a Lexington car.
Oct. 25, 1917.

D. Q. Johnson, Santa Rosa, Cal.
I received the carburetor and it works at all times to perfection, making the old Buick "40" run like a modern car. Oct. 7, 1917.

Our Satisfied, Enthusiastic Money-Making Dealers

Our advertising is an easy job. In every mail, every day, surprised and satisfied users, contented dealers who are making profits on Sunderman Carburetors, write us enthusiastic letters of endorsement. Printed just as they come to us, they make excellent advertising copy.

They Prove the Value of the Sunderman
They Prove the Market and the Profits

The Sunderman Carburetor is without a peer in the field of automobile accessories and parts—it is the only instrument that will make substantial profits for dealers, and at the same time make more money for the car owner who buys it.

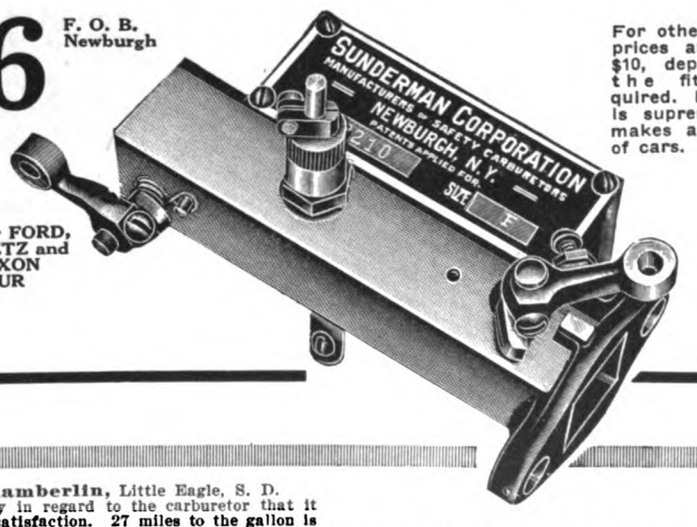
The Saving in Gasoline Pays the Owner a Perpetual Profit

The Sunderman Carburetor is uniformly saving from 30 to 50% in gasoline on every car. Look at the letters on the left of this page, and let the owners prove this statement.

This saving alone sells the carburetor—the extra power, flexibility, pick-up and hill climbing ability come as good measure—an unexpected dividend on the investment.

SUNDERMAN
Vacuum Carburetor

$6 F. O. B. Newburgh



For other cars the prices are $8 and $10, depending on the fittings required. Its service is supreme on all makes and models of cars.

For FORD, METZ and SAXON FOUR

O. W. Chamberlin, Little Eagle, S. D.
I will say in regard to the carburetor that it gives good satisfaction. 27 miles to the gallon is about the best we have done, but the roads are very bad and twenty miles is very good, in fact, about 15 is the average for a Ford. My Ford is mechanically in bad shape, which I expect to remedy and then will give these people something to think about. Oct. 7, 1917.

Chas. C. Kneeland, Groveland, Mass.
In regard to the carburetor I received from you a short time ago will say that I installed same on my Maxwell Roadster and find it is the best thing in the line of a carburetor that I have ever seen, in fact I am doing stunts with my car that seem impossible to the average car owner. I gave a demonstration to a friend of mine and on the strength of it I am ordering one for him. May 20, 1917.

F. H. Pierson, Poughkeepsie, N. Y.
I am sending you carburetor which I used on my Maxwell car with such good results that when I disposed of it I removed the carburetor, which I wish you would change and adjust so I could use it on my Ford. May 17, 1917.

H. W. Stebbins, Watertown, N. Y.
I am using one of your carburetors on a 22 H.P. Motor with so much satisfaction that I beg to inquire if you recommend that the same will work equally as well on a 8-10 H.P. 4 cyl. 2 cycle Motor. June 15, 1917.

Bourne Brothers, House Painters and Interior Decorators, Milton, Mass.
I have had one of your carburetors put on my Ford truck and am much pleased with it.
July 16, 1917.

D. G. Douglass, Washington Mills, N. Y.
I bought a carburetor from you last year and it certainly did fine work. My Overland never ran better since I had it than since I have installed this carburetor. July 2, 1917.

F. E. Howard, Faribault, Minnesota.
Have a Sunderman Carburetor on a Reo car and it works OK. Will run on kerosene when the motor is hot. July 12, 1917.

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Users, and Our Hustling Have Written This Ad.

The Sunderman Principle Is Right— It Is Sure, It Has Been Proved

Designed on the only fundamentally correct plan, which produces finer vaporization, therefore quicker, more complete combustion and consequent greater power, the Sunderman Carburetor is the marvel of present-day carburetion.

CAR OWNERS—Don't Delay—Save Gasoline and Money all Winter —Buy a Sunderman Today.

DEALERS—Look to the right, and read what your fellow tradesmen say. Profit speaks in every line, satisfaction and service in every letter. Get hold of our proposition to-day—and then talk to us at the Shows.

Exhibiting { New York Show, Grand Central Palace, Space D-8
Chicago Show, Armory Balcony, Booth 5

SUNDERMAN CORPORATION

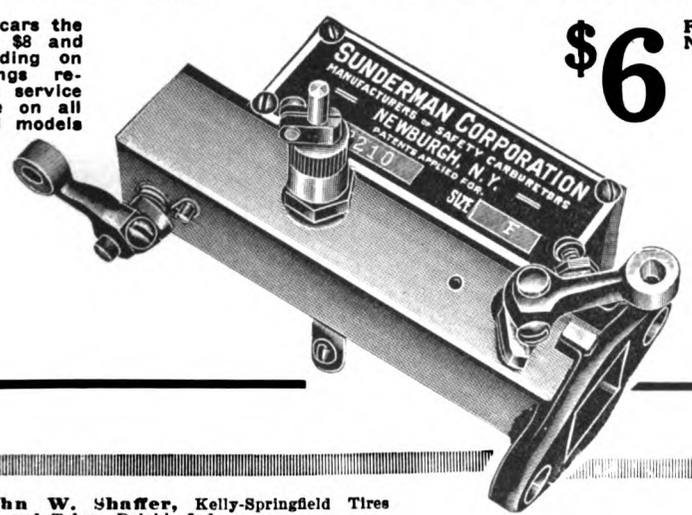
5 CHAMBERS STREET NEWBURGH, N. Y.

WESTERN BRANCH: 403 Kresge Bldg., Detroit

SUNDERMAN

Vacuum Carburetor

For other cars the prices are $8 and $10, depending on the fittings required. Its service is supreme on all makes and models of cars.



$6 F. O. B. Newburgh

For FORD, METZ and SAXON FOUR

John W. Shaffer, Kelly-Springfield Tires and Tubes, Delphi, Ind.
I recently purchased through the Universal Accessories Co. a Sunderman Carburetor and installed it in a 1918 Ford car. The results so far have been so surprising that I am writing in regard to territory. June 20, 1917.

A. M. Lockett & Co., New Orleans, La.
So far as economy is concerned, we do not think that your carburetor can be excelled, as the mileage obtained with the old carburetor was from ten to eleven miles per gallon of gasoline, whereas we are now getting from eighteen to nineteen miles per gallon. May 25, 1917.

The New Adirondack Garage, T. J. Lynch, Prop.
Kindly ship me two more carburetors for small Saxon four-cylinder runabout cars. I have used four or five of them and can place at least 100 more. They are giving entire satisfaction and great mileage. May 24, 1917.

J. Bergquist, Fitchburg, Mass.
Have received and tested out Ford Carburetor you sent me recently. Find that it is working very good and I could without doubt sell a large quantity of them in this district. June 4, 1917.

Simmons Hardware Co., St. Louis, Mo.
Recently we wired you an order for a SUNDERMAN CARBURETOR to be used on a Ford car. This carburetor was for one of the employees of this firm and he states that it is giving excellent service. June 12, 1917.

H. H. Palmer Garage, Bishop Hill, Ill.
I sent to Chicago and got two of your carburetors and put them on Ford cars and they worked fine. June 22, 1917.

P. H. Brown, Auto Repairing, Chepachet, N. Y.
I installed one of your carburetors on a Ford car and it worked so fine would like to sell them. July 27, 1917.

Dealers Who Handle Sunderman Carburetors Write as Follows:

Redden Motor Truck Co., Inc., 235 West 58th Street, New York.
Recently it was brought to my attention that the Sunderman Carburetor was a decided gasoline saver on a Ford car, and as my firm are always on the lookout for anything that will reduce the operating expense of a Ford car, I took it as a personal matter to try out one of your carburetors. The performance of the carburetor is certainly satisfactory in every respect. I notice that it is hardly ever necessary to use a throttle when on country trips, as the carburetor seems to be in itself an automatic throttle when coming on to grades or when pulling is hard in heavy going. As for gasoline economy, on my last trip I used a trifle over 6½ gallons of gasoline on the run from Albany to New York. I certainly appreciate your arranging to have a service man at your factory on a holiday to attach a carburetor to my car.
Yours very truly,
L. S. HIGHAM, Sales Manager.
November 23, 1917.

Motor Car Equipment Co., Indianapolis, Indiana.
Received the carburetor and after installing it and getting the proper adjustment it certainly does work fine. Would like to try out one or two more before ordering in quantities. July 2, 1917.

The City Garage, Terlton, Okla.
Your carburetor arrived and we placed it on the Ford car and every one that has tried it thinks it works fine. July 11 1917.

Russell & Wineland Auto Repair Co., Berwyn, Neb.
We received the SUNDERMAN VACUUM CARBURETOR a few days ago and have tried it out on my Maxwell and find it very satisfactory. We want to handle them here. May 14, 1917.

Thomas McClusky, Los Angeles, Cal.
I will write you again in regard to the SUNDERMAN CARBURETOR, as I have so many calls for them and I could install lots of them, as every one that rides with me in my car wants me to get them one, and I tell them I will have some of them on hand shortly. If you can't do any better, send me literature and the prices so that I can satisfy those that I have promised. If you want me to have the agency let me know, and if so send me a half dozen at once, and by that time I can have you to send me fifty or more. And let me know the best price on them by large amounts. It would be impossible for you to get this little carburetor away from me if I could not get another one. Oct. 6, 1917.

Crown City Sheet Metal Works, Pasadena, Cal.
I am using one of your carburetors on a Ford machine which is giving almost double the mileage the one I took off did. I have never seen any carburetor to equal it. The machine runs smoother, with more power, and starts almost always on the first turn. Oct. 12, 1917.

Neikirk & Miller, Hardware Specials—Buggies, Implements and Autos, Greenspring, O.
We received carburetor for Ford car and have been using it since and have found it to be very satisfactory. June 14, 1917.

United States Automobile Supply Co., Omaha, Neb.
We have had very satisfactory results with the SUNDERMAN CARBURETOR and hope to greatly increase our sales in the near future. Oct. 24, 1917.

T. J. E. Pinson, Platte Center, Neb.
Once more I am impelled to write you about your carburetors. I now have 43 here working in good shape, they fire the engine all right, pull all right and have plenty of power. July 29, 1917.

Groveland Street Garage, Haverhill, Mass.
I ordered 6 carburetors yesterday, the 30th, and I wish to change that order and make it 12 in all, 10 Fords and 2 Maxwells. I wish to say that the carburetors are performing some wonderful stunts on the cars I have put them on. July 31, 1917.

G. D. Gates, Albion, R. D. No. 4 Pa.
Received the carburetor, and the Sunderman is the best I have ever used. I have sold a number of your carburetors and they all give good satisfaction. June 9, 1917.

N. J. Floan, Hibbing, Minn.
Received the carburetor, and the Sunderman installed and it works fine. I can sell quite a few here and would like to get agency for same. May 23, 1917.

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Westcott

THE Westcott Motor Car Company was the first to solve the problem of chassis lubrication by eliminating grease cups and installing wick-fed oil cups exclusively, and the first to equip all their open models with "*self-acting*" tops.

They foresaw the need of automatic regulation of motor temperature and incorporated thermostatic control in every Westcott power plant.

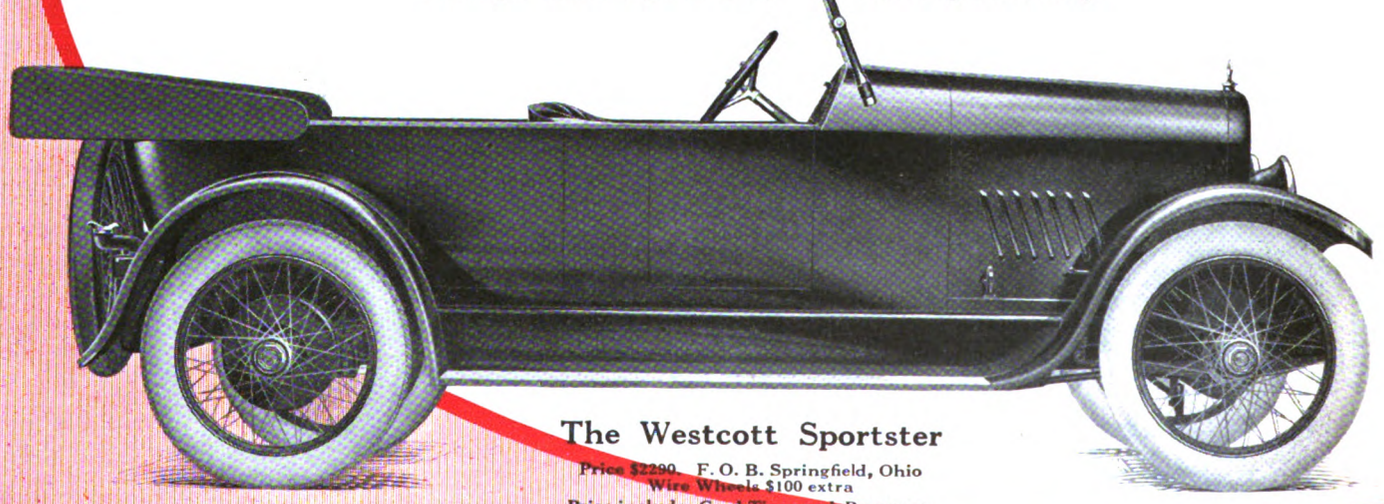
In like manner they have anticipated every requirement in body types so as to make the masterful all-season Westcott chassis available in just the style of car completely satisfactory to each buyer.

Now, though still midwinter, and while Westcott Convertible Sedans and Coupes are selling as fast as the factory can build them, the Westcott designers are ready with the most rakish summer model, the Westcott *Sportster*, whose every line and angle proclaim it the pace-maker in the ultra smart class.

Whether you are interested in motor cars from the standpoint of owner or distributor, your inspection of our offerings at the shows will convince you that the Westcott is the outstanding value of the year.

New York Show Space B-1.

Chicago Show Space B-2, 1st Regt. Armory.



The Westcott Sportster

Price $2290 F. O. B. Springfield, Ohio
Wire Wheels $100 extra
Price includes Cord Tires and Bumpers, front and rear

Digitized by Google

Westcott Superiorities

Continental Motor, 6-cylinders, 3½ x 5¼: Cast Aluminum Crank Case.

Timken Axles, Bearings, and Brakes.

Delco Starting, Lighting, and Ignition.

Wick-fed Oil Cup Chassis Lubrication *without a single grease cup.*

"Self-acting" Top of Pantasote on all open models, affording simplicity and ease of adjustment.

Thermostatic Control of Engine Temperature.

Fedders Cellular Radiator.

Rayfield Carburetor with Integral Priming Device, operated from seat.

Gemmer Semi-irreversible Steering Gear; Adjustable Steering Column; Solid Walnut Steering Wheel, Aluminum Mountings.

Spicer Universal Joints.

Boyce Moto-Meter.

Jiffy Curtains with Blackmore Door Openers; Tool Compartment in Driver's Door.

Wheel Base 125".

Double-ventilating, Rain-visioned, Storm-Proof Wind-shield.

Chrome Vanadium Springs throughout.

Controls in Normal Driving Position.

Disposition of Auxiliary Seats.

Quality and Beauty of Upholstery.

Quality of Instrument Board and Instruments.

Low Up-keep; Endurance; Beauty; Comfort.

35 x 4½ Oversize Tires (32 x 4½ on Sportster) Non-skid Rear: Ribbed Front.

French Pleated No. 1 Long Grain Dull Leather upholstery; Genuine Curled Hair and Double-deck Springs.

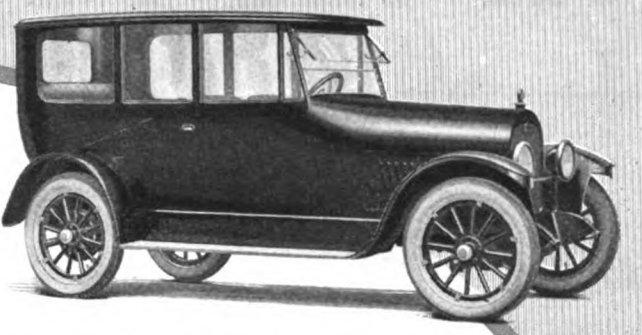
Power; Hill Climbing; Low Throttling; Acceleration; Accessibility; Freedom from Vibration.

Variety of Color Selections.

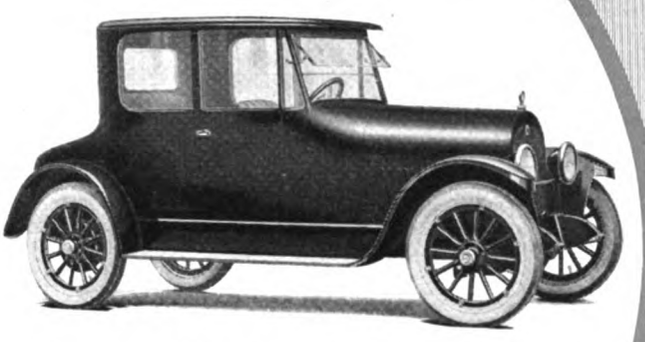
Ample Leg Room in both Compartments.

Every Car Road-tested before Shipment.

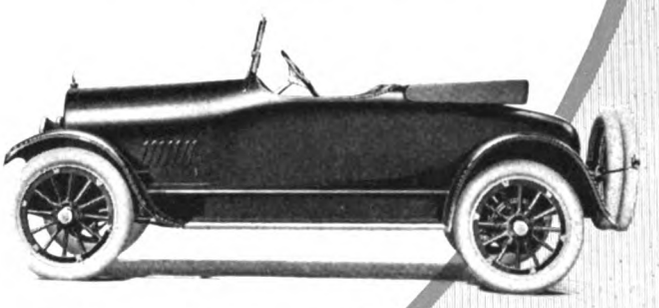
THE WESTCOTT MOTOR CAR CO.
SPRINGFIELD, OHIO



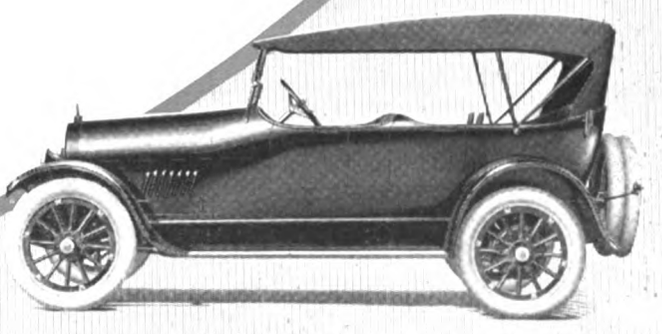
The Westcott Seven Passenger Convertible Sedan
Price $2790. F. O. B. Springfield, Ohio



The Westcott Four Passenger Convertible Coupe
Price $2790. F. O. B. Springfield, Ohio



The Westcott Four Passenger Touring Roadster
Price $1890. F. O. B. Springfield, Ohio



The Westcott Seven Passenger Touring Car
Price $1940. F. O. B. Springfield, Ohio

Westcott Advertising for 1918 will be dominating both in volume and in character.

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Sell the Public What It Wants



YOUR customers are not demanding that a car have a certain number of cylinders.

They are not even demanding that a car get its power from an internal explosive engine.

They are not demanding gas cars any more than they are demanding steam cars.

They are not demanding anything in an automobile except a better performance.

What your customers want is a car which will run with a soft, smooth, gliding motion—without any noise or vibration, even at highest speeds—a car whose energy does not depend upon the speed of a fly-wheel; but whose power is stored in advance—whose maximum effort is just as available at low speeds as at high.

Your customers are not demanding a better carburetor—a better clutch—a better gearshift—or a better self-starter—what they are demanding is none of these devices at all, but emancipation from them.

Instead of demanding six or eight or twelve cylinder engines—what your customers really want is a smooth, safe, flexible ride—one-finger control. What they really want is comfort—safety—simplicity.

And they want a car whose fuel is kerosene.

If there is any advantage in selling your customers what they really are demanding—

If there is any advantage in delivering them the kind of performance they have always wanted in an automobile—

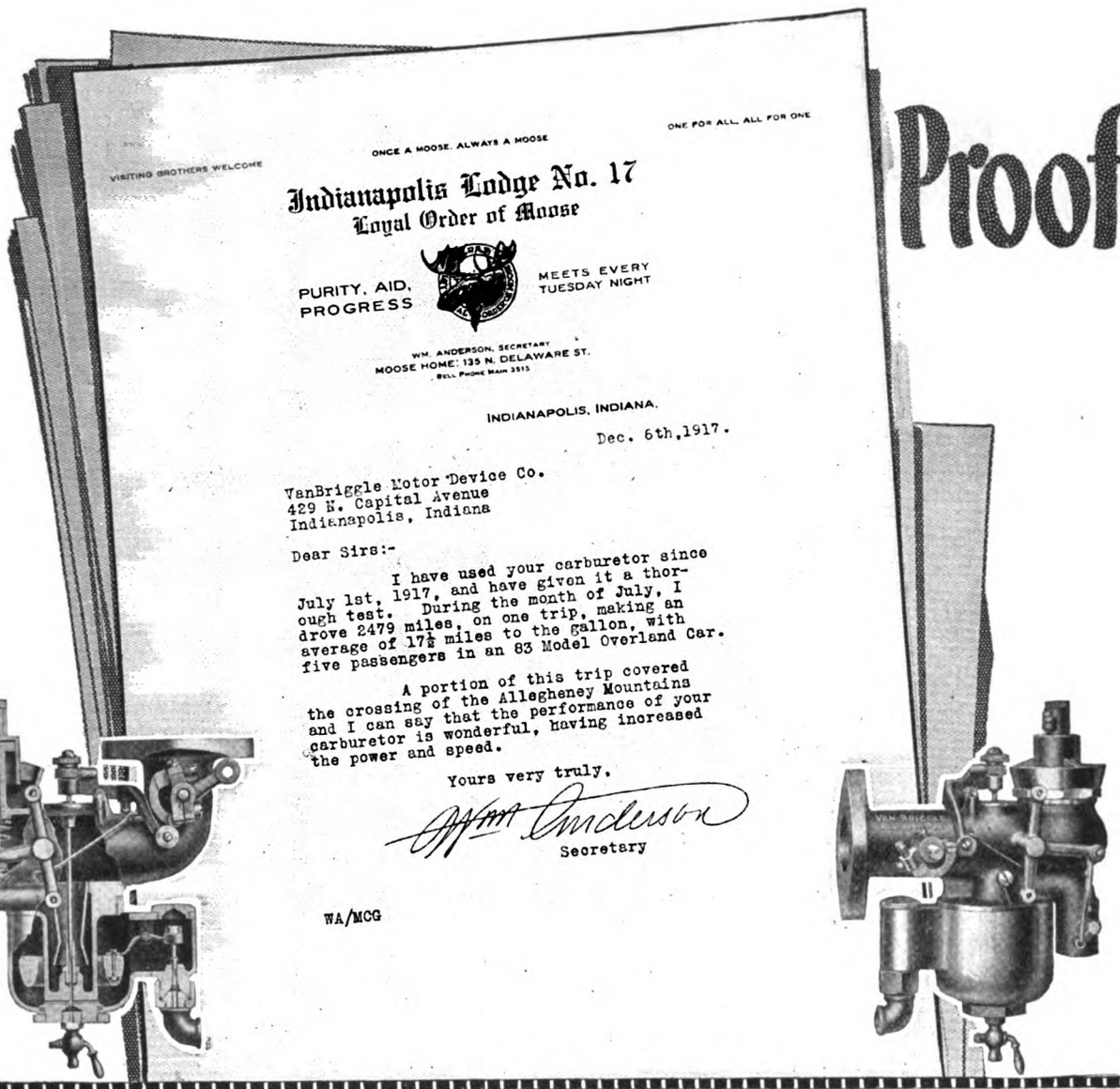
Then the franchise for the sale of the Stanley Steam Car in your territory is the best business asset you could get.

STANLEY MOTOR CARRIAGE CO.
NEWTON, MASS.

Touring Cars
$2400

STANLEY
STEAM 22nd year CAR

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Proof!

for Pleasure Cars, Trucks, Tractors

VAN BRIGGLE CARBURETOR

One Principle for all Motors

Here's written proof from Wm. Anderson, who, like all other VanBriggle users, has found through *actual* test, that the VanBriggle Carburetor *increases* power and speed, and *delivers* greater mileage—even under the most laborious circumstances. Illustrated descriptive booklet free on request. *Send for it.* ¶ JOBBERS AND DEALERS: The VanBriggle is as easily handled as tires. Small stock meets any need. New opportunity for profit and service. Write for proposition.

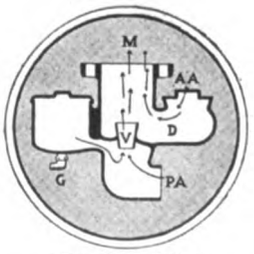
KEY TO DIAGRAMS: PRIMARY AIR (P.A.); AUXILIARY AIR (A.A.); GASOLINE (G); MANIFOLD (M.); MIXING CHAMBER (D.); VENTURI TUBE (V.); LOCATION OF MANIFOLD ON HORIZONTAL TYPE (Z.).



The Van Briggle Way

EXPLANATION OF DIAGRAMS

Because of the peculiar construction of the Van Briggle's primary air chambers, the primary air enters the venturi tube in a whirling, swirling movement, breaking even the poorest gasoline into the most minute particles. The primary mixture then enters the mixing chamber. The auxiliary air, traveling across to the manifold MUST PASS THROUGH THE PRIMARY MIXTURE. Two mixtures are thus assured in the Van Briggle Carburetor—each thorough and absolute. A thorough mixture and complete vaporization mean EVERYTHING to your motor. Compare the Van Briggle Way with The Other Way. There *is* a difference!



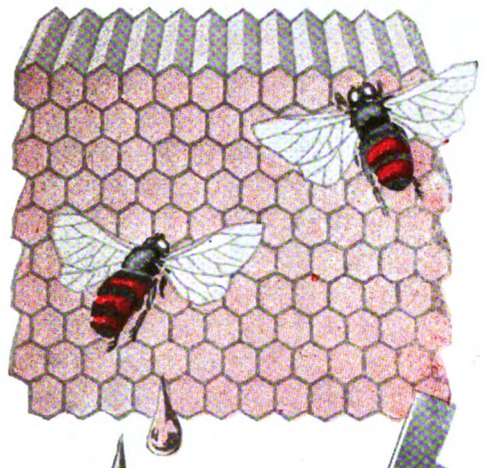
The Other Way

VAN BRIGGLE MOTOR DEVICE CO.
431 North Capitol Avenue, Indianapolis

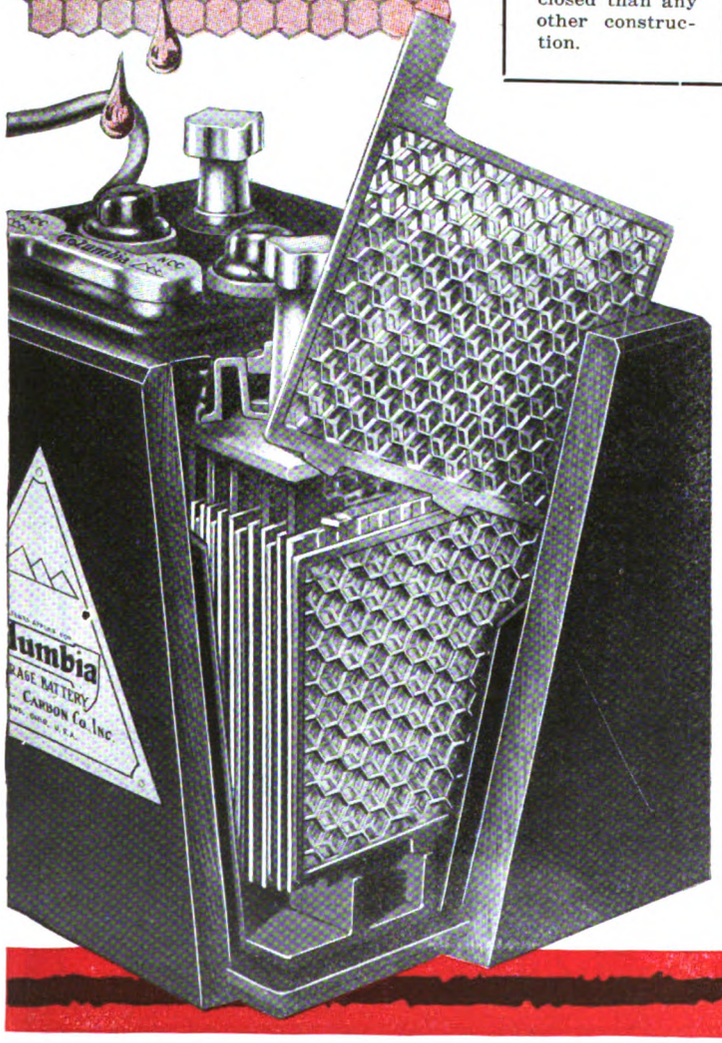
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Columbia Storage Battery

With the honeycomb grid



The hexagonal pattern of the honeycomb gives the maximum combination of strength and capacity. It gives greater support to the material enclosed than any other construction.



We have taken our tip from the honey-bee. In a cell which not only is the strongest mechanical construction, but which also holds its contents securely braced in every direction, the bee packs away his golden store of honey. In a grid of this same honeycomb construction, we pack away a golden store of profit for you.

For, realizing that the most vital part of a storage battery is the plates, we have so constructed the plates of the Columbia Storage Battery that they will back a real guarantee, a *definite* guarantee of capacity, performance, life, and service.

This design—exclusive to the Columbia Storage Battery—gives the maximum area of active material, the greatest and most uniform conductivity, and the greatest resistance to buckling for a given weight. This ability to withstand abuse comes from the hexagonal shape and the way the cells on opposite sides of the plates are "staggered," so that each side reinforces the other, and the active material interlocks in all directions.

You can see how this gives strength where strength is needed: the result is Service when Service is needed.

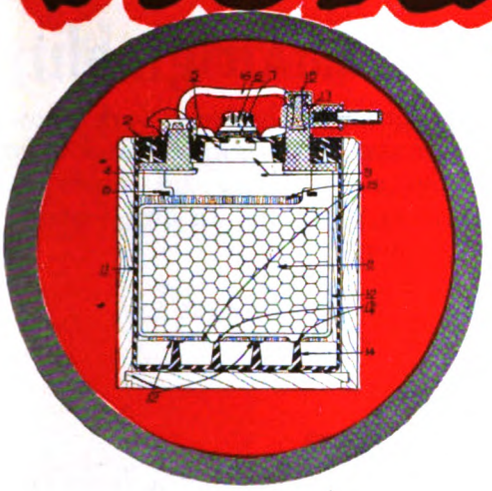
It is the ability of the Columbia Storage Battery to give continuous service, rather than continually *require* it, that makes a Columbia dealer an unusually profitable connection.

Our new plan of distribution is entirely different from the general scheme commonly followed. Our plan makes it possible for you to build up a highly profitable storage battery business without incurring the expense and investment of installing complete service station equipment and stock.

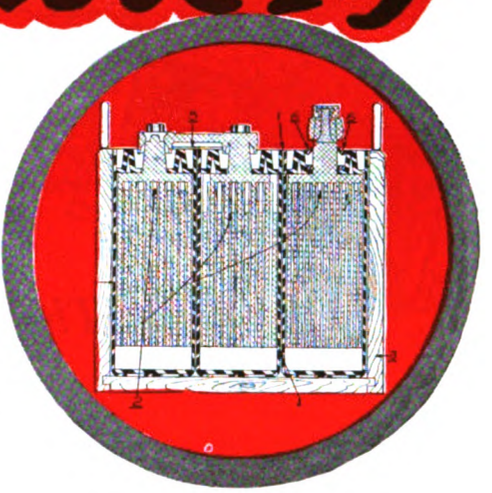
National Carbon Company, Inc.
Department R Cleveland, Ohio

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Columbia Storage Battery



THE honeycomb grid described on opposite page is but one of 18 distinctive features, every one of which is a Columbia point, not merely of difference, but of *superiority*.



1. **Connector Skirt**—Automatic Capillary Seal holds the sealing compound in contact with post. Simpler, more permanent, more positive and effective than hard or soft rubber.

2. **Sealing Well**—Affords the maximum sealing surface from the interior of the cell to the exterior. No heavy, unsightly compound used. Smooth, neat appearing top.

3. **Acid Space**—Largest possible for restricted dimensions. Permits rapid radiation, quick cooling, and less frequent flushing or addition of water.

4. **Chilling Ledge**—Instantly cools compound when poured into sealing wells. This, with tight-fitting cover, prevents sealing compound flowing into cell. Eliminates one common cause of short circuits.

5. **Vent Plugs**—Bayonet catch design with ample grip, locks tight with simple quarter-turn, and prevents loss of electrolyte by splashing. Large hole permits easy inspection of plates, separators, and solution level.

6. **Vent Outlet**—Cannot become clogged with dust or other impurities or allow same to be washed back into cell. Location near base prevents any expelled electrolyte coming in contact with fingers.

7. **Vent Gasket**—Of soft rubber, prevents acid creeping or leaking.

8. **Separator Retainer**—Flat hard-rubber strip. Furnished in lengths which are simply pushed into position and snapped off with fingers. Cannot be dislocated to allow separators to float, causing short circuits.

9. **Honeycombed Grids**—An exclusive Columbia feature, gives greatest and most uniform conductivity and the greatest resistance to buckling for a given weight. Pellets interlock and the grid is reinforced in all directions. Great toughness, tensile strength, and ductility.

10 and 11. **Staggered Plates**—Positive elements are kept against one side of jar and negative elements against other. Separators fit jars tightly and extend beyond each side, top, and bottom edges of the plates, thus effectively preventing plate sediment from collecting across positive to negative plates at side and consequent short circuiting.

12 and 13. **Inclined Plate Feet**—Inclined feet force the plate against the edge of the cell. Holds this element rigidly in place, thus preventing breakage of jars, chafing, and destruction of separators.

14. **Four Jar Ribs**—The use of four ribs strengthens the jar at those points where the great resistance to shock is required. They also prevent short-circuit by accumulated sediment. (See 12 and 13.)

15. **Separators** fit jars tightly and extend beyond each side of the plate and beyond the top and bottom edges of the plate, thus preventing short-circuit due to buckling and short separators.

16. **Safety Handle**—Fastenings not exposed to corrosion. Will sustain 25 times weight required. Adapted to all standard type holddowns.

17. **Absolutely Universal Terminal**—Requires no lead burning or skill to set properly. To adjust is the work of a moment. No tools required. It is impossible to connect a Columbia Battery in a reverse direction. Because of the universality of the Columbia Terminal, only five types of Columbia Batteries are needed to make replacements on more than 300 different makes and models of cars.

18. **Clover Leaf Terminal Nut**—Designed to give an easy, firm grip of the fingers, and also to allow the use of pliers or a wrench without danger of damage.

Let us tell you about our new dealer and service plan which is entirely different from the general scheme of storage battery distribution. Makes it possible for you to work up a profitable storage battery business without expense of installing usual complete service station equipment and stock.

See Exhibits at Shows: *Space C-60, Third Floor, Grand Central Palace, New York City. Chicago, Booth 74, Coliseum Gallery*

NATIONAL CARBON COMPANY, Inc., Department R, Cleveland, Ohio

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Kissel Exclusiveness and Originality

IN a new Kissel model, to be first shown at the New York Show, we promise you something so unusual in originality and value that it will set an absolutely new standard in the motor car industry. In points of improvements, refinements and features, the KisselKars will prove decidedly unique.

The New Hundred Point Six

5-Passenger

Staggered-Door Sedan

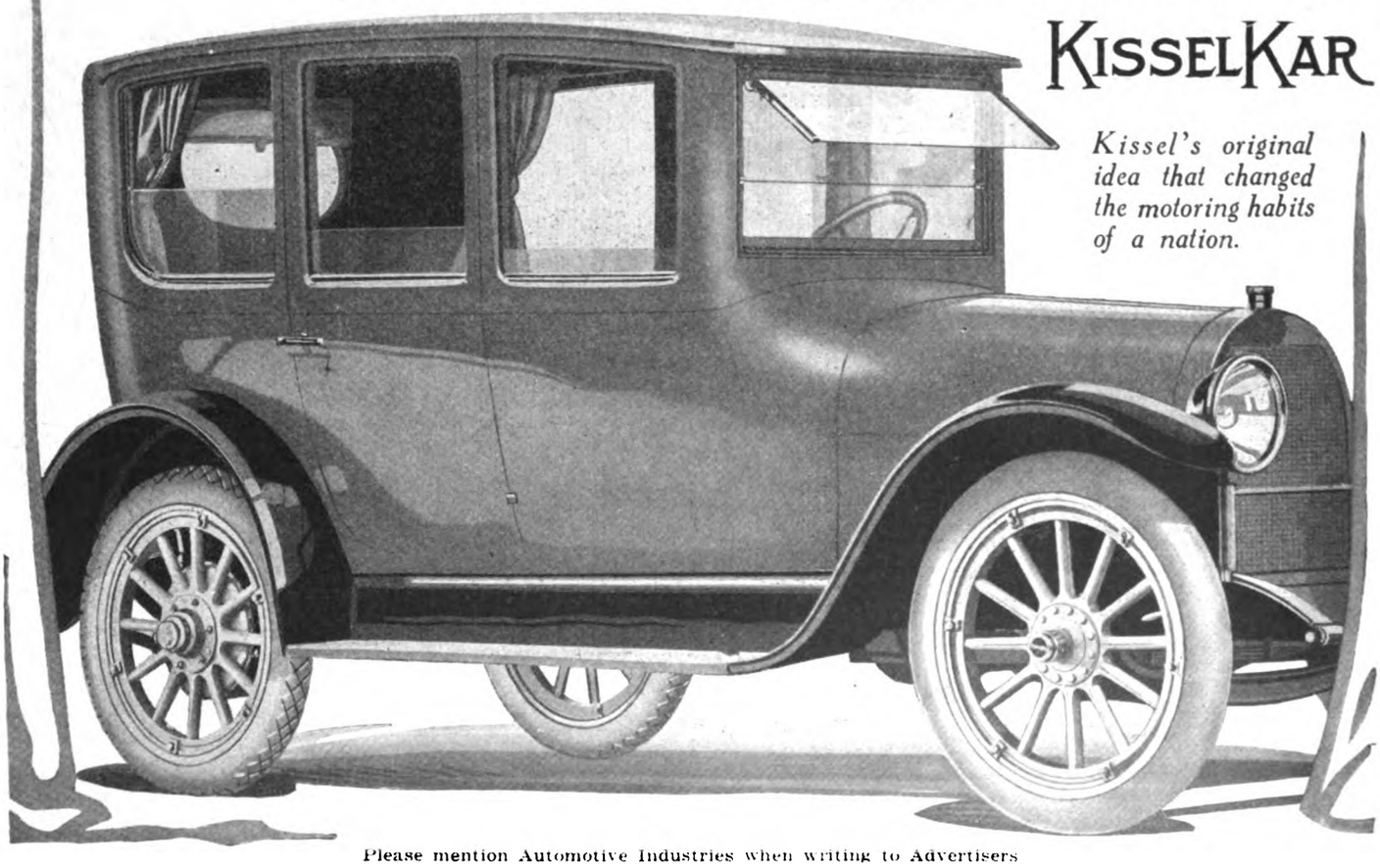
Characterized by unusually graceful lines, replete with custom-built appointments. Note the new ALL-YEAR Top that is entirely removable or in which all side windows may be lowered or raised—an exclusive Kissel feature.

Compare the Hundred Quality Features of the HUNDRED POINT SIX. Its efficiency, reliability, quietness and economical maintenance are among those superiorities car purchasers are looking for today. ***Don't miss the Kissel exhibit at the Grand Central Palace Show, New York, Jan. 5th to 12th.***

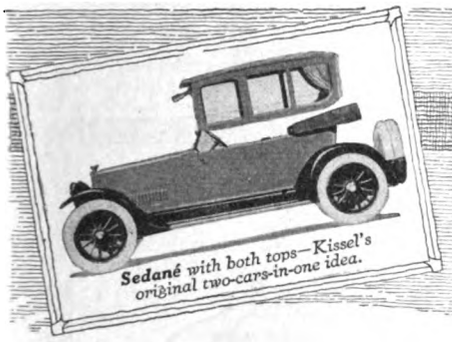
Kissel Motor Car Company, Hartford, Wis., U. S. A.

KISSELKAR

Kissel's original idea that changed the motoring habits of a nation.

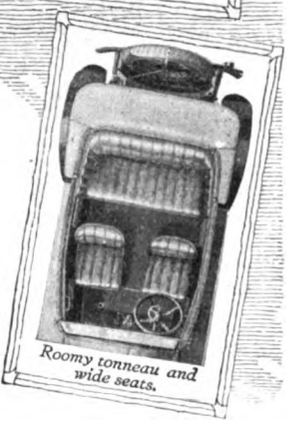


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Sedané with both tops—Kissel's original two-cars-in-one idea.


Perfect blending of ALL-YEAR Top and body, no visible attachments, no rattles.


With the new Semi-Victoria Style Summer Top up.


Roomy tonneau and wide seats.

at the New York Automobile Show——

BY virtue of utility, economy, supreme quality and originality, the ALL-YEAR Car, in the 1918 models, will continue to maintain its leadership. Note how the Top is **built-in,** not on, and is entirely removable—no visible fastenings or attachments—no rattles, draughts, or leaks.

The New Hundred Point Six

4-Passenger Sedané

Inspect its unusually roomy tonneau. Note the unusually wide seats and aisle, the cushions of unusual depth, doors of unusual width. Examine the ALL-YEAR Top, that is entirely removable, or in which all windows may be lowered or raised.

DEALERS: Don't miss the new KisselKar to be introduced at the Grand Central Palace. With the public demanding the unusual in automobile features, the new KisselKars will prove the sales leaders in 1918. Write us at the Show or Kissel headquarters, Waldorf-Astoria Hotel.

Kissel Motor Car Company, Hartford, Wis., U. S. A.

The ALL-YEAR *Car*



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A Guarantee of Quality

Every car owner who buys Texaco Motor Oil by the can, with the seal unbroken, spends his money with the assurance that he will get his money's worth.

The Texaco green can with the red star on the sides is a guarantee of quality—when the seal at the end of the spout is unbroken.

TEXACO MOTOR OIL

is a quality oil. It is sold on the basis of quality, not of price.

The lubrication of a modern, high speed automobile motor is too important a factor for the lubricant to be *bought* on any other basis.

Texaco Motor Oil lubricates perfectly. It reduces friction to a minimum. It stands up well in use, retains its original lubricating qualities, because it prevents the leakage of gasoline into the crank case. Due to certain basic qualities it cannot deposit a hard carbon crust. It is the oil for *results*.

When you buy motor oil buy Texaco. The best way, the safest way, to buy is in one or five gallon cans. You can identify Texaco by its clear, clean color.

THE TEXAS COMPANY
New York Chicago Houston
DISTRIBUTING OFFICES IN MOST CITIES

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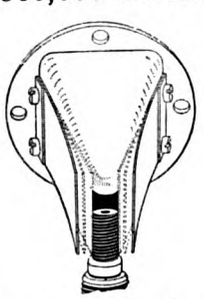
Tillotson CARBURETOR

ENGINEERS and manufacturers of motor cars and motor trucks who are familiar with the Tillotson design of carburetor know that for downright dependability and all-around efficiency it cannot be excelled.

Over 300,000 are in use to-day!

Tillotsons are giving carburetor satisfaction to owners of cars of varying power, size and weight. Each model is specially designed and built for the particular type of car it is to serve.

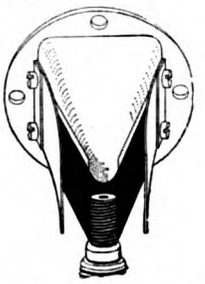
Let us figure on your requirements for the coming year.



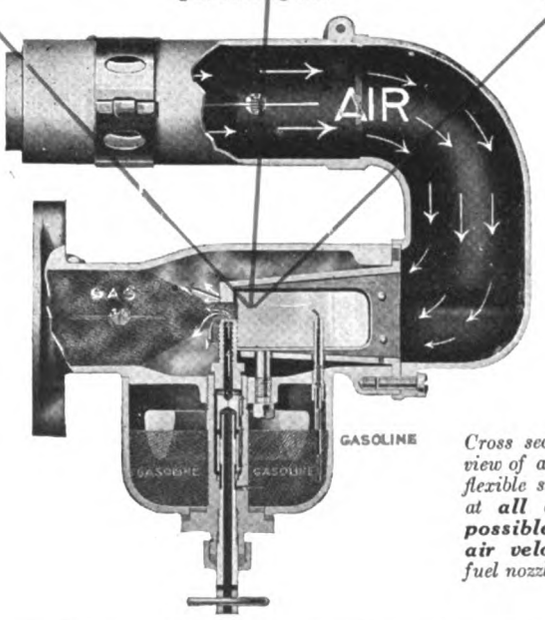
Intermediate position of reeds changing with varying engine speeds



Position of reeds with throttle closed. Engine running slow



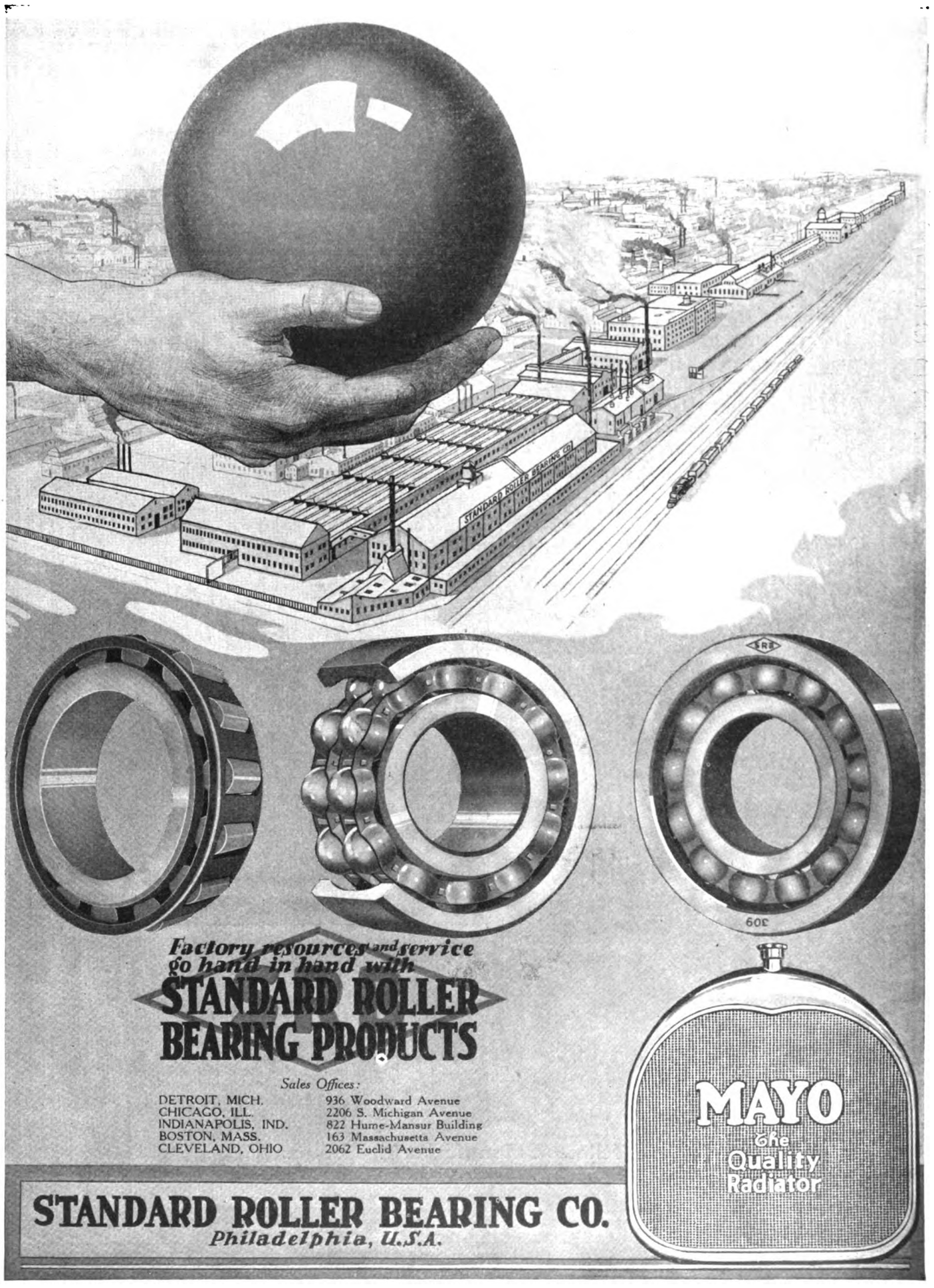
Position of reeds at wide open throttle. High engine speeds



Cross section of Model B, with front view of air valve showing how the two flexible steel reeds expand to maintain at all engine speeds the highest possible vacuum and greatest air velocity at the point where the fuel nozzle is located.

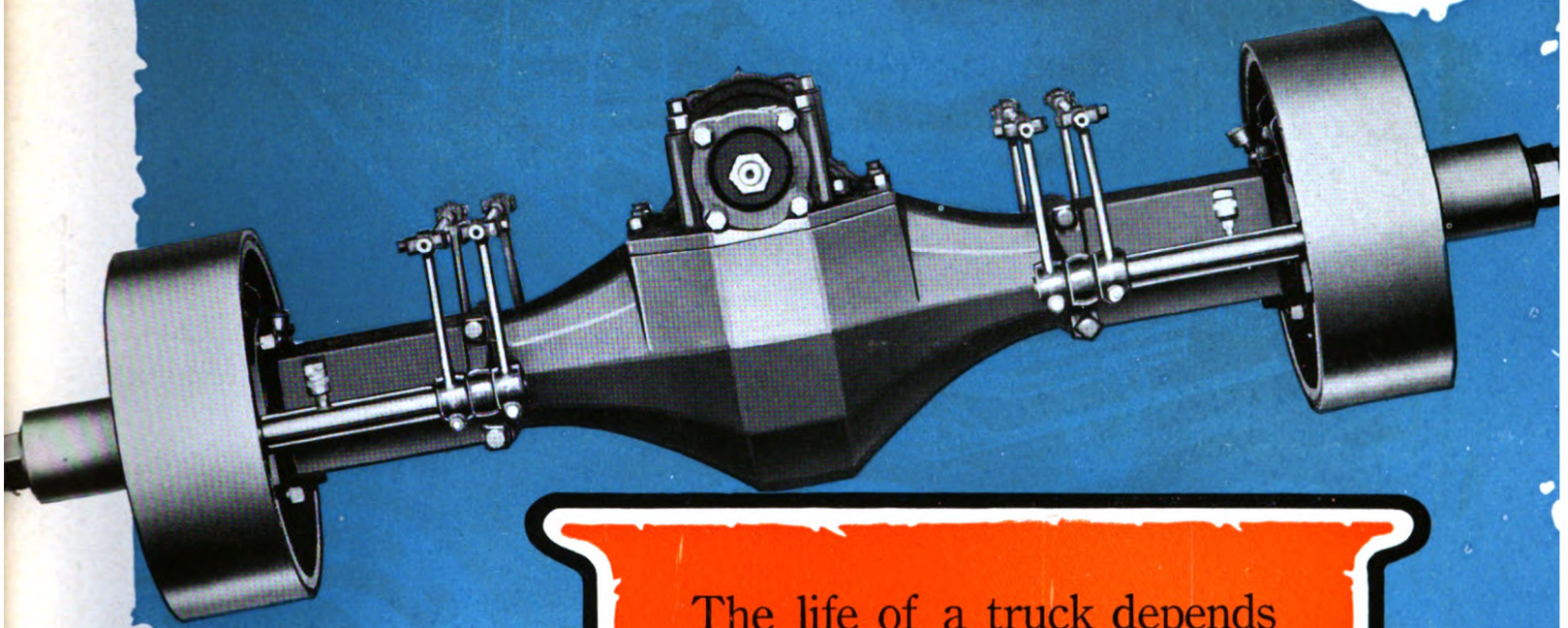
The Tillotson Manufacturing Company
Toledo, Ohio

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LIBERTY AXLES



The life of a truck depends upon its rear axle—for upon that vital part rests the full weight of the truck and its load, and through it the power of the engine is transmitted to the wheels.

The rear axle of a truck is 100% important.

Liberty Axles are designed and built for but one purpose: to faithfully fulfill their duty of prolonging the life of every truck of which they are a part.

LIBERTY
AXLES

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LIBERTY AXLES

Our

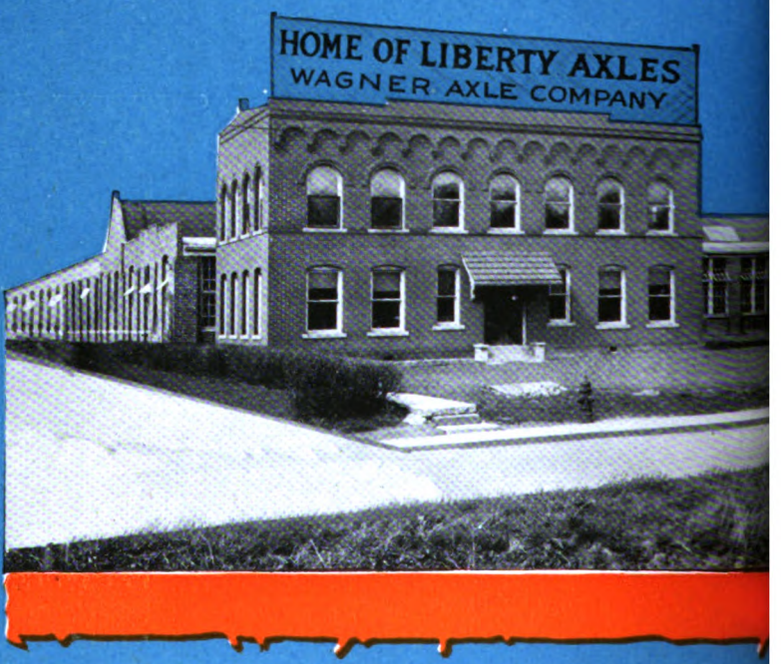
THE MEN

The value of experience cannot be exaggerated. And experience allied with knowledge and skill is a guarantee of the worth of the product to which it is applied.

The organization back of Liberty Axles includes men long known in the axle field—executives of experience and reputation; engineers whose mechanical ability verges on genius.

The personnel of its makers is proof of the quality of Liberty Axles.





LIBERTY

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Organization

THE PLANT

The best skill, most thorough knowledge and far reaching experience, are helpless without the facilities to utilize them.

It is our good fortune that with our splendid organization of men, we have a splendid plant. Our factories at Anderson, Indiana, cover an area of over 14½ acres. In this vast establishment we employ hundreds of men. Here are the draughting rooms and assembly departments. Here are the delicate testing machines and all the other equipment necessary to the construction of a high grade axle.

These advantages in the grasp of men of knowledge and ability assure the soundness of Liberty Axle construction.

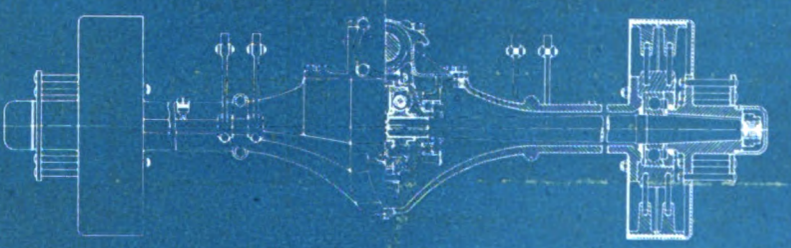




AXLES

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LIBERTY AXLES



SPECIFICATIONS

Ribbed axle and worm and gear housings cast from open-hearth steel. Also axle spiders which are bolted on each side of main axle casting. They also support the brakes.

Axle shafts are of chrome-vanadium steel, machined to 2¾ in. heat-treated and ground to size. Flange ¼ in. x 3½ in. holds bearings in shape and prevents axle from slipping sidewise.

Bearings: Two double thrust U. S. Ball Bearings on each axle, also two supporting the differential, U. S. Radial and Thrust Bearings at front and rear of worm. Sizes used have been tested and proved right in service.

Worm and gear of David Brown type. Worm of special alloy steel, gear of special bronze, both ground to size. Gear ratio 7¾ to 1.

M & S. Differential. Two-Piece housing of open-hearth steel. Special device holds worm gear in place.

Chrome-vanadium steel driving gears and pins. Brakes, dual double internal expanding, of our own design. Simple, effective, easily adjusted.

No truss rods—greater road clearance.

Spring centers as desired.

Track. Front 58¾ in., rear 61 in.

WAGNER AXLE CO.

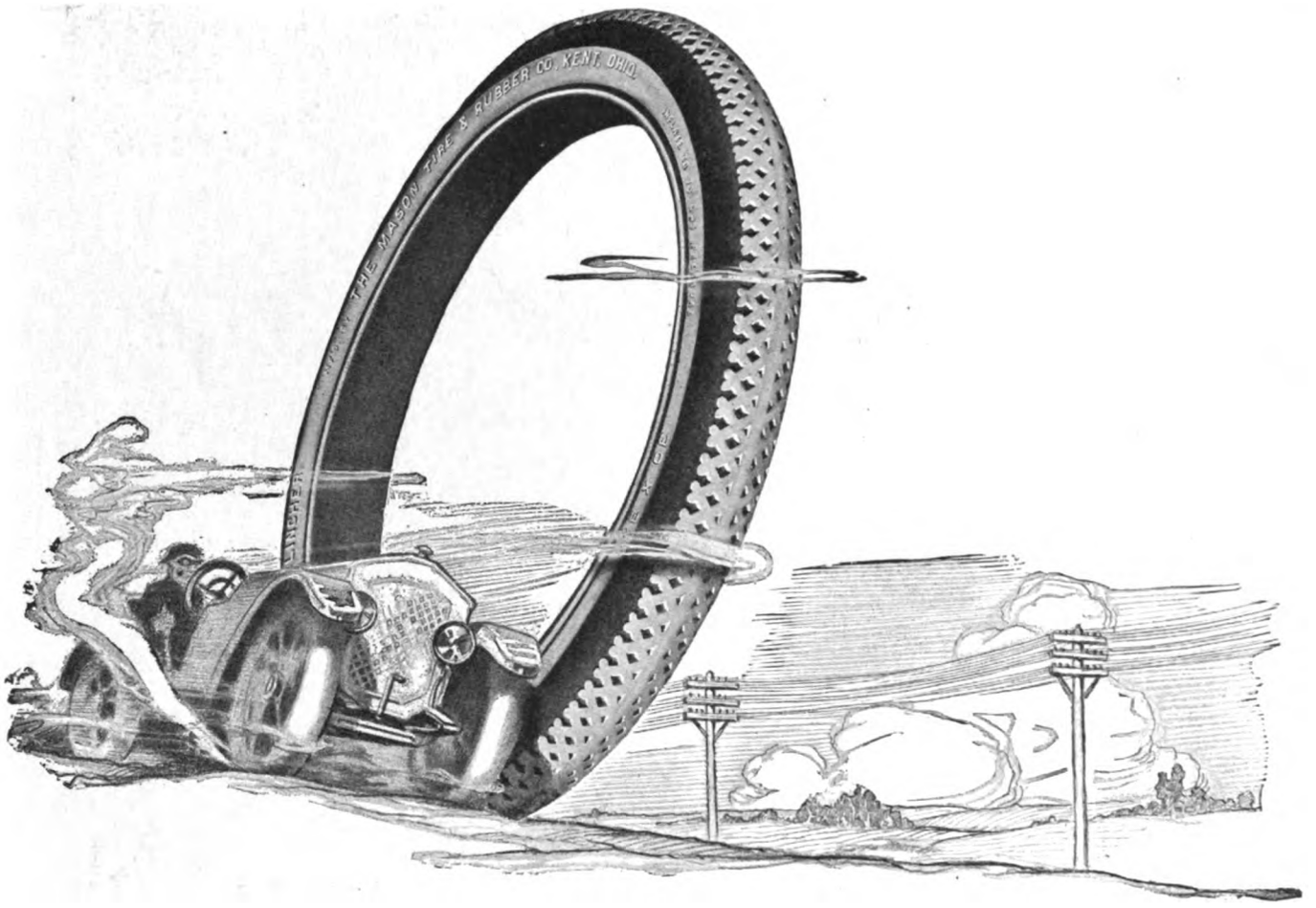
ANDERSON-INDIANA U.S.A.

LIBERTY AXLES

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Keeping Up With the Car

Mason Tires keep right up with the car, proving their built-in quality and service in every mile the speedometer ticks off.

Perfect balance is the secret of Mason quality. Put Mason Tires on your car, and you'll get more mileage, better performance and longer life for the car.

On every make of car, Mason Tires are proving their more mileage value. And still they sell at popular prices.

Mason dealers are reaping the harvest of repeat orders, gained from Mason success. The fair play Mason dealer policy works to their advantage. A line to the factory will acquaint you with it.

MASON TIRE & RUBBER CO.
Factory: Kent, Ohio
Akron Suburb

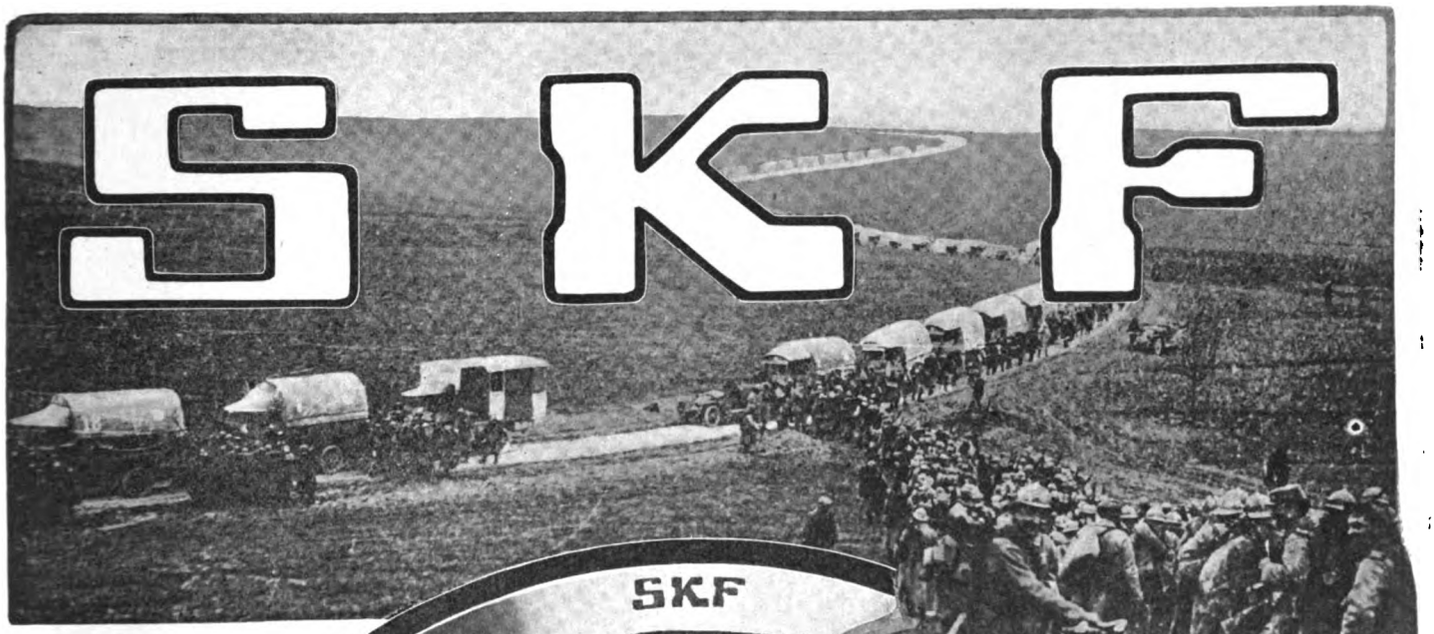
MASON MEANS MORE MILEAGE

DISTRIBUTING BRANCHES:

Cleveland	Chicago	New York	Kansas City	Buffalo	Atlanta	Akron
1806 Euclid Ave.	2120 Michigan Ave.	28 W. 63d St.	1732 Grand Ave.	834 Main St.	21 Houston St.	34 W. Market St.

Please mention Automotive Industries when writing to Advertisers

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Over Hills and Fields—Thru Snow, Rain and Shell Fire

Winter's snow and summer's heat are alike to the thousands of high powered motor trucks that are swiftly moving their burdens over shell ridden roads.

Constant use—poor repair and replacement facilities—rough driving—all the hardships of war only bring out the unusual performance of SKF Ball Bearings. They are masters of every situation which calls for excess stamina and durability. Under heavy overloads and sudden shocks the inner race, balls and retainer of SKF Ball Bearings are free to pivot in the outer race. This exclusive feature of SKF prevents wear and heating due to binding. To equip with SKF is to insure dependability.

SKF BALL BEARING CO.

HARTFORD CONN.

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BROWN-LIPE TRANSMISSIONS

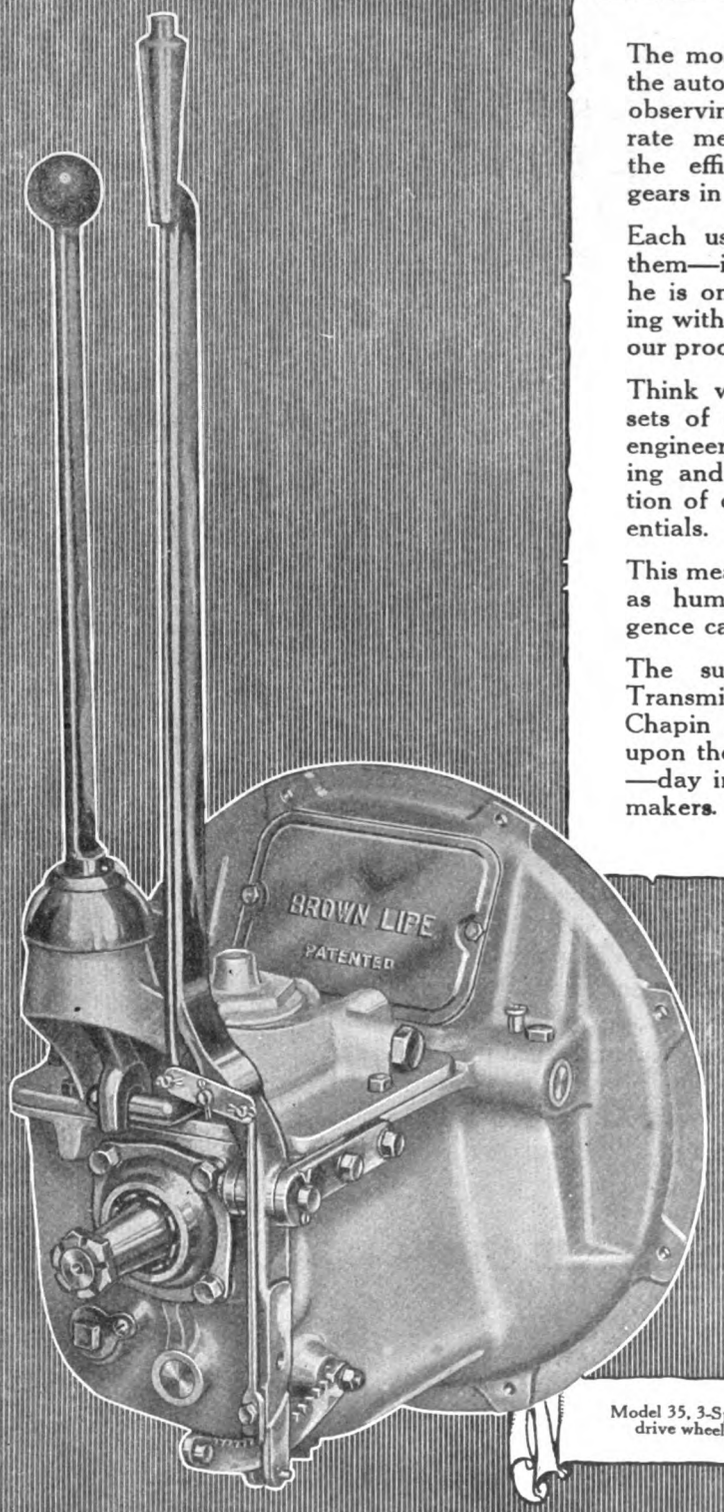
The most expert engineering skill in the automobile industry is constantly observing and following our accurate methods of manufacture and the efficiency maintained by our gears in service.

Each user—and there are 200 of them—is protected by the fact that he is one of the 200 who is working with us every minute to improve our production.

Think what it means to have 200 sets of inspection departments and engineers who are constantly studying and improving on the application of our transmissions and differentials.

This means a product as near perfect as human experience and intelligence can make it.

The success of the Brown-Lipe Transmissions and Brown-Lipe-Chapin Differentials has depended upon the tireless demands of service —day in and day out—for 200 car makers.



Model 35, 3-Speed, U.P.P. Transmits maximum power to drive wheels with minimum friction, noise and wear.

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BROWN-LIPE-CHAPIN DIFFERENTIALS

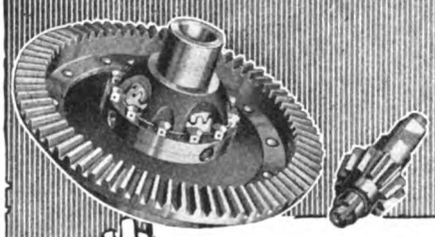
Since the very beginning of the automobile industry, the design, quality and superiority of Brown-Lipe Transmissions and Brown-Lipe-Chapin Differentials have been recognized as the leaders in their respective fields.

Today 80% of the pleasure car and truck manufacturers use either one or both as standard equipment.

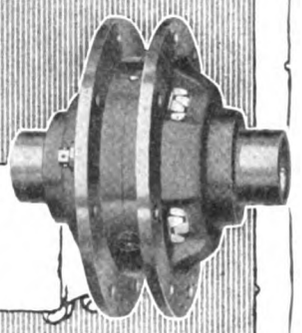
Our engineering departments will assist you in working out your transmission and differential problems. Write us

BROWN - LIPE - GEAR CO.
Transmissions
BROWN-LIPE-CHAPIN CO.
Differentials
Syracuse, N. Y.

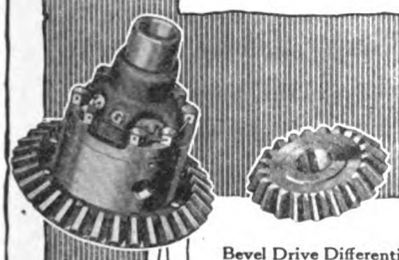
Representatives
New York: Thos. J. Wetzel, 29 W. 42d St. San Francisco: A. H. Coates, 444 Market St. Foreign Agent: Benjamin Whittaker, 2 Norfolk St., Strand, London, W. C.



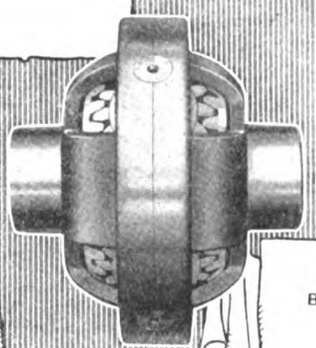
Differential for G. M. Co. Trucks used by Weston-Mott Co. Division of General Motors Co.



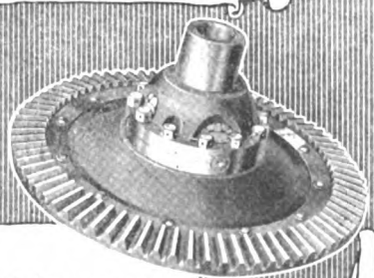
Differential for Worm Drive Axle, 1½- and 2-ton Trucks as used in the product—Timken Detroit Axle Co.



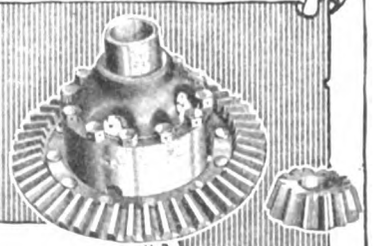
Bevel Drive Differential in Internal Gear Drive Axles for ½-ton Trucks as used by the Torbensen Axle Co. Used under Republic ½-ton Truck.



Bevel Type Differential for Worm Drive used by Sheldon Axle Co.



Bevel Type Differential, 6 to 1 ratio for Truck Axle mfg'd by Salisbury Wheel & Axle Co., Inc., Jamestown, N. Y.



Bevel Drive Differential used in Jackshaft Chain Drive as provided by Kelly Springfield Motor Co., in their 3½-ton Trucks.

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A DRIDEK Leather Top Will Not Scratch or Chafe Will Hold Its Color and Appearance and Is Guaranteed Absolutely Waterproof

TRADE DRIDEK MARK REG.

The Most Remarkable Top Material Yet Produced

"Over the Top"

When you put a DRIDEK leather top on your car, you cover it with a character and distinction that produces an increased value and puts your car in the class where it belongs.

DRIDEK tops are being put on many of the *best* cars. If you don't know all about DRIDEK get samples and price list at once.

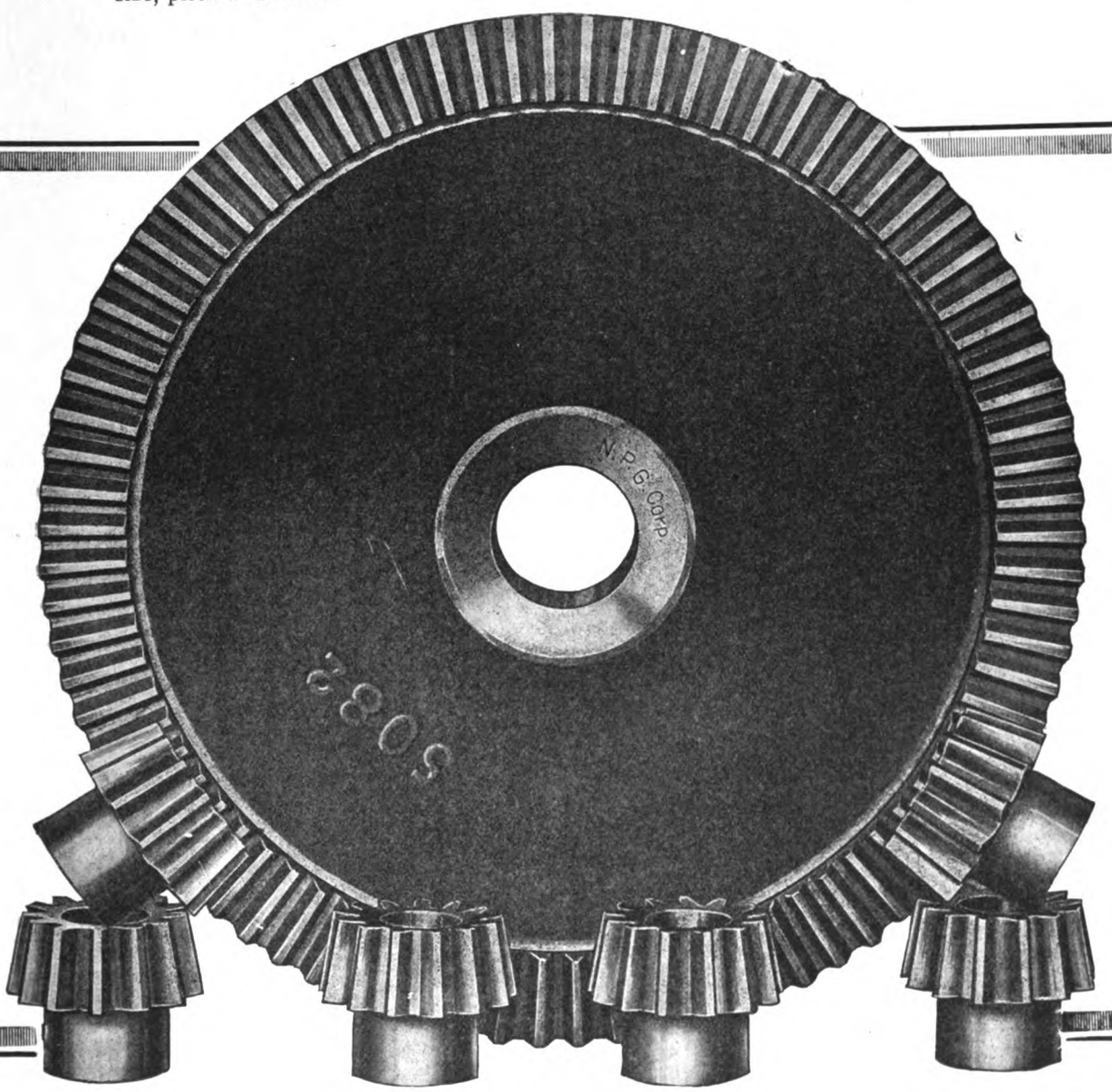
L. J. Mutty Company, Boston, Mass.

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Try Us On Bevel Gears

We've specialized on bevel gears. Our very large capacity and the fact that hundreds of thousands of our bevels are standard parts on leading automobiles, machine tools and other machinery places us in a peculiarly advantageous position to fill your requirements.

Our equipment provides for generating the correct shape of tooth which assures the highest quality of workmanship and for a rapidity of production which makes our prices attractive. Give us at least a chance to figure on any quantity, size, pitch and finish.

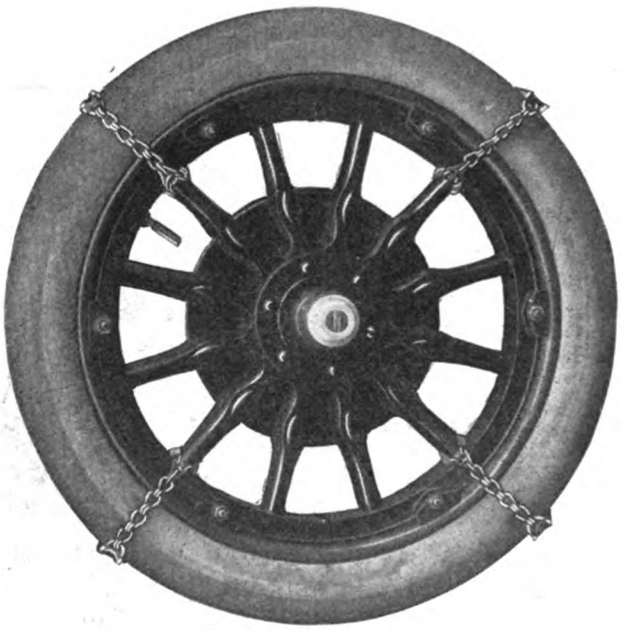


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GEAR CORPORATION
SYRACUSE, N.Y.

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You Need These—Because They Mean More Business and Greater Profits

The Woodworth Easyon Chains and the Woodworth Easyon Solid Tire Grips make an instant appeal to the good sense of the motorist, and virtually sell themselves.



Woodworth Easyon Chains

Grip Like Mud Hooks
Ride Like Bare Tires

Are designed to be conveniently carried by the motorist and then to be quickly and easily put in place when he finds his back wheels spinning in the mud or snow or in any slippery place.
They take up scarcely any room.
They are applied in a few moments.
They provide perfect traction.
They are so designed that they cannot scratch the wheels or harm the tires.
They are made in three sizes—to fit any car.
They are packed 8 in a bag—4 for each wheel. Made also for solid tires—single and dual. They are low in price.

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Geo. B. Carpenter & Company
436 Wells Street

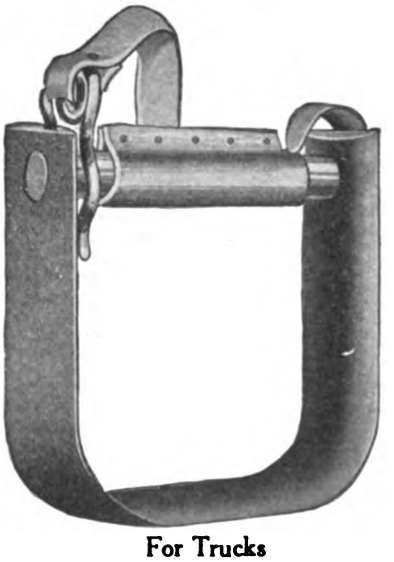
New York City Distributors
Rose Auto Supply Co.
1765 Broadway

Easyon Solid Tire Grip

Takes a powerful hold on the road; does not injure the tire or the roadway; it is practically unbreakable and causes no bumping on pavements. When run on hard road surfaces the tire is running over a very thin half oval surface, but when the tire slips the grip assumes a slanting position on the tire and takes a deep hold in mud or snow.

Made for all sizes of single or dual tires

Write us for our liberal proposition



For Trucks

Woodworth Manufacturing Corp.

Niagara Falls, New York

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G&O Radiators

Designed and Built to meet the exacting requirements of

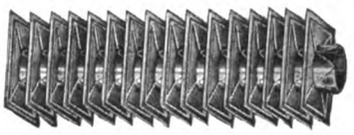
Airplane Service

combining:

Light Weight
Efficiency and
Durability

Diagonal and Square Honeycomb Types. One Quality Only —The Best

Our engineering experience and up-to-the-minute manufacturing facilities are at your disposal.

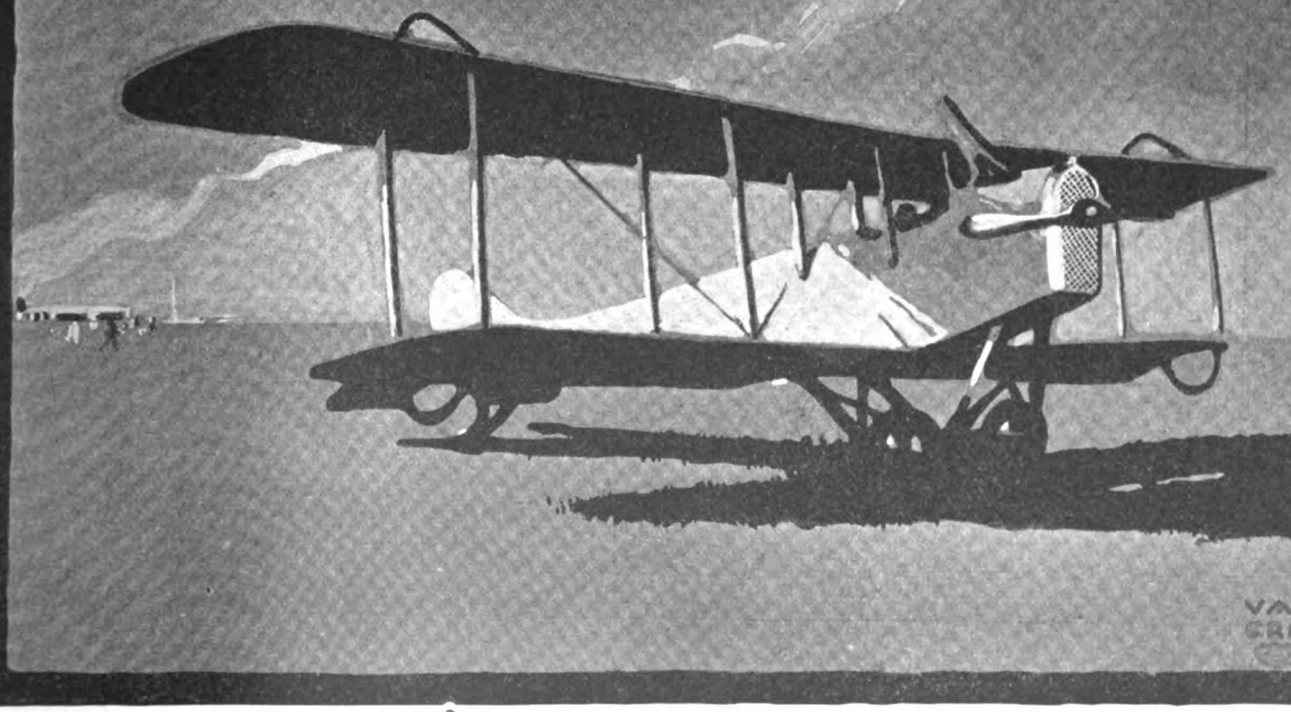


Square Fin Tubing

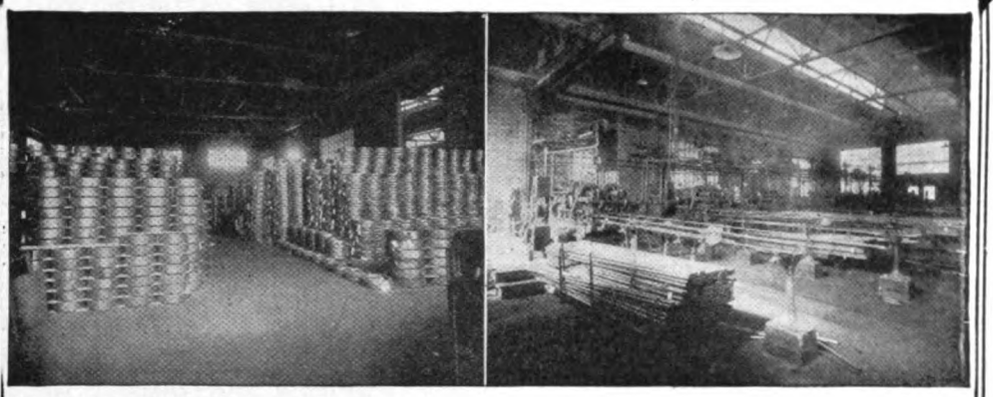
The G & O Manufacturing Co.
New Haven Conn.







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Why We Deliver Promptly

Having our own strip steel mill, we produce "Elisco" tubing from the raw material to the finished product in our own plants.

This assures for our customers the advantage of prompt and regular deliveries on all orders for—

ELISCO

Light-Gauge, Cold Rolled

STEEL TUBING

—the only welded steel tubing made by automatic machines combining ***all six*** operations in ***one.***

TUBING:

Cold drawn; ¼ inch to 3 inch O.D. 16 to 20 B.W. gauge. Hot-rolled, high carbon, butted and brazed; ⅞ inch to 2⅜ inch O.D., 11 to 17 gauge.

STRIP STEEL:

Cold rolled; .035 and thicker, width up to 12 inches. Hot-rolled, .065 and thicker, widths up to 8½ inches.

BARS:

Hot rolled. Square bars 1¼ inch to 2½ inch inclusive. Flats, widths up to 8½ inches.

SHAPES:

Channels, 3 inch, 4 lb., 5 lb., 6 lb., and 4 inch, 5¼ lb. sections. Angles 2½ and 3 inch equal leg. U-bars and special shapes of moderate dimensions in hard and soft steel.

Let us figure on your requirements.

THE ELYRIA IRON & STEEL CO.

East 131st Street CLEVELAND, OHIO

Chicago Office, 1243 Peoples Gas Bldg.
Atlanta, Ga., Office....Candler Bldg.
Detroit Office, 1934 Dime Bank Bldg.
New Haven, Conn..504 Colonial Bldg.

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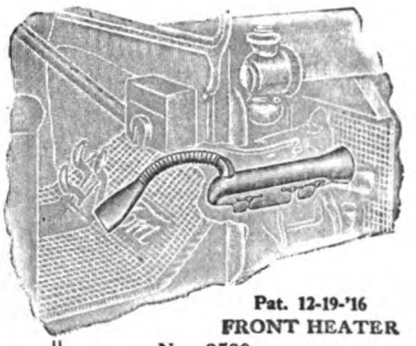
The NEW Presto Car Heater For All Ford Cars

Front Heater $5

Rear Heater $6.50



No. 2600—Gives abundance of heat; just where you need it most.

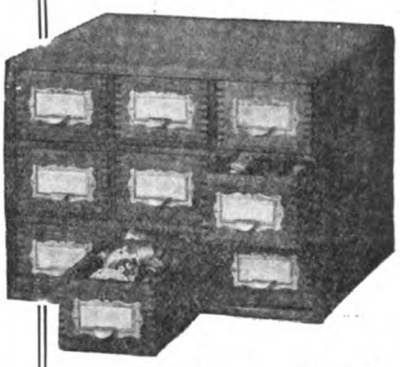


Pat. 12-19-'16
FRONT HEATER
No. 2500

Presto Specialties

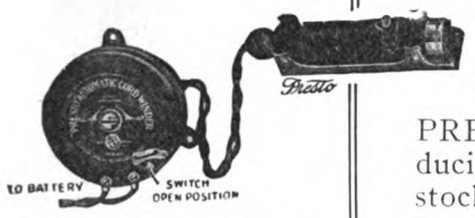


No. 2100 — PRESTO Electric Heater for Auto Engines, Carburetors and Radiators. $4 in U. S. A. $6 in Canada.



PRESTO Connector Cabinet Furnished Dealers, Garagemen and Supply Houses, with connectors or without.

Are In Practically All Jobbers' Catalogs— All Dealers' Stocks



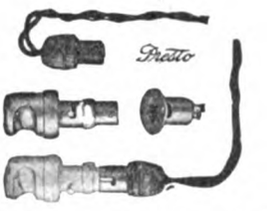
No. 252 — Combination Cigar Lighter, Holder and Cord Winder. $5.00. (Four other styles.)

PRESTO Specialties set the pace, introducing many new products it pays to stock.

The complete line of PRESTO Heaters; Cigar, Pipe and Cigarette Lighters; Trouble and Hand Lamps; Cowl, Dash and Step Lights, are standard the automobile world over. PRESTO Switches, Adapters, Plugs and Lamp Sockets comprise another famous line.

Practically all Jobbers catalog the PRESTO Specialties. Practically all live dealers sell them.

JOBBERS: Send for electros of new PRESTO Specialties for your next catalog.



No. 230-S — Combination Dash and Trouble Lamp with Lever Switch. (Made in four styles.)



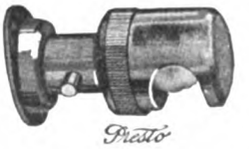
No. 286 — Inspection Trouble Lamp. (Three other styles.)



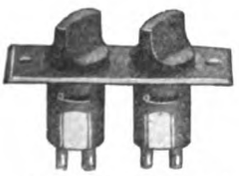
No. 655-S—Metal Dash Lamp (4 styles for wood and metal dash).



No. 3-P—Dash Board Y Plug Socket.



No. 647-S — Bull Pup Dash Lamp, one of 18 styles of Dash Lamps.



No. 417—2 Dash Board Light Switches, for Ford and all other Lighting Outfits. Single or two, three or four gang.



No. 135 — Double End Focusing Socket for Ford headlights.



No. 8 — Elbow Plug for Ford Headlights.



No. 4-C—Converting Plug



All weather protector for Ford cars. Keeps out the cold winds.

Metal Specialties Mfg. Co., Inc.

338-352 N. Kedzie Ave. Chicago

Eastern Branch: 16-24 W. 61st St., New York.
Western Branch: 149 New Montgomery St., San Francisco, Calif.

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THE SCHATZ "UNIVERSAL" Annular Ball Bearing



Letters from users of the "Universal" prove that **it leads the field internationally** in **safety** and **carrying capacity** and that it **triumphs** over the **hardest** service conditions.

Takes **300%** to **400%** **more thrust load** than any other known annular bearing. Takes end thrust in **either direction without adjustment** and **without impairment of annular efficiency.**

"The Super Bearing"

INNER race one-third deeper than the average and held to curvature only 4% greater than the curvature of the balls.

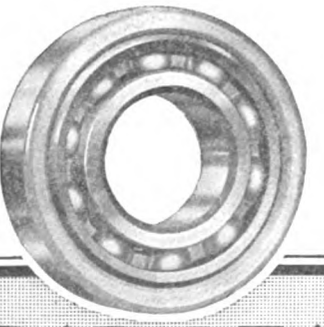
Outer race generated on two integral cups or race rings with space between to distribute radial load and to prevent binding strain under thrust load.

Separator free from rivets, rivet holes and distance pieces. It consists of two interlocking units and is sufficiently flexible to accommodate itself to changes in the axis of rotation of the balls.

Races and balls made from the highest quality of high carbon chrome crucible alloy steel to a specified analysis.

Raw material, parts in process and **finished product** are so rigidly and persistently inspected that the "Universal" has established a new standard of quality for ball bearing manufacture.

The "Universal" is a self-contained, combined radial and thrust bearing **internationally standardized** and **interchangeable.**

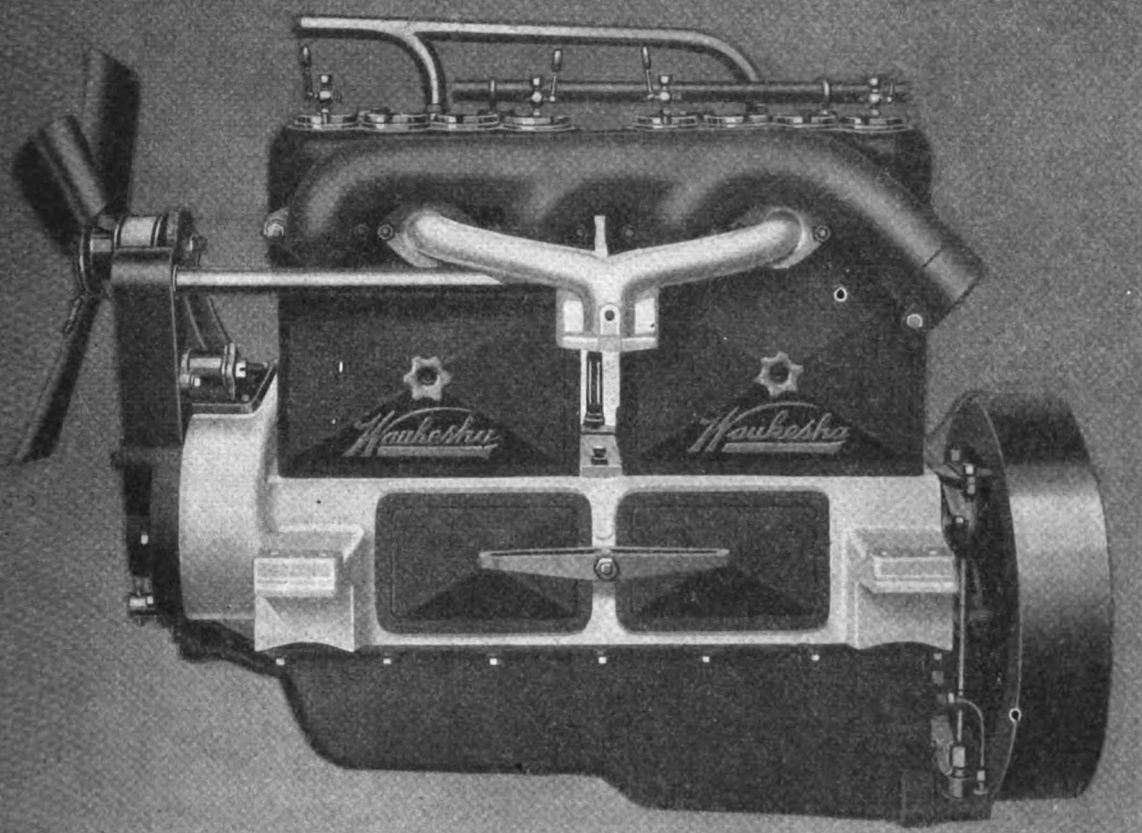


Engineers of motor cars and parts or of any other mechanism with rotating members should write for catalog and data sheets.

THE FEDERAL BEARINGS CO. INC.

26 WILLIAM ST., POUGHKEEPSIE N.Y.

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Emerson Says:

"Work is victory. Wherever work is done, victory is obtained. There's no chance and no blanks." The conscientious effort put into the designing and building of

Waukesha
TRADE MARK

Four-Cylinder Motors for Trucks and Tractors

has been rewarded by the confidence of the Nation and the approval of the world's foremost automotive engineers. The name *Waukesha*, in itself, is an unqualified guarantee of more-than-satisfactory service.

"Demand a Waukesha Motor in the Truck or Tractor You Buy."

WAUKESHA MOTOR CO., Waukesha, Wis.

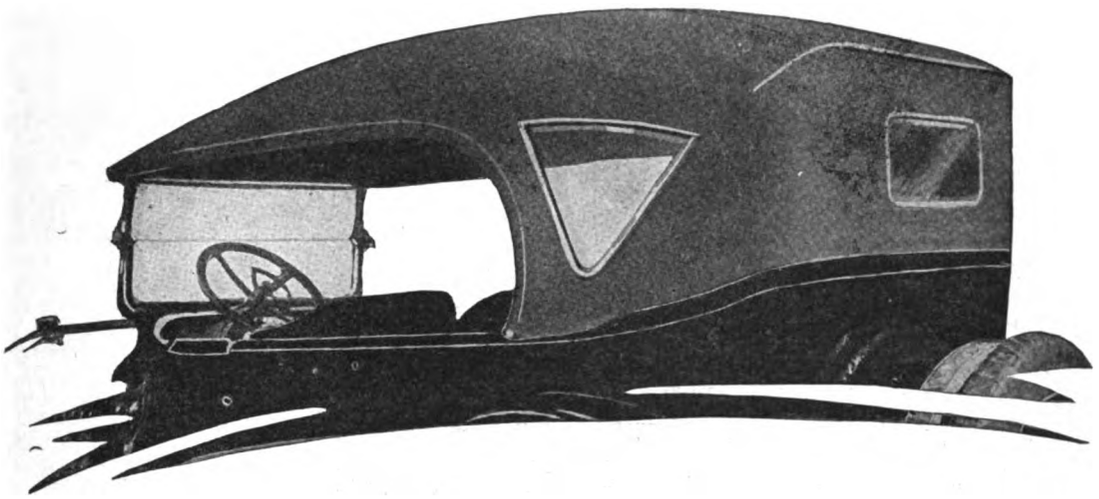
World's Largest Manufacturers of Truck and Tractor Motors Exclusively

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DU PONT AMERICAN INDUSTRIES



RAYNTITE—The Top That Stays New

Mail This Coupon

marking X before subject that interests you.

	Rayntite Top Material		Fairfield Rubber Cloth
	Motor Fabrikoid		Industrial Dynamites
	Craftsman Fabrikoid		Blasting Powder
	Truck Special Fabrikoid		Blasting Supplies
	Marine Special (U. S. Stand.)		Farm Explosives
	Book Finish Fabrikoid		Hunting
	Fabrikoid Sheeting		Trapshooting
	Py-ra-lin Toilet Goods		Anesthesia Ether
	Challenge Collars		Leather Solutions
	Novelty Sheeting		Soluble Cotton
	Transparent Sheeting		Metal Lacquers
	Py-ra-lin Rods & Tubes		Wood Lacquers
	Py-ra-lin Pipe Bits		Mantel Dips
	Py-ra-lin Specialties		Bronzing Liquids
	Sanitary Wall Finish		Pyroxylin Solvents
	Town & Country Paint		Refined Fuel Oil
	Vitrolac Varnish		Commercial Acids
	Vitrolac Stain Finish		Alums
	Flowkote Enamel		Saltpetre
	Liquid Light for Mills		Wood Pulp
	Antoxide Iron Paint		Pigment Pastes
	Auto Enamel		Tar Distillates
			Dyes and Bases

Name

Address

City State



Visit the Du Pont Products Store 1105 Boardwalk, Atlantic City, N. J.

A grey, dingy, faded top will make any car look passè. Don't sell your car because the top looks shabby. Get a new top—a top that stays new.

DU PONT FABRIKOID RAYNTITE

never fades. It is water, grease, stain and dust proof—and as cleanable as glass. When soiled by travel, plain water will restore its beauty. It is guaranteed for one year not to leak, crack nor peel but built to last the life of your car.

Any good top maker can re-top your car with Rayntite.

Check Rayntite in the coupon and send for samples, booklet—and list of cars on which Rayntite is furnished as regular equipment.

Du Pont Fabrikoid Company

World's Largest Makers of Leather Substitutes

Wilmington - - - Delaware

Works at Newburgh, N. Y., and Fairfield, Conn.

Canadian Office and Factory, Toronto

The Du Pont American Industries are:

E. I. Du Pont De Nemours & Company, Wilmington, Delaware. Explosives.
Du Pont Chemical Works, Equitable Bldg., New York. Pyroxylin and Coal Tar Chemicals.
Du Pont Fabrikoid Company, Wilmington, Delaware. Leather Substitutes.
The Arlington Works, 725 Broadway, New York. Ivory Pyralin and Cleanable Collars.
Harrisons, Inc., Philadelphia, Pa. Paints, Pigments, Acids and Chemicals.
Du Pont Dye Works, Wilmington, Delaware. Dyes and Dye Bases.

DU PONT

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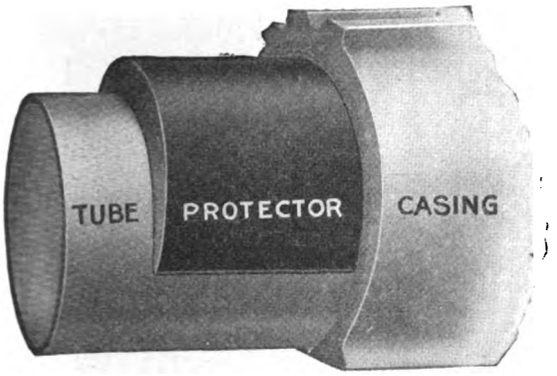


Where the Slightest Flaw Invites Destruction

IN the aeroplane—where the slighest defect in any part or material invites almost certain destruction and loss of life—you usually find Hess-Bright Ball Bearings. They are essential to machines in which dependability, endurance and faultless operation are imperative, and are invariably an indication of conscientious construction. The same is true regarding motor cars — the better are Hess-Bright equipped.

Where Performance takes Preference over Price

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U. S. Patent No. 1,181,065

The Coffield Tire Protector
Eliminates Tire Troubles

See it at the New York Automobile Show
January 5 - 12, Booth 43, Fourth Floor

The Coffield Tire Protector makes an instant appeal to every automobile and motorcycle owner, for it is the last word in solving the tire trouble problem in pneumatic tires.

It is used by thousands of motorists in every state in the country. and every user is an enthusiastic booster.

Its Construction

The Coffield Tire Protector is made entirely of firm and elastic rubber, and does not contain a single thread of fabric. This makes it absolutely different from any similar device ever placed on the market.

It is made by hand with extreme care, and can never creep nor buckle inside the casing. On sweltering hot days it keeps the tire several degrees cooler.

Increases Mileage

In addition to turning down nails, tacks, etc., before they can puncture the inner tube, the Coffield Tire Protector prevents stone bruises by distributing the blow so that it is taken up by the entire casing. This does not permit the fabric, which is the backbone of the casing, to become weakened at any one point.

Blow-outs are therefore reduced to a minimum, and the life of the tire is greatly increased.

Many users of the Coffield Tire Protector get 100% more mileage from their tires than formerly. Some get as high as 150%.

No Advance In Prices

In spite of the high cost of crude rubber, the price of the Coffield Tire Protectors has not been advanced. The first cost is low, and it is the only cost, for you only buy them once—and with proper use they will outlast many sets of tires.

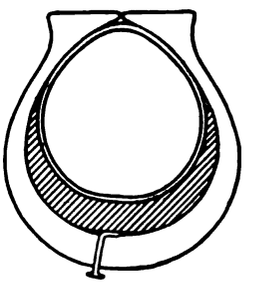
Write to-day for descriptive literature. Or, see us at the New York Automobile Show—Booth 43, Fourth Floor.

State Agencies Open

We still have a few choice state agencies open for high-grade distributors.

The Coffield Tire Protector Co.
Dept. 300 Dayton, Ohio, U. S. A.

Perfect Protection



When a nail is picked up it is clinched between the Protector and the casing, thus preventing puncturing of the inner tube.



Shocks from stones, etc., are distributed around the casing. There is no weakening of the inside fabric at any one point.

Read What Users Say

An Aeroplane Engineer

I have been using your Tire Protectors for the past year, and have found them very satisfactory in the hottest of weather; and have made some special heat tests, finding that there is no heating or chafing of casing or tube. In one instance I got 15,400 miles from one casing by using the Coffield Tire Protector.

JOS. E. BUTZ, The Dayton-Wright Aeroplane Co., Dayton, Ohio.

A Prominent Banker

I am pleased to advise you that I have used the Tire Protectors you sold me last spring with a great deal of satisfaction. During the time they have been in use I have not had a puncture, and in addition to this great convenience I believe I have received at least 2,000 additional miles from my tires on account of the Protectors.

H. H. THOMAS,
V.-Pres., Savings Investment & Trust Co., East Orange, N. J.

A Lumber Company

It is poor economy for any motorist to be without Coffield Tire Protectors. If I owned a dozen cars I would have them on every wheel of every car, and save many dollars thereby. If the Protectors have any faults whatsoever, I have failed to find them.

I have more and better tire service at less expense. One of my tires has run about 1,000 miles since it was decided worthless, and it appears as if it may yet run another 1,000 miles.

N. W. CHURCHILL,
Yard Foreman, North End Lumber Co., Tacoma, Wash.

A Transfer Company

Replying to your inquiry regarding your Tire Protectors, will say they have given perfect satisfaction. We have not had one puncture since we have installed them, and can recommend them to anyone as a positive proof against punctures. They have eliminated our tire troubles.

PEORIA BUS & BAGGAGE LINE,
Peoria, Ill.

A Clothing Store

When you installed a set of Coffield Tire Protectors in our delivery car about six weeks ago we promised to let you know what we thought of them. Up to the present time we have not had a single puncture or a minute's delay or trouble of any kind.

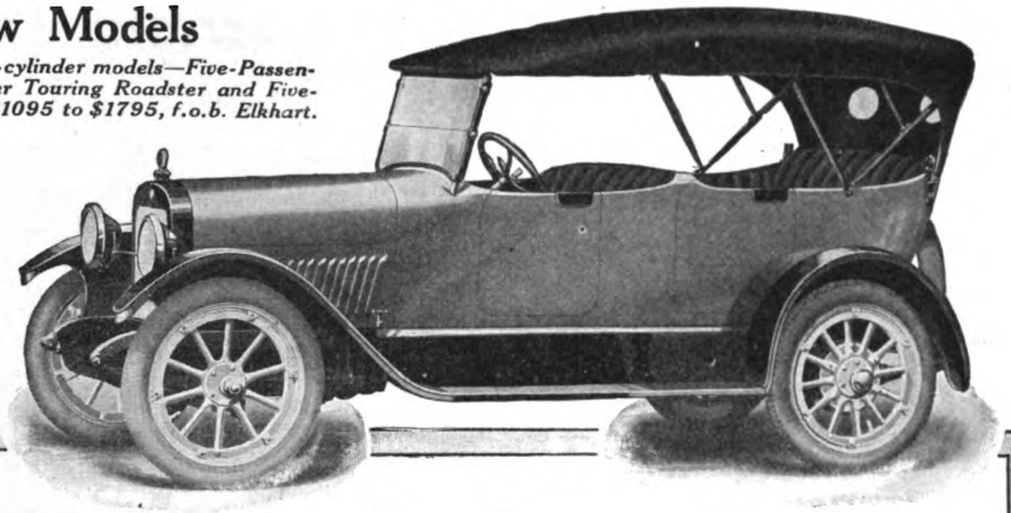
Before putting your Protectors in the tires we had almost daily punctures and tire trouble —often two punctures in a day.

HENRY HALLE & BRO.,
Memphis, Tenn.

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Six New Models

Three 4-cylinder models—three 6-cylinder models—Five-Passenger Touring Car, Four-Passenger Touring Roadster and Five-Passenger Sedan. Price range, $1095 to $1795, f.o.b. Elkhart.



Looks good, doesn't it?

—and the picture doesn't begin to do it justice

ELCAR

It is graceful in design and beautiful in finish—smart and stylish in every detail. Nothing lacking for beauty, comfort, performance or endurance. Drive all day and you won't be cramped or tired.

The steering is the easiest; the control the simplest. Easy riding whether fully or partially loaded; remarkable in this respect. Abundant power for hard pulls—fine driving qualities at all speeds—and all the speed you want.

Reliable quality is a certainty in the Elcar. We learned to put in quality years ago when building cars selling up to and above $3000. It is a quality car at a popular price—good and large enough to fulfill any motor car requirement.

Catalog on Request

Write for the Elcar catalog—very descriptive, well illustrated—gladly mailed to all interested.

Don't think of choosing until you have seen the Elcar. It will be at the New York and Chicago shows, and at other leading shows—or see it in the show room of any Elcar dealer.

Elkhart Carriage & Motor Car Company
C-778 Beardsley Avenue **ELKHART, INDIANA**

Pretty as a picture from any angle



Brief Mention of Elcar Points

Four-cylinder models, 37½ horse power at 2,100 r. p. m. Six cylinder models, 40 horse power at 2,100 r. p. m. Two unit electrical system. Long wheel-base, 116 inches; road clearance 10½ inches. Full floating rear axle with spiral bevel driving gears. Timken Roller Bearings front and rear. Double universal drive; tubular propeller shaft. A wonderfully easy riding semi-elliptic spring suspension. Roomy and comfortable bodies of beautiful design and durable finish; new "Cathedral Pipe" upholstering. Equipment complete, even to motometer.

Dealers! Look at the value—look at the price—then get in touch quick if you are interested. Our increased production will enable us to accommodate a few more live dealers in picked territories.

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G.P.&F. SERVICE
"KNOWING HOW SINCE '81"

Maxim Silencer
Is a Valuable Selling Point for Any Car

To the Passenger Car Manufacturer:

The dealer who can point to the car he sells, and say to his prospective customer: "This car is equipped with a Maxim Silencer," has brought forth a new and forceful selling point.



H P. MAXIM
Inventor

The fame of Maxim Silencers for fire arms has built a reputation that extends far beyond the following that has actually used the Silencer. Around this reputation, great prestige and confidence have grown up.

Maxim Silencers for automobiles are proven selling points that sell. They insure noiseless motors, free from power hampering back pressure.

As manufactured by Geuder, Paeschke & Frey, Maxim Silencers are now available for motor cars of every make.

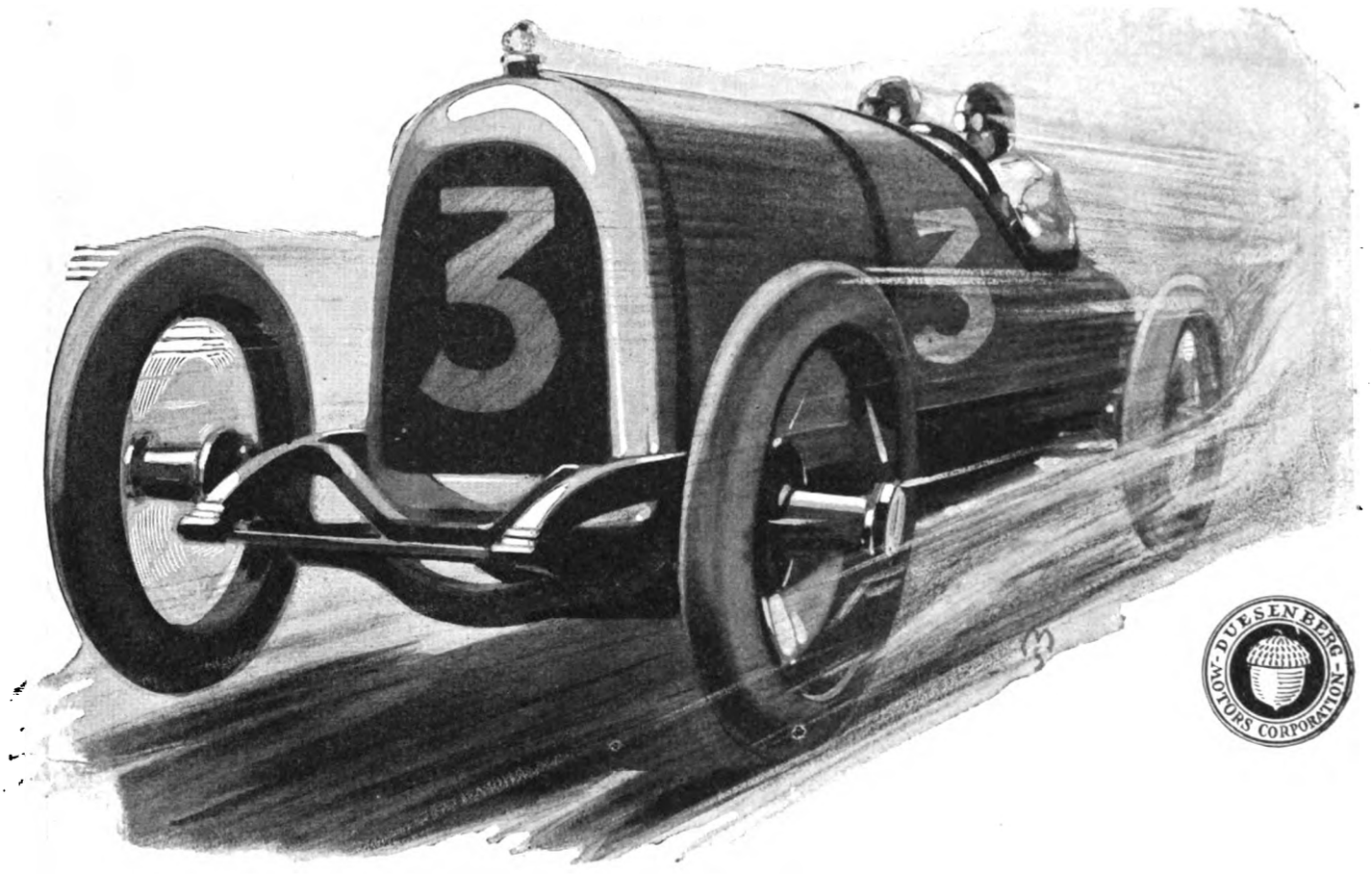
Let us submit a quotation on your requirements

Geuder, Paeschke & Frey Co.

1422-1700 St. Paul Avenue **Milwaukee, Wisconsin**



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EDDIE HEARNE'S GREAT RECORD

Duesenberg Automobile Engines have quite a reputation of their own for tremendous power, high efficiency and dependability, but the Duesenberg Engine in Eddie Hearne's "Roamer-Duesenberg Special" is a world-beater for sheer, downright grit and stick-to-it-tiveness. Hereunder is a brief resume of Hearne's record this year:

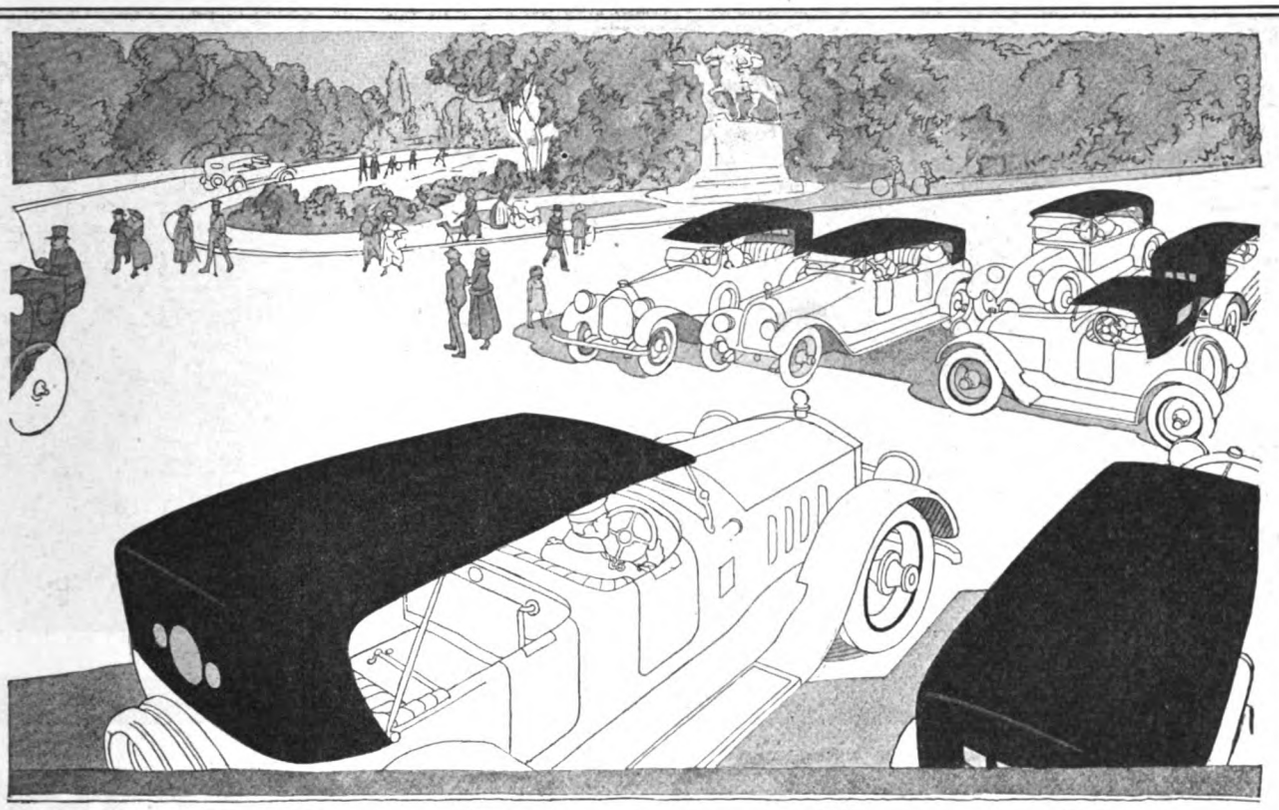
Nov.	29th, Ascot Speedway, Los Angeles, 50 miles	First
Oct.	29th, Uniontown Speedway, Uniontown, Pa., 168½ miles	First
Oct.	13th, Fair Grounds, Richmond, Va., 5 miles	First
Oct.	13th, Fair Grounds, Richmond, Va., 10 miles	First
Oct.	13th, Fair Grounds, Richmond, Va., 25 miles	First
Oct.	6th, Fair Grounds, Danbury, Conn., 5 miles	First
Oct.	6th, Fair Grounds, Danbury, Conn., 10 miles	First
Sept.	28th, Fair Grounds, Trenton, N. J., 5 miles	First
Sept.	28th, Fair Grounds, Trenton, N. J., 10 miles	First
Sept.	28th, Fair Grounds, Trenton, N. J., 10 miles	First
Sept.	22nd, Sheepshead Bay Speedway, 100 miles	Third
Sept.	3rd, Uniontown Speedway, Uniontown, Pa., 112½ miles	Finished
Sept.	15th, Narragansett Park Speedway, Providence, R. I., 25 miles	Fourth
Sept.	15th, Narragansett Park Speedway, Providence, R. I., 100 miles	Third
July	14th, Twin Cities Speedway, Fort Snelling, Minn., 100 miles, out 17th lap.	
July	4th, Omaha Speedway, Omaha, Neb., 150 miles	Fifth
June	16th, Chicago Speedway, Chicago, Ill., 250 miles	Fourth
May	30th, Cincinnati Speedway, Cincinnati, O., 250 miles	Fifth
May	10th, Uniontown Speedway, Uniontown, Pa., 112½ miles	Third

This is the complete list of races in which Hearne started this season as supplied by the American Automobile Association. It is a record unique for its remarkable showing of consistency and speed.

DUESENBERG MOTORS CORPORATION

120 BROADWAY *Contractors to the United States Government* **NEW YORK CITY**

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Smart Cars Deserve Smart Tops

ABBOTT
BELL
BIDDLE
BOUR-DAVIS
COMET
CRAWFORD
CUNNINGHAM
DANIELS
DORRIS
DREXEL
GLIDE
GRANT
ELGIN
EMPIRE
F. I. A. T.
FRANKLIN
H. A. L.
HATFIELD
HAYNES
HUPMOBILE
JONES
JORDAN
KING
KLINE
LEXINGTON
McFARLAN
MADISON
MITCHELL
MOON
MURRAY
NATIONAL
OWEN MAGNETIC
PAIGE
PEERLESS
PENNSY
PIEDMONT
ROSS
SCRIPPS-BOOTH
SINGER
STANDARD
STEARNS-KNIGHT
STEPHENS
STUTZ
TEMPLAR
YALE

IN fact, smart tops are necessary to make smart cars. The truth of this is readily apparent if you will look at the cars on the avenue and measure with your eye just what you see. In a majority of instances, you will see the top first, and in all cases where the top is raised, it is the most prominent part of the car.

It is this *importance* of the top that has led nearly fifty manufacturers of good cars to adopt Neverleek Top Material as regular equipment. They have found by experience, testing and observation, that Neverleek makes not only smart tops but good tops. Neverleek tailors well; that is, it takes faithfully the lines and curves of good designing; it forms a top that is a harmonious part of the whole car.

The beauty and richness of Neverleek *are lasting*. This material has quality in it; the stuff that not only guarantees protection against leaking but retains good looks through long wear. Neverleek won't stretch nor sag nor crack nor fade.

Remember this one point when you buy a new car. Any car is a better car if the top is Neverleek. It will be a better-looking car as long as you have it and a higher selling value when you dispose of it.

Nearly fifty makes of cars, selling from less than $1000 to more than $5000, carry Neverleek Top Material as regular equipment. This list is given on the left of this page. Study it. We have a booklet, "Style in Motor Tops," containing information that will be interesting to any motorist and samples of material showing different grains and finishes. Why not write for it today? Mailed free on request. Should the condition of the top on your old car suggest renewal, any top-maker will be glad to re-cover it with Neverleek.

F. S. CARR COMPANY

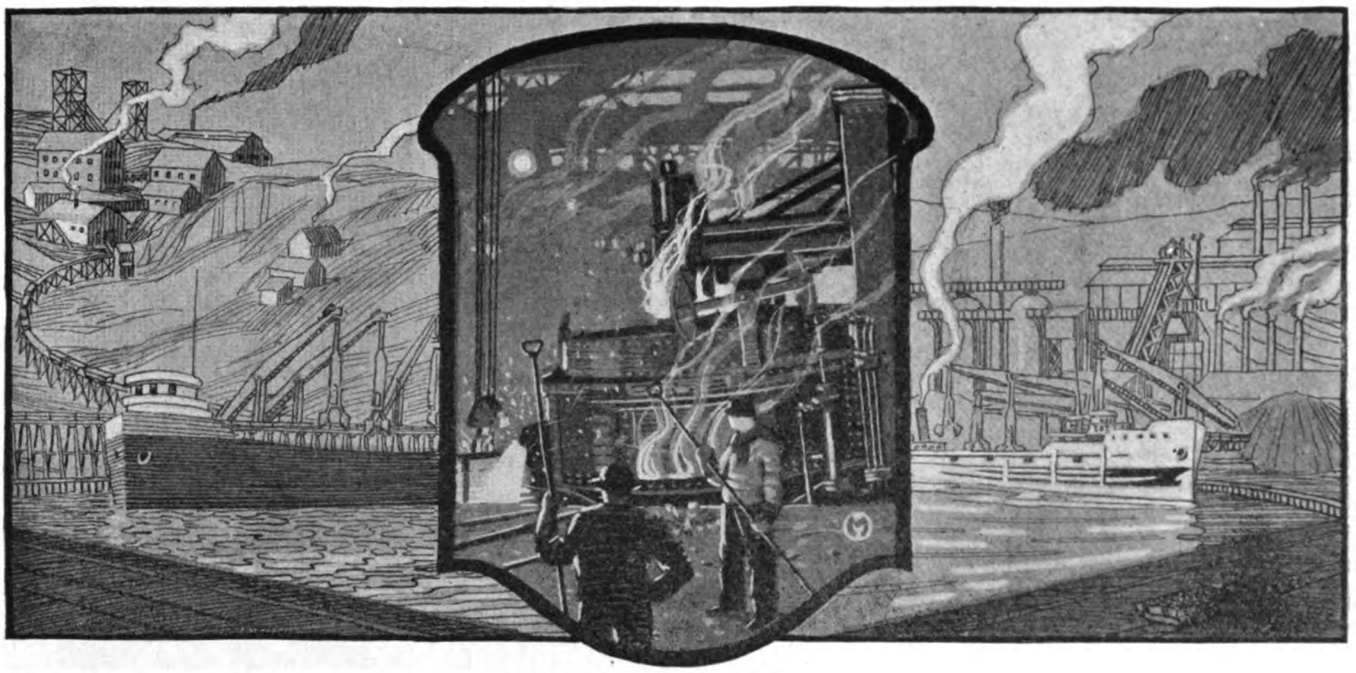
31 Beach Street
BOSTON, MASS.

NEVERLEEK
TOP MATERIAL

969 Woodward Ave.
DETROIT, MICH.

Trade Mark Reg. U. S. Pat. Off.

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PARKER PROCESS
RUST-PROOFS IRON AND STEEL

Steel-so hard to get so easy to save!—

Now being used in the Manufacture of

Typewriters
Building Supplies
Automobiles
Motor Trucks
Motor Accessories
Electrical Equipment
Farm Implements
Ranges and Stoves
Steel Furniture
Sporting Goods
Phonographs
Dental Supplies
Railway Supplies
Telephone Equipment
Ornamental Iron Work
Arms and Ammunition
Etc., etc.

Think of the millions of dollars invested in the steel industry—bringing the ore from the mine—refining it in the mammoth smelters. And the hundreds of thousands of men employed!

Then think that 23% of all of this valuable metal is allowed to rust away each year! It is almost unbelievable. The waste is so stupendous that the human mind can hardly fathom it.

When it might be prevented if iron and steel products were only protected properly against this rust. There is now a satisfactory method of rust-proofing iron and steel—the Parker Process.

This method is being employed today by over five hundred of the leading manufacturers of the country. The value of it—the absolute reliability of the results—cannot be questioned when so many of the great industrial authorities endorse it.

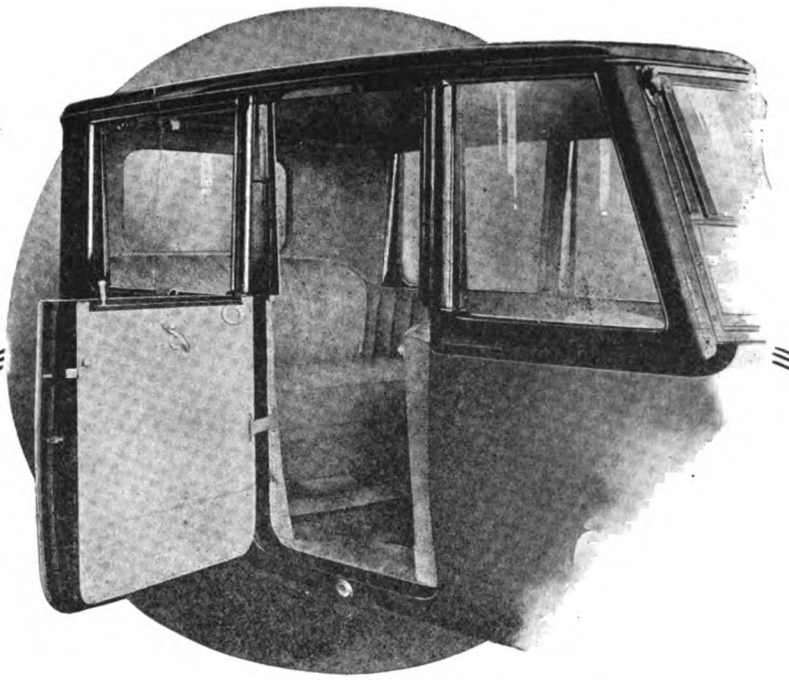
The Parker Process can be fitted into your production plans. It does not interfere with efficiency—is not prohibitive in cost. It is extremely practicable—because it is not electrical, a paint, or a coating of any sort.

We would like to tell you more about the Parker Process. Also we will gladly perform any experiments you may desire to show that it is practicable for your particular product. Furthermore, our plant is open for any inspection to anyone interested in the protection of rust. You will be welcomed at any time.

PARKER RUST-PROOF COMPANY OF AMERICA
DETROIT, MICHIGAN

No. 17

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ENCLOSED CAR BODY MODE

More beautiful and luxurious than ever before, have been pronounced the H & K body designs, in hardwood-framed steel, under active production at the works in Philadelphia.

Illustration shows the latest H & K Steel Body for the Paige Sedan. The daring yet graceful lines, luxuriously upholstered interiors, the smartness and individuality displayed in this work, equals that of the most expensive custom-made, and appeals to all lovers of the beautiful in automobiling.

Our great works at Philadelphia are engaged on the finest enclosed body work for several of the foremost cars of the country—reflecting the buyer's keen appreciation of a really valuable and enduring product, made entirely complete, ready for application to the chassis, and now being shipped in large quantities daily.

Suggestion is made for your engaging space here for producing your requirements in the most successful steel enclosed bodies; steel stampings of all kinds; complete cushion and back springwork, etc. Inquiries and drawings to the nearest office.

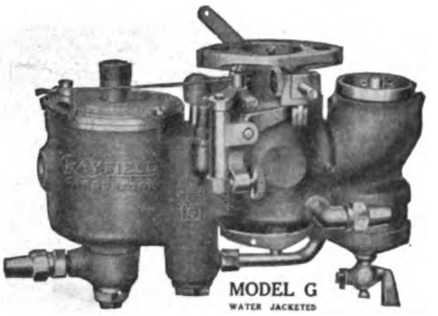
Hale and Kilburn Company

Philadelphia

New York *Washington* *Detroit* *London* *Chicago*

Don't fail to see specimens of the latest designs in H & K Steel Bodies at our exhibit in the New York Show. The exhibit will be worth while.

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RAYFIELD CARBURETOR

Hooverizing on Gasoline

YOU don't relish a half-baked potato; and it has little nourishment. Improper cooking wastes food.

Half-consumed gasoline—from improper carburetion—is likewise waste. It goes up in vile-smelling, black smoke which marks the inefficient, extravagant car.

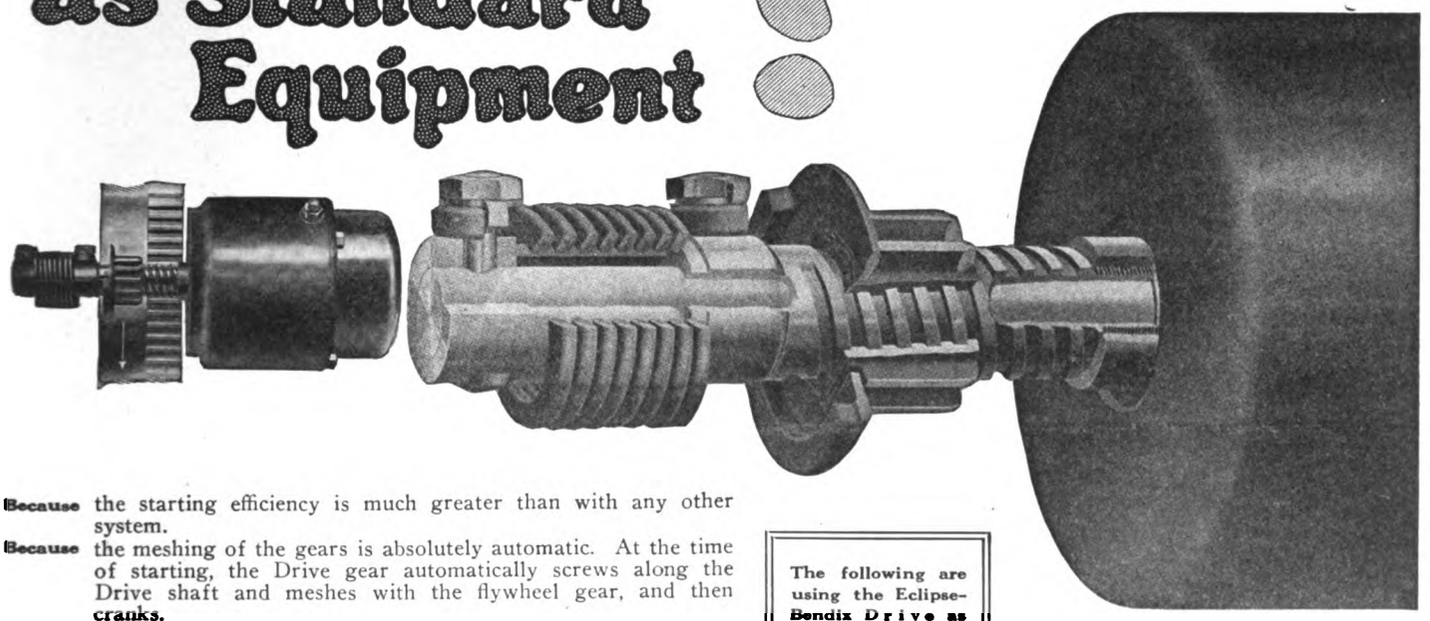
We're all "Hooverizing" these days. We must conserve fuel as well as food. The Rayfield Carburetor will get every possible ounce of power out of your gasoline.

We guarantee this: 20% to 50% more miles per gallon and better all-'round performance. You can test a Rayfield on your car; cold weather is a good time. If you're not convinced, we'll gladly refund your money.

Findeisen & Kropf Mfg. Co.
2117 Rockwell Street, Chicago

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Why have 150 Car Builders adopted the ECLIPSE-BENDIX DRIVE as Standard Equipment?



Because the starting efficiency is much greater than with any other system.

Because the meshing of the gears is absolutely automatic. At the time of starting, the Drive gear automatically screws along the Drive shaft and meshes with the flywheel gear, and then cranks.

Because the demeshing after starting is absolutely automatic. After the engine is started the flywheel gear turns faster than the Drive gear and screws the latter back on the Drive shaft until it is out of mesh.

Because cast iron teeth without any chamfer not only make a great saving in cost, but are actually superior, being the simplest, most efficient and durable construction possible. The teeth are cut in the flywheel which is a natural gear blank. Stripping of these teeth by accidental starting when the engine is running is impossible, because of the automatic demeshing action.

Because back-fires are automatically protected by the shock-absorbing spring Drive.

Because there is no over-running clutch to stick or slip.

Because there is no resistance or two-point switch to burn out.

Because there are no shifting levers and pedals, with their complications.

Because it is simpler and has fewer parts than any other starting system.

Because it eliminates chains, which stretch, break and get noisy.

Because it minimizes gear noise in cranking by driving through a spring.

Because it is absolutely silent when the engine is running, being absolutely disconnected.

Because it permits of using a simple, small generator for constant running.

Because it permits of cranking the engine with the most efficient of all starters—a separate electric starting motor—and also more evenly.

Because it makes the two-unit type of starting and lighting system superior to any other and the most popular of all.

Because it requires the minimum of care and attention during the life of car.

Because it is regularly supplied and used as standard equipment with the following starting and lighting systems, on over 150 different makes of motor cars; and also on a large number of marine and aeroplane motors.

A-B-C	Dusenburg	Leece-Neville	Splitdorf
Allis-Chalmers	Dyneto	North East	Sterling
Auto-Lite	Fay Bowen	North Western	Van Blerck
Delco	Gray & Davis	Remy	Wagner
Detroit	John O. Heinze	Robbins & Myers	Ward-Leonard
Disco	Kemco	Roth Bros.	Westinghouse

New York Show Headquarters
3rd Floor. C. 77-78

Chicago Show Headquarters
Coliseum Gallery, Space 48

ECLIPSE MACHINE CO. Elmira, N. Y.

Sales Agents: BRANDENBURG & CO.; NEW YORK, 57th & Broadway; DETROIT, Dime Bank Bldg.; CHICAGO, 1112 Mich. Ave.

The following are using the Eclipse-Bendix Drive as regular equipment:

PASSENGER CARS				TRUCKS
Abbott	Gray-Dort	Page	Pan-American	American-LaFrance
Allen	Gray-Eagle	Paige	Patterson	All Steel
American Six	Hal-Twelve	Pathfinder	Peerless	Atterbury
Anderson	Harroun	Penny	Phianna	Bell
Apperson	Harvard	Pilgrim	Pilfold	Briscoe
Auburn	Hatfield	Partin-Palmer	Pilot	Collier
Austin	Haines	Premier	Princess	Corbitt
Alter	Haliday	Pullman	Renault	Concord
Biddle	Hassler	R. C. H.	Regal	Dixie
Bimel	Heney	Remington	Reo	Dorris
Bour-Davis	Hispano-Suiza	Riddle	Ross	Duplex-Power
Briscoe	Interstate	Roamer	Russell	Federal
Bush	Imperial	Saxon	Scripps-Booth	Geneva
Canadian-Overland	International	Service	S. G. V.	Garford
Canadian-Regal	Jackson	Singer	Stearns	G. M.
Case	Jones	States	Standard	G. V.
Chalmers	Jordon	Stephens	Stewart	Gramm-Bernstein
Chandler	King	Sun	Stegeman	Grant
Chevrolet	Kissel	Shadwyck	Stearns-Knight	Higrade
Campbell-Four	Kline	S & S	Thomas	Indiana
Cole	Lenox	Touraine	Trumbull	Jeffrey-Quad
Columbia	Lescina	Union	Velie	Kerno Truck
Commonwealth	Lexington	Vulcan	Westcott	Kearns
Crawford	Liberty	White	Willys-Six	Kissel
Crow-Elkhart	Lozier	Willys-Knight	Winton	Kelly-Springfield
Coey	Lancia	Wolverine	Yale	Lippert-Stewart
Cummings	Madison			Little-Giant
Daniels	Marion-Handley			Mack
Davis	McFarlin			Martin
Dixie	Meteor			Nash
Dorris	M. H. C.			National
Dort	Mitchell			Overland
Denmo	Moline-Knight			Peerless
Detroiter	Monitor			Rush
Dile	Monarch			Republic
Drexel	Monroe			Saya
Drummond	Moon			South Bend
Eagle	Murray			Stegemen
Economy	Moore			Tiffin
Elcar	Malbohn			Turnbull
Elgin	Metz			U. S.
Empire	Nash			Velie
Erie	National			White
Enger	Napoleon			Wealthy-Heights
Fiat	Norwalk			
Fostoria	Nelson-LaMoon			
Ghent	Nusco			
Glide	O. S.			
Grant	Oakland			
Gerlinger	Oldsmobile			
	Overland			
	Ogran			
	Olympia			

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DURABILITY is the essential quality often looked for in top material but rarely found. When Drednaut is used, an unequalled, weather-resisting, long-wearing top shields you.

More "Chase" material is used on vehicles today than any other brand.

DREDNAUT MOTOR TOPPING often outlasts the car itself—it is a positively *weatherproof*, non-cracking, non-blistering material that can be easily handled and cleaned.

APPEARANCE is a big factor in top material. A top of Drednaut adds beauty to any car,—the beautiful, rich-appearing surface is not impaired by folding or the elements.

Use DREDNAUT and *be protected*, both by a splendid top and the "CHASE" name.

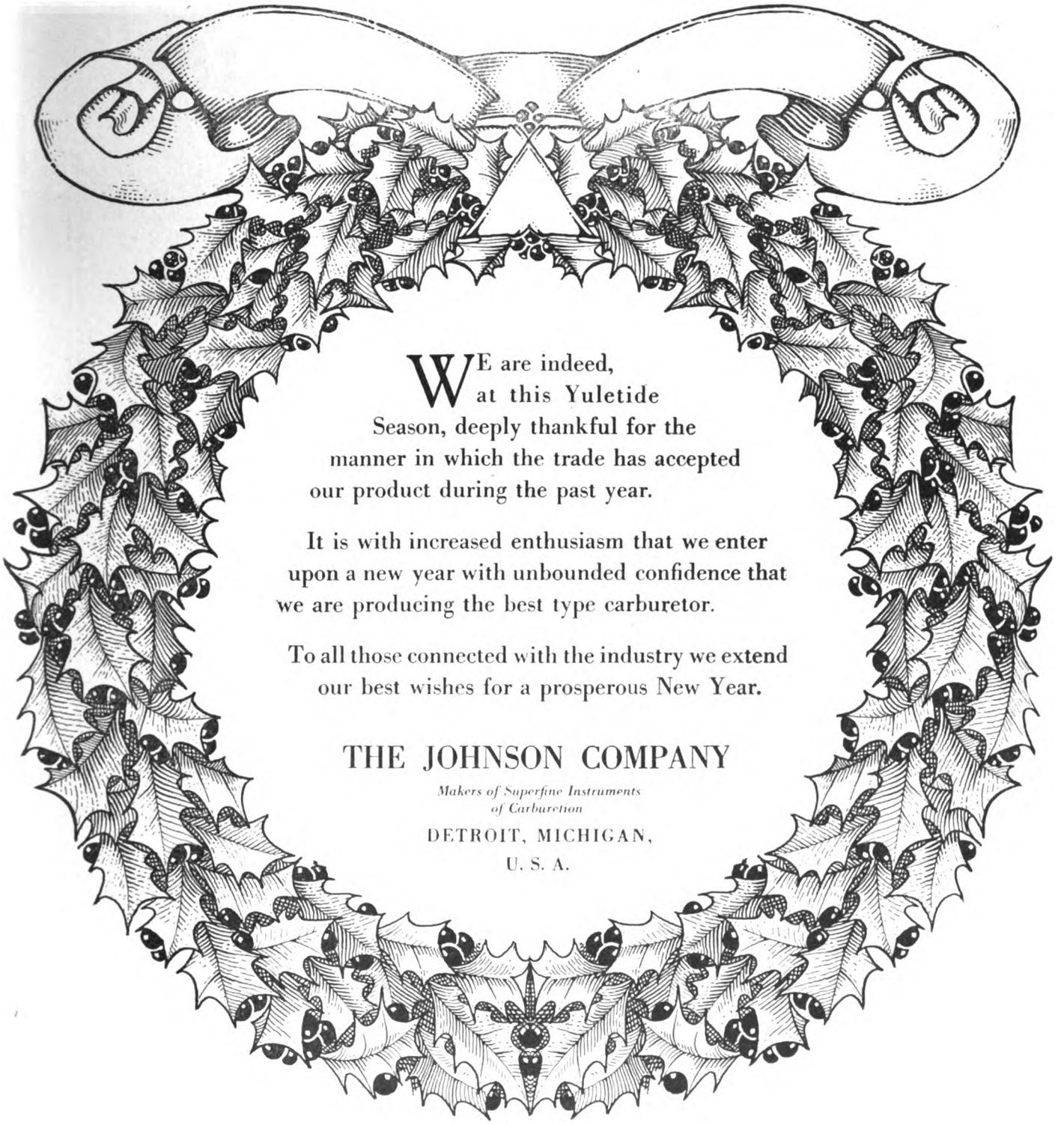
DREDNAUT MOTOR TOPPING retains its smart appearance after years of the severest use—it is a *genuine* product, that has given complete satisfaction the past twenty years.

OTHER PRODUCTS OF OUR MILLS:
Plush, Wool and Cloth Robes,
Mohair Velvet Upholstery,
Cinch Curtain Fasteners

L. C. CHASE & CO., BOSTON
NEW YORK DETROIT CHICAGO
Leaders in Manufacturing Since 1847

OTHER PRODUCTS OF OUR MILLS
Leatherwove Upholstery,
Wool and Cloth Steamer Rugs,
Wexford Motor Cloths

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WE are indeed,
at this Yuletide
Season, deeply thankful for the
manner in which the trade has accepted
our product during the past year.

It is with increased enthusiasm that we enter
upon a new year with unbounded confidence that
we are producing the best type carburetor.

To all those connected with the industry we extend
our best wishes for a prosperous New Year.

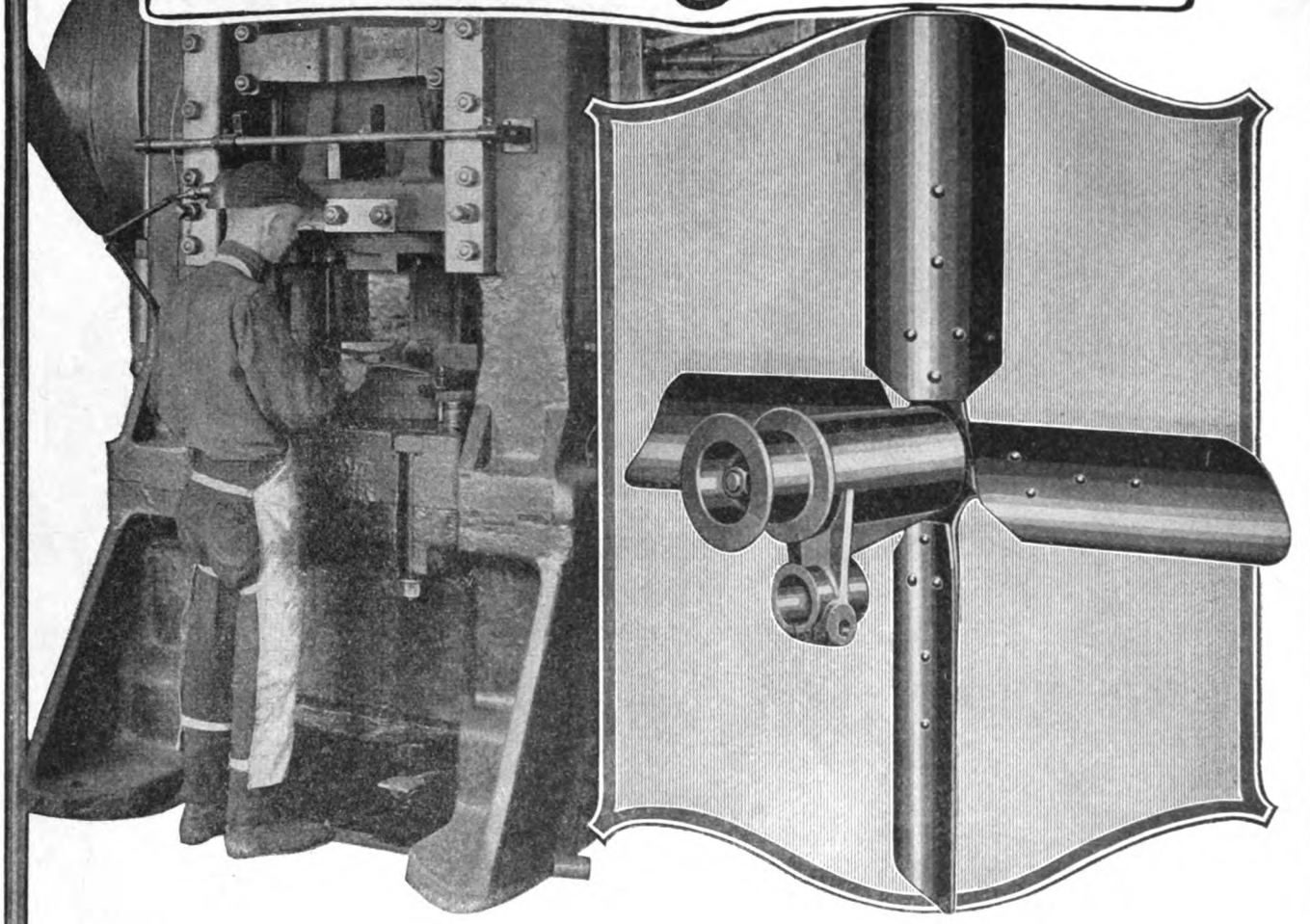
THE JOHNSON COMPANY

Makers of Superfine Instruments
of Carburetion

DETROIT, MICHIGAN,
U. S. A.

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OAKES
Cooling Fans



Oakes Fans Use Least Power and Produce Greatest Air Velocity

Above is shown a spindle driven fan, especially designed for use on Buda Motors. It is provided with large heavy duty bearings—proper swing of bracket. This is our model 500 curved type of blade, as adopted by Government on Class B trucks. Oil-right feature guarantees indefinite lubrication and bearing protection.

The giant press shown at left is one of a "battery"—further proof of Oakes superior manufacturing facilities.

THE OAKES COMPANY, : : : : INDIANAPOLIS, IND.

Chicago Representative: Theo. L. Dodd, 657 Ry. Exch. Bldg.

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TORBENSEN INTERNAL GEAR TRUCK DRIVE



Now Buyers Ask— "Which Rear Axle—and Why?"

A careful study of the newest motor truck statistics shows clearly the indisputable leadership of internal gear drives among motor truck buyers.

This is because actual truck service has shown them that the final drive is the most important feature in making a truck reliable or otherwise.

Now there are 44,257 Torbensen Internal Gear Drive axles in use. Torbensen Drive is by far the leader of all internal gear drives.

This leadership is due, for the most part, to the patented, forged-steel I-Beam — exclusive in Torbensen Drive — which makes it stronger, lighter, more economical and longer-lasting.

It has become the strongest selling feature in trucks equipped with it.

The splendid seventeen-year record of Torbensen Drive gives all the proof that any one can ask for.

Torbensen Advertising is made to help you sell trucks. It is running steadily in the big national weeklies. Tie up with it by handling a line of trucks that have Torbensen Drive.

Write now for the instructive booklet—"Driving *at* the Wheel and *near* the Rim." It tells all about Torbensen Drive frankly and factfully.

A solid-forged I-Beam is the unyielding steel backbone of Torbensen Drive. It carries *all* the load. It does *nothing* else.

A jackshaft with pinions on its ends does *all* the *driving* through the internal gears. It does *nothing* else. It carries *no* load whatever.

These members, held in practically perfect, permanent alignment, form the famous Torbensen Drive.

This drive is as simple as any good drive can be. All its parts are easily accessible. It is easy to take apart and easy to put together again.

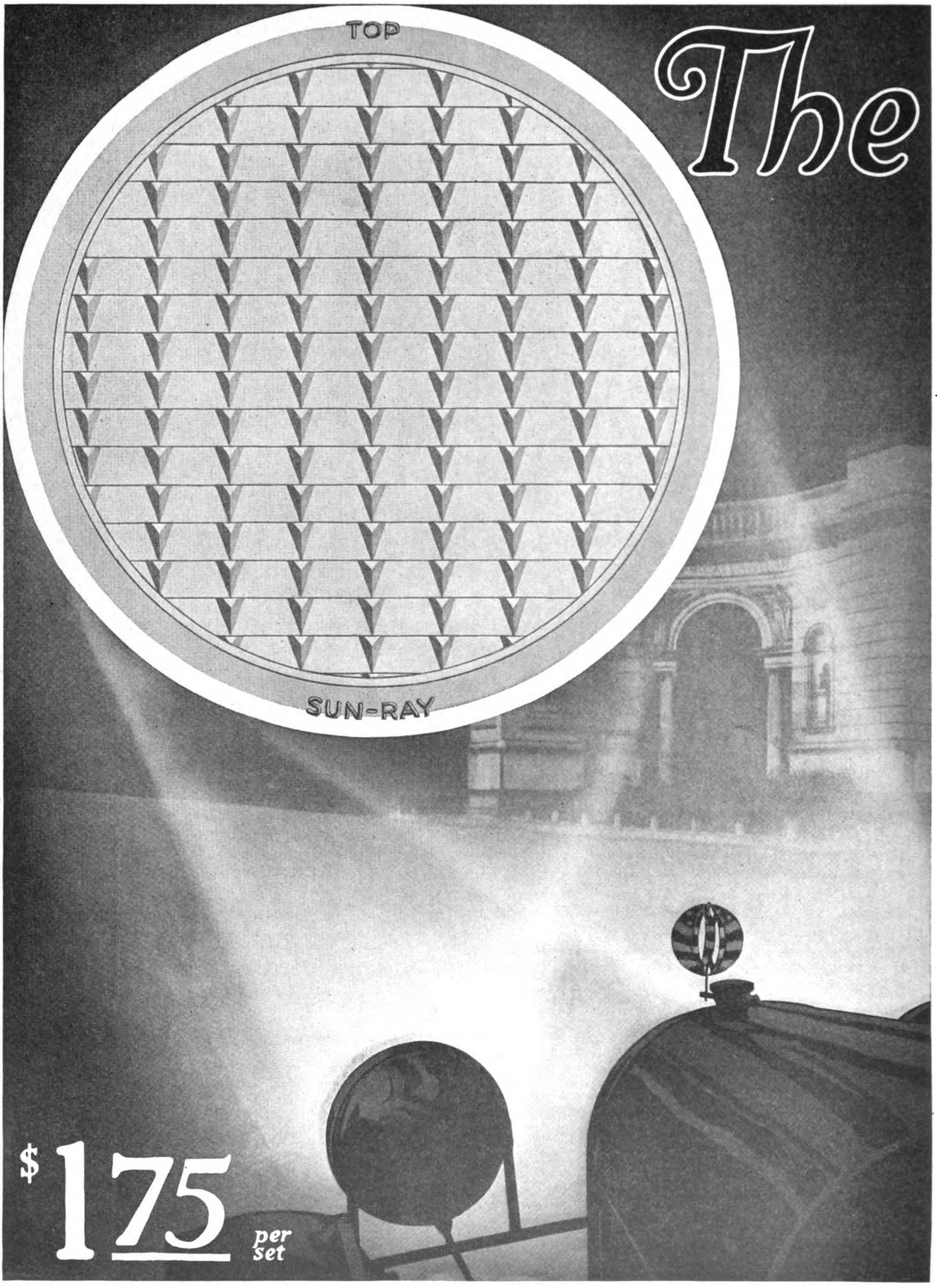
Seventeen years of ever-growing service have *proved* that Torbensen Drive makes trucks last longer, makes rear tires give 20% greater mileage and reduces gas and oil consumption.

THE TORBENSEN AXLE CO.
CLEVELAND, OHIO

TORBENSEN DRIVE is made to last. Every owner gets a GOLD BOND GUARANTEE that the I-Beam axle and spindles will last as long as the truck and the internal gears at least two years.

Largest Builder in the World of Rear Axles for Motor Trucks

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Sun-Ray Lens

At Last!

A popular priced lens that meets every legal requirement

EVER since automobile headlight lenses were put on the market the motoring public has been forced to pay extraordinarily high prices for them—prices out of all proportion with the cost of producing the lenses themselves.

But here is a new lens—the Sun-Ray—that gives you everything the other lenses give and more. It is manufactured by the most approved methods and from the best materials—yet it sells *profitably* at $1.75 a pair.

All the other lenses can be grouped in two main classes. One class diffuses light, the other class deflects or refracts it.

The diffusing lens takes the strong light rays from the reflector and scatters them in all directions, making a wide area as light as day in front of your car.

By its very nature it precludes the possibility of a sharp, bright penetrating *distance beam.*

The refractive or deflective lens gathers up all the light rays and redirects them down in a *concentrated narrow beam on the road*—a beam so narrow as to make night driving dangerous since both sides of the road are dark and turning is therefore hazardous.

It was with a full knowledge of these deficiencies that we entered the field determined to produce a lens that would prove *truly effective.* At the same time we determined to market our lens at a fair price to the public, with a fair profit to ourselves and our selling agencies.

The result is the Sun-Ray lens—priced at $1.75.

It gives motorists for the *first time* a lens that *both* diffuses *and* refracts the light. It shoots a long concentrated beam of road light far ahead, showing every inch of the highway. And it does *more.*

It gives you a side diffusion *of 168 degrees,* lighting up ditches, curves, crossroads and signs.

It gives you all the advantages of diffusion *plus* the advantages of deflection and meets the complicated legal requirements of every State in the Union. The Sun-Ray distance beam is the necessary 42 inches above the road at a distance of 75 feet ahead of the car. This distance beam, which is bound to rise and fall with the irregularities of the road, does not glare.

The hard, biting horizontal beams are *partially broken up* by a number of thick triangular prisms on the inside of the glass. This feature, in addition to giving tremendous side diffusion minimizes glare without in any way interfering with the effectiveness of the road light.

The clear parts of the Sun-Ray light are thin, thus reducing the absorption common to the thicker lenses —and the outside surface is absolutely flat and smooth, preventing dust, snow and mud from collecting on the glass and dimming your light.

Consider all these advantages. Then consider the price of the Sun-Ray—*just $1.75 per pair.*

The field that such a lens, at such a price, opens to dealers is tremendous—and constantly growing.

We want jobbers in every important center in the United States. We want dealers in every community. Write or wire at once for territory.

THE PRISMOLITE CO., 4th and Gay Streets, Columbus, Ohio

Every size for

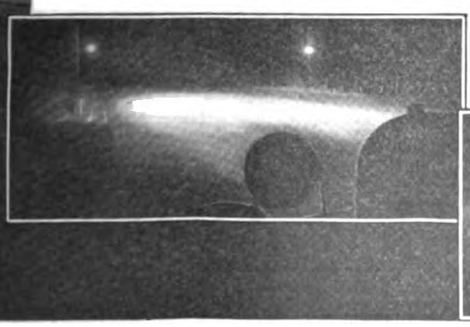
$1.75 per set

25c additional west of the Missouri River.

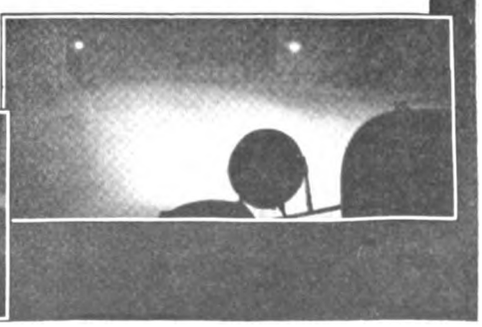
The Sun-Ray lens combines the advantages of both the diffusive and refractive types.

The refractive type of lens sacrifices diffusive side lighting for a bright beam of light concentrated on the road.

The diffusive lens gives wide side lighting but its very construction precludes the possibility of a bright "distance beam."







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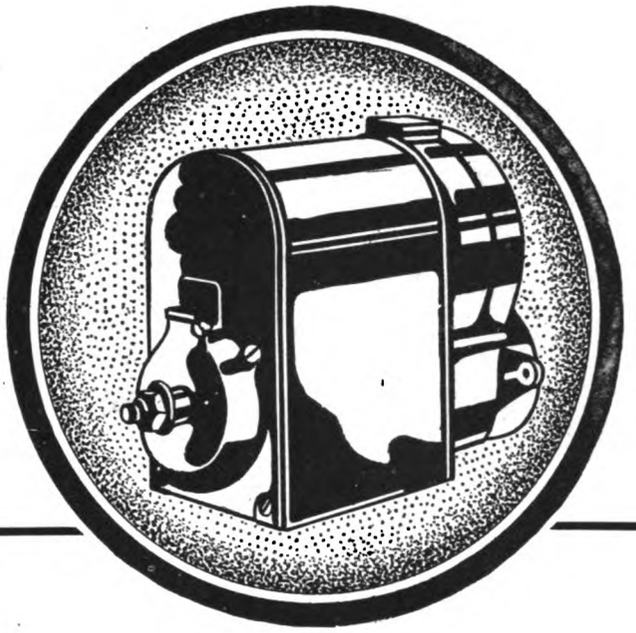
Delco Equipped



Delco will be represented at the National Automobile Shows by the automobiles whose name plates appear here. The list includes America's leaders—automobiles which have won unusual favor because they give unusual satisfaction. All of these cars are equipped with Delco ignition systems, or complete starting, lighting and ignition. Wherever you see a Delco system you can expect quality in automobile construction.

The Dayton Engineering Laboratories Company
Dayton, Ohio, U. S. A.

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At the New York Show

Grand Central Palace,
Eisemann Magnetos will be shown in

SPACES D39 AND 40

In addition to the standard Eisemann series, in which there are several improvements, especial attention is invited to

The New Eisemann Magneto-Generator

This latest Eisemann achievement is of vital interest to the industry as a whole.

Do not fail to see it!

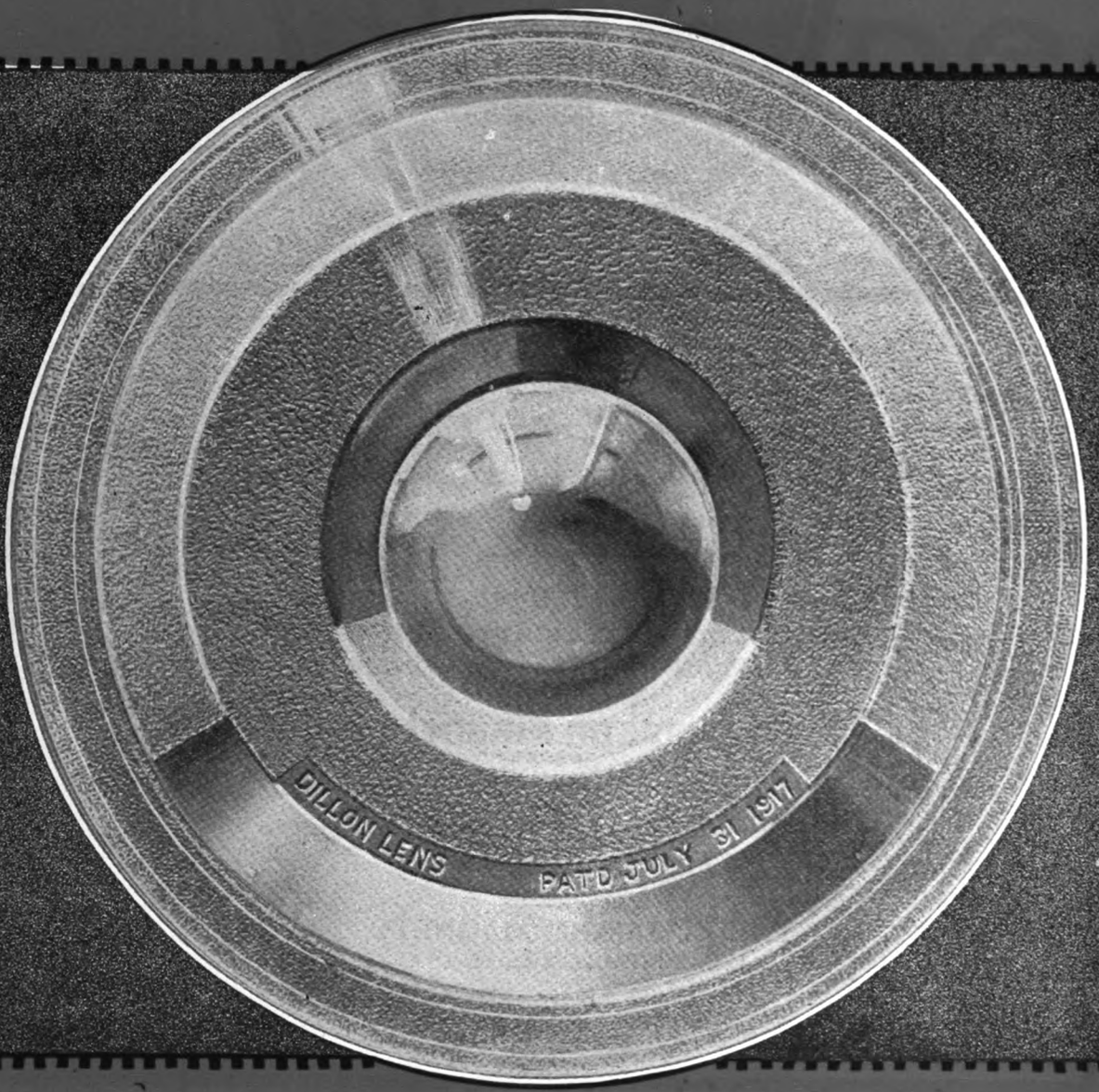
THE EISEMANN MAGNETO CO.
Sales and General Offices: 32-33d Street, Brooklyn, N. Y.
Chicago, Ill., 910 So. Michigan Avenue
Detroit, Mich., 802 Woodward Avenue

THE

EISEMANN
MAGNETO

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The Lens that Science Built



DILLON

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The Square Path of Light



Twice the Lighted Area

Why You Will Want to Sell the Dillon Lens

The ideal lens is here at last! Not a lens in name, but a lens in fact. Not a mere piece of pressed glass hurriedly marketed to fill a need nor a lens with only fantastic design to distinguish it.

But an actual **lens**—the Dillon Multi-Vision Lens—distinguished by its **performance!**

The Dillon Multi-Vision Lens embodies new scientific principles of illumination. Other lenses cut out glare and cut down light. The Dillon actually **adds** to your field of vision while eliminating glare, because it projects a **square** path of light instead of a narrow, wedge-shaped beam. Thus, the Dillon Multi-Vision Lens is safe, shadow-free, and glareless. **It does what others claim to do,** yet it costs **less** than many inferior makes. It is easier to handle and easier to sell. All sizes are sold at the same low price, $3.50, **anywhere** in the United States.

Dillon demand is growing, Dillon sales are mounting, Dillon dealers will profit.

Write to The National Distributing Bureau, Inc. for Interesting Proposition

MULTI VISION LENS

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Millions Will Read



Thousands Will Buy

How We Are Helping You Sell the Dillon Lens

The Literary Digest carries a double-page advertisement, December 29th, shown above. This is the opening gun of a barrage of publicity, sure to create a strong "drive" on lenses. This extensive advertising campaign will cover the country in such publications as the Digest, Collier's, Scientific American and other weekly and monthly journals.

It is not, however, the volume but the **method** that makes Dillon advertising novel. **YOU** will be selling every Dillon prospect because you, Mr. Dealer, will be featured in every advertisement, through the introduction of an original trade character—**Otto Deeler.**



OTTO DEELER

Thus, attention will be focused on your store in a new and refreshing manner. This idea alone will be worth thousands to Dillon dealers.

Write for special proposition. Learn to-day of the many selling helps we give you.

NATIONAL DISTRIBUTING BUREAU, Inc.

EXCLUSIVE DISTRIBUTORS FOR THE DILLON LENS

NDB

240 Oliver Bldg., **Pittsburgh, Pa.**

Dillon Lenses are manufactured by the
DILLON LENS & MFG. CO., Wheeling, W. Va.

DILLON

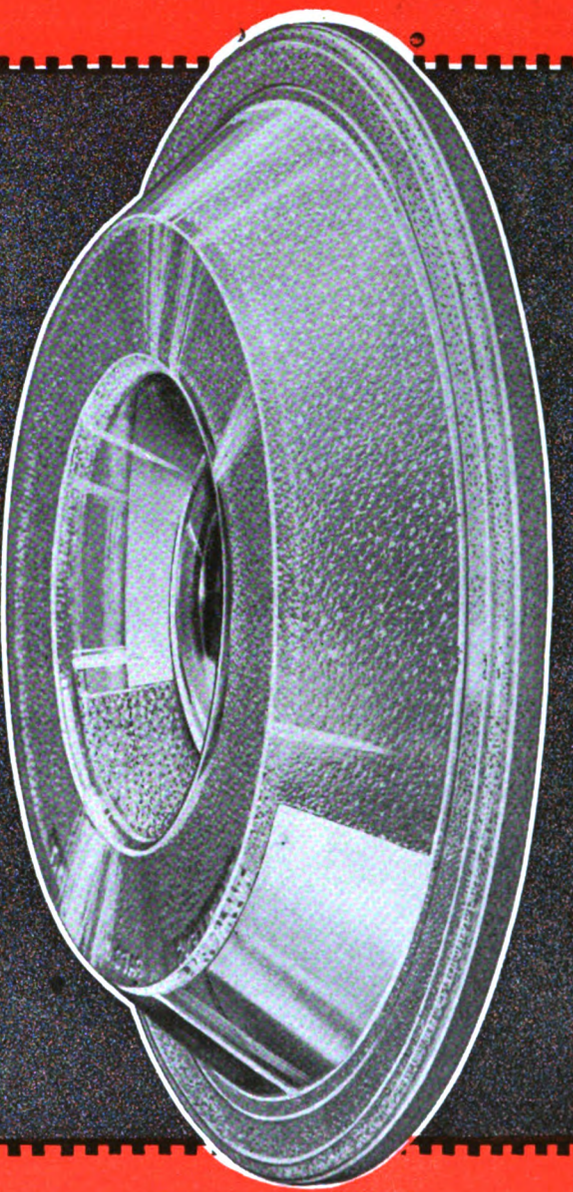
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The Dillon doesn't dazzle

$3.50 PER PAIR

ANY SIZE

Anywhere in U.S.A.

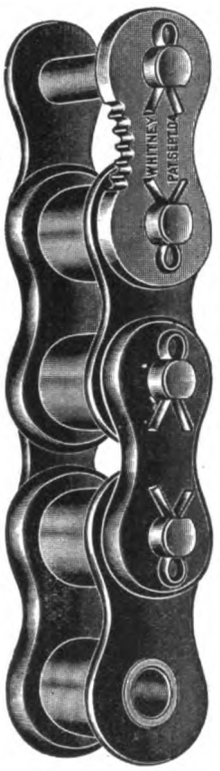


MULTI VISION LENS

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"WHITNEY" Transmission Chains

For Motor Vehicles and Machinery



Whitney Chain
Roller Type

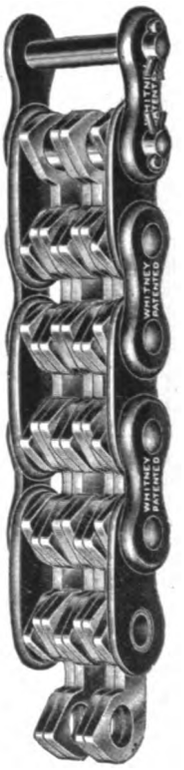
Our years of experience in chain making, combined with the care taken in the various processes of manufacture, hardening, etc., makes "Whitney" Chains strong, dependable and efficient transmitters of power.

We manufacture Roller and Silent Types of chains and will be pleased to co-operate with you in study to adopt chain drives to your product.

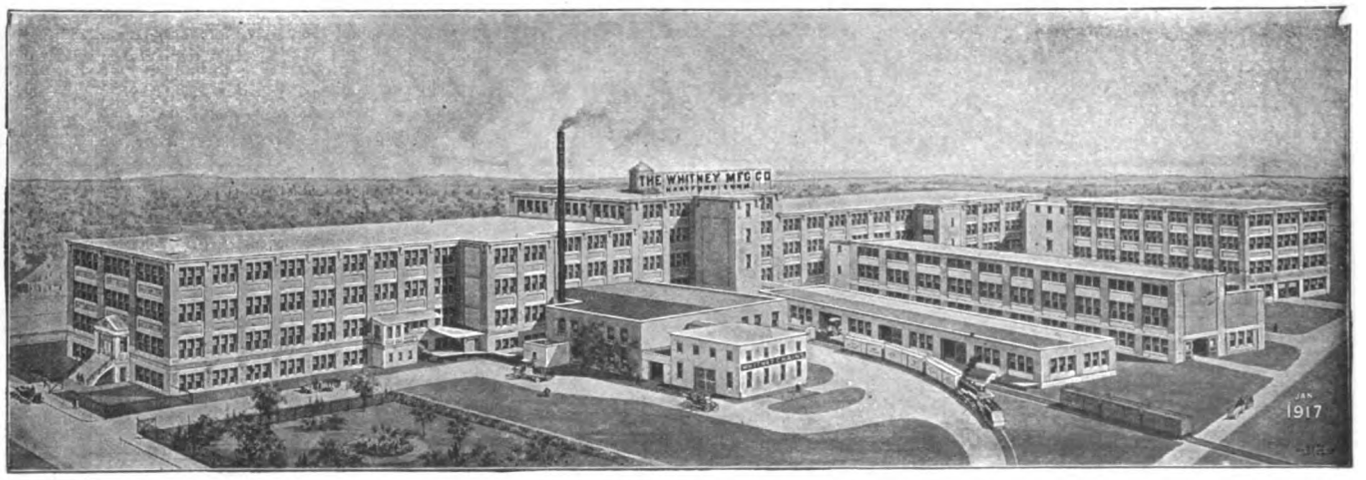
"Whitney" Roller Chains may be purchased from the leading Jobbers of Automobile Supplies throughout the country.

PROMPT DELIVERIES

Recent building additions and increased equipment now enable us to make prompt deliveries.



Whitney Chain
Silent Type



The Factory Behind the "Whitney" Products

All of our factory buildings are fireproof, thus safeguarding our customers against one frequent cause of unexpected and expensive delays.

THE WHITNEY MFG. CO., Hartford, Conn.

CHAINS KEYS AND CUTTERS HAND MILLING MACHINES

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WARNER

GEAR COMPANY OF MUNCIE



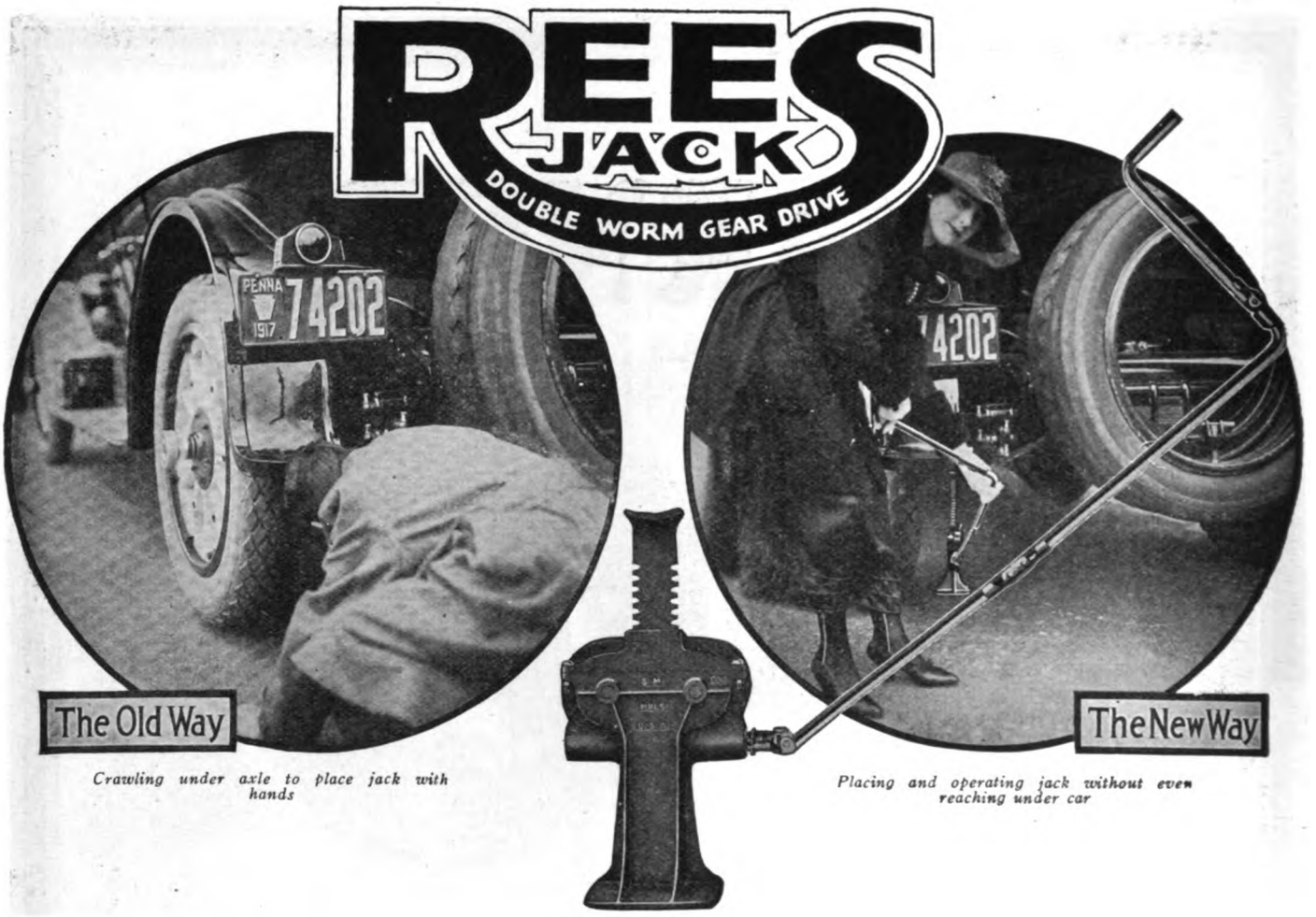
WARNER

A Mark of High Quality and Long Service In Any Motor Truck

Transmissions — Steering Gears
Clutches — Differentials

WARNER GEAR COMPANY, Muncie, Indiana
Detroit Office, 967 Woodward Ave.

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Crawling under axle to place jack with hands

Placing and operating jack without even reaching under car

The Safest, Cleanest and Most Powerful Auto Jack Made

A woman can handle a Rees Jack with ease, and without even soiling her hands.

It can be placed under the car by its long handle, thus obviating the necessity for reaching under the axle to place it with your hands.

You can *stand up* when operating it. It will operate with the handle at an angle to the jack, which is sometimes necessary on uneven or muddy roads.

CONVERTS FRICTION AND END THRUST INTO POWER

Being a worm-drive jack (the most efficient lifting principle known to mechanics) it lifts *steadily*, not in jerks. It cannot run out when held upside down. It cannot fall under a load.

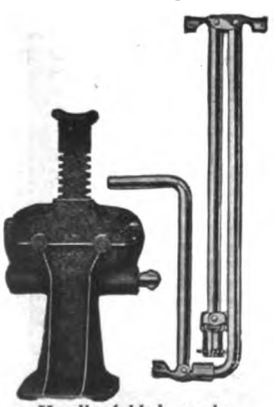
The Rees Jack is no larger nor heavier than other jacks—it fits in your tool box, handle and all.

But it is tremendously powerful. Born and developed in railroad yards, lifting freight cars, an automobile is *merely play* for it. You can lift a car with one finger on the jack handle.

ONLY FOUR WORKING PARTS

It is simple and compact in construction. Contains only 4 working parts, no springs, pawls, or ratchets. Handle is connected to jack by universal joint, and can be locked or unlocked by one twist of the fingers.

$8.00



Handle folded, ready for tool box

THE UNITED STATES JACK COMPANY NOW OWNS THE EXCLUSIVE SELLING RIGHTS FOR THE REES JACK

DEALERS

The Rees Jack sells itself. It is one of the best advertisements and attention-getters you can have in your place.

Everyone who sees it wants to try it. And one trial means a sale, if the one who tries it has any use at all for a jack. Let them try it on your office safe. It will lift it without an effort.

Write at once for extremely generous and certain business-getting proposition. Big profits, small outlay, quick sales.

UNITED STATES JACK COMPANY

EXCLUSIVE SALES AGENTS

UNION ARCADE PITTSBURG, PA.



Inside view, showing simple, powerful construction

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Russel Features

The power axle is entirely independent of the load-carrying axle, wholly relieving it of road and load strains.

The load-carrying axle is a one-piece round bar of heat-treated chrome nickel steel.

The Russel Differential, Internal Gears and Pinion Gears are made in our own machine shops guaranteed by Russel reputation.

Russel brakes are exceptionally large and afford unusual protection to the truck on the crowded thoroughfare and steep grade.

Less complicated parts.

More efficient and reliable under all conditions of road or load.

More ground clearance.

Less dependent upon lubrication.

Operating cost less.

Assures more tire mileage.

—THAN OTHER TYPES

SNOW FALLS. Ice sheathes the pavements. Roads are frozen mud. The rigors of winter cover all. Horses are crippled and die—their drivers suffer. Once transportation—at Zero—faltered or ceased. Because Man and Beast are frail.

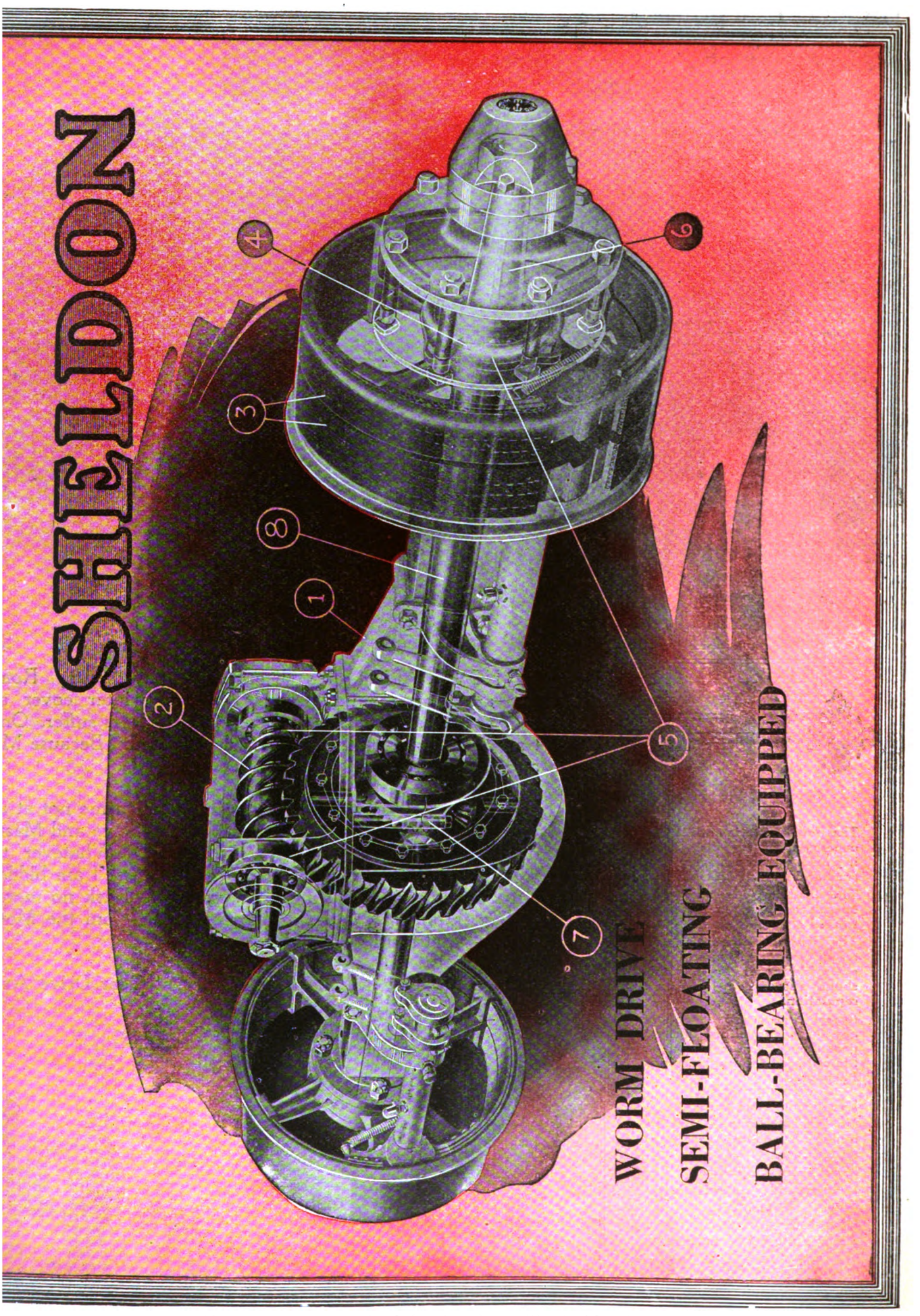
But snow, ice, zero and heavy-going concern me not at all. I am the Motor Truck. I am at once the Slave and Master of Men—though I am Man's Creation. Whatever the weather or the road, I go where and do what I am bidden. I ask no questions. I make no excuses. I ask no mercy. I obey implicitly. I perform irresistibly. I am the Motor Truck—that is all.

I am equipped with the Russel Internal Gear Drive Axle.

Russel Motor Axle Company
North Detroit

Russel
Internal Gear Drive Axles

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SHELDON

SHELDON was first in America to build worm-drive axles successfully for the trade. For more than 50 years Sheldon has led in the scientific development of heat treating fine steels.

SHELDON axle design and construction, therefore, has attained its present high standards by a natural development through the continuous striving by men of knowledge and experience to meet *actual service conditions*.

THE SHELDON Worm-Drive Axle contains no mechanical unit, embodied no principle of construction, that has not proved its superiority by years of service under varying conditions, over thousands of miles.

1. One-piece cast-steel housing, built like a bridge and just as strong. Lightest and strongest type of construction known.
2. Straight or David Brown type worm. Highest efficiency longest life, guaranteed for one year, mileage 100,000 miles and upward frequently reported.
3. Double internal brakes. Powerful, quick-acting, unfailingly sure. All working parts enclosed and protected from foreign substances. Unequalled for economy of upkeep.
4. Semi-floating wheel bearing construction. Fewer parts, lighter weight, greater strength, economy of manufacture and operation.
5. Ball-bearing mounting throughout. High efficiency, bearing adjustments eliminated.
6. Tapered hub mounting. Permits of demountable wheel, makes tire changes quick, easy, economical.
7. Oversize differential. Never wears out, built to outlast the truck.
8. Big husky drive shaft, 3½% nickel steel forging, correctly heat treated, tapered from differential to wheel bearing, gives strength where needed for every character of stress imposed upon it.

Sheldon Axles are more than correct in theory; they have been PROVED IN PRACTICE

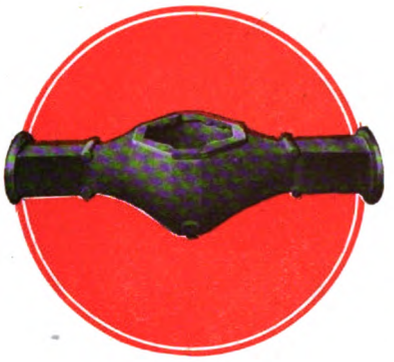
SHELDON AXLE & SPRING CO.

Makers of Axles and Springs for Heavy Duty Service for over 50 Years.

WILKES-BARRE PENNA

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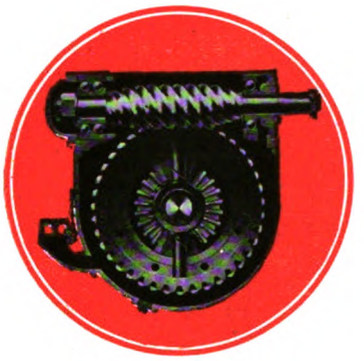
SHELDON AXLE & SPRING CO.,



1 The Sheldon Worm-Gear Axle is encased in a *one-piece* housing. This means that instead of the various parts being cast separately and then welded together, the complete housing is cast in one mould. By virtue of this one-piece construction, there can be no loosening of parts, regardless of road or operating conditions—an extremely vital factor to consider where commercial haulage is concerned.

The one-piece axle housing furthermore protects and strengthens the working parts in a manner that cannot be duplicated in any other form of construction.

It requires from 90 to 100 tons hydraulic pressure to bend the housing double; even then it does not crack, owing to the extreme toughness of the metal used—the result of careful and expert annealing.



2 The Straight or David Brown type of worm is used in the Sheldon Axle because it has proved to be more silent and more durable, as well as the simpler of the two types of worm generally in use. Neither use nor abuse can make it noisy.

Forged from the finest steel, and heat-treated to wear-proof toughness, the worm threads are machined to microscopic limits.

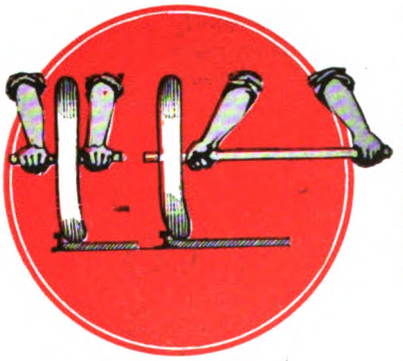
The worm carrier, in which the worm is mounted, is a substantial casting, machined so accurately that later adjustment is never necessary.

The lower section of the worm wheel runs in a bath of oil in the base of the housing. This is splashed through the worm shaft bearings, maintaining a constant film of oil between the surfaces of the worm threads and the teeth of the worm gear.



3 To insure complete safety of operation, Sheldon brakes are made ultra-efficient. This is accomplished by means of double external expanding type of brake—simple in operation, self intensifying, easily adjusted, exceedingly powerful, quick-acking and unfailingly sure.

Sheldon brakes have a generous bearing surface and are doubly enclosed to thoroughly protect the bearing surfaces from dirt, grit and other foreign substances. The brakes are easily accessible for relining. When it comes to the question of adjustment, it is not necessary to touch the brakes themselves; they are tightened merely by moving back the sector to which the brake pull lever is bolted, and inserting the lever bolt in the next hole.



4 Sheldon axles are of the semi-floating wheel bearing type. Consequently Sheldon axles are more simply constructed by reason of fewer parts, lighter in weight for the same reason, yet have a greater carrying capacity than the full-floating type. This simplified construction means greater accessibility and the greater carrying capacity means greater economy of upkeep and operation.

The wheels in the Sheldon axle are mounted on an extra heavy axle shaft which bears the dead load of the truck. In the full-floating type the wheels are mounted directly on the less dependable tubular extension of the axle housing—a construction in which any slight bending, as a result of skidding or other causes, requires an expensive replacement—generally a factory repair job.

But the greatest advantage of Sheldon semi-floating construction is graphically shown in the sketch opposite. To the left (Fig. 1) is illustrated the simple leverage angle of the full-floating type against the side strains at the wheel rim, and to the right (Fig. 2) is shown the wide leverage angle of the Sheldon semi-floating construction. Obviously the latter incorporates the correct principle for resisting side strain.

SHELDON

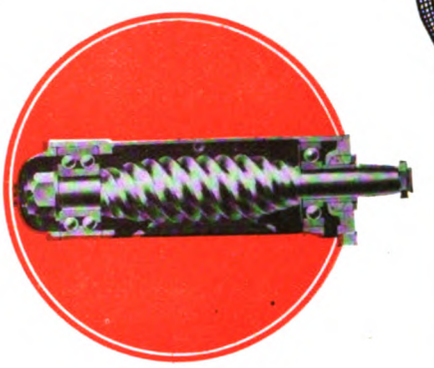
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Makers of springs and axles for heavy duty service for more than fifty years. **WILKES-BARRE, PA.**

5

It is borne out by innumerable tests, conducted under every imaginable condition, that ball bearings offer less friction and have greater load capacity than any other type of anti-friction device invented. This is particularly true under the wedging action of a thrust load of such proportions as is exerted on the worm. Furthermore, in the case of the worm, the use of the ball bearings is the only way whereby the elongation of the worm due to frictional heat can be perfectly compensated. This is accomplished by leaving the annular ball bearing placed at the front end of the worm, free to float.

Finally, and of great importance, ball bearings do not require the adjustment which other bearings, by their nature, must receive.



6

The Sheldon wheel bearings are enclosed in the main axle housing. They are thus protected against grit and other foreign matter when the wheel is demounted At the same time the bearings are easily accessible, it being necessary only to remove the wheel and then the bearing retainer in order to get to them.

The shape of the hub itself gives greater strength where greater strength is needed, and furthermore allows the easy demounting of the wheels, thus making a change of tires quick, easy and economical.



7

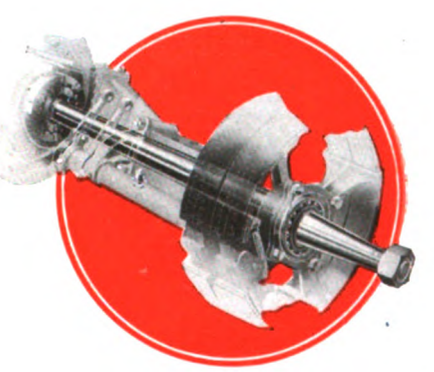
As far as we can learn, not a single Sheldon differential has ever worn out. Notice how the gear teeth, instead of being concave in design are broad and thick at their base, this providing ample protection against gear stripping and quick wear. Each bevel gear is supported *on both sides* by an intended hub inserted into a bearing ring in the spider. This insures absolute alignment and eradicates all possibility of faulty performance. Strength is further continued with efficiency in the hexagonal broaching of the differential gear to receive the axle shaft. A square insertion would permit quick wear, a splined insertion would weaken the metal. Sheldon design avoids both weaknesses.



8

The big, husky Sheldon drive shaft is a forging 3½% nickel steel; accurately proportioned, expertly heat treated, and ground to size.

The distribution of strain along this length dictates a taper from the differential to the wheel bearings—thus a uniform strain is secured throughout and ample strength is provided where needed.



WORM DRIVE AXLES

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The Comfort Car





IN pulling and climbing ability, the new Hupmobile is little short of phenomenal.

But your reliance on its flood of power is only the beginning of your *comfort.*

Already it has demonstrated an increase of no less than 24 per cent in gasoline mileage; more than 15 per cent in tire mileage; a surprisingly low cost of maintenance.

Add to this its superb steadiness, with riding ease that invites complete relaxation, and you will realize why this Hupmobile has actually given a new meaning to the word "comfort."

Hupmobile

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Stewart PRODUCTS



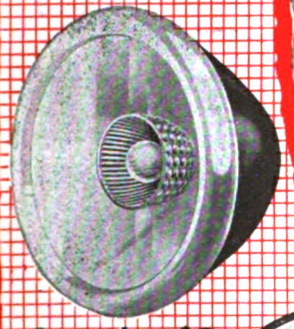
$6

Stewart Motor Driven Warning Signal Hand Operated Type $3.50



$10

Stewart Vacuum System



Stewart Lens $2 per pair



$25 Stewart Speedometer

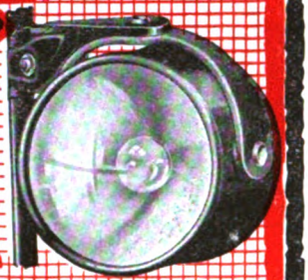
Progressive Dealers Know It Pays to Sell Leaders Only

LIVE dealers everywhere—men who do a big business and are making big money—know by experience that it pays to sell Leaders Only. They stock, sell and feature Stewart Products. The wide demand for Stewart Products is extremely significant to the wise dealer. It points out to him the unmistakable trend of public opinion — the tremendous demand for the best known and most widely advertised automobile accessories on the market.

The dealer who has achieved really big success does not waste his time, energy and money in trying to "put across" unknown accessories. He banks on a steady, consistent "turnover." He handles the one established line—the one that is universally accepted as a standard. He carries a complete stock of Stewart Products.

Determine right now to sell nothing but Leaders for 1918. Concentrate on "boost," feature and sell Stewart Products—the fastest-selling and easiest-to-sell of all automobile accessories.

Stewart-Warner Speedometer Cor'n
Chicago, U. S. A.

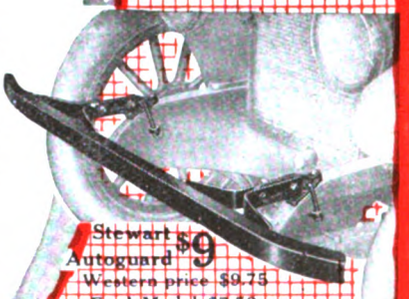


Stewart V-Ray Searchlight $5



$1

Stewart V-Ray Spark Plug



Stewart Autoguard $9
Western price $9.75
Ford Model $7.50
Western price $8.25
Ford Rear Autoguard Tire Carrier $11.50
Western price $12.50

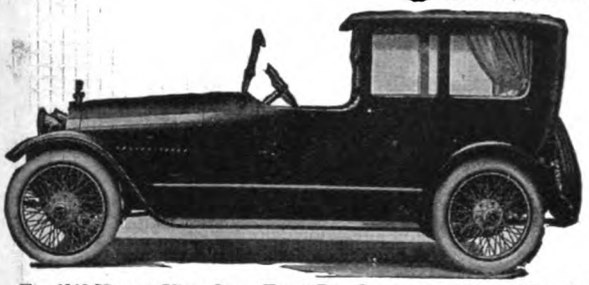


Stewart Speedometer and Instrument Board for Fords $12
Western price $12.50

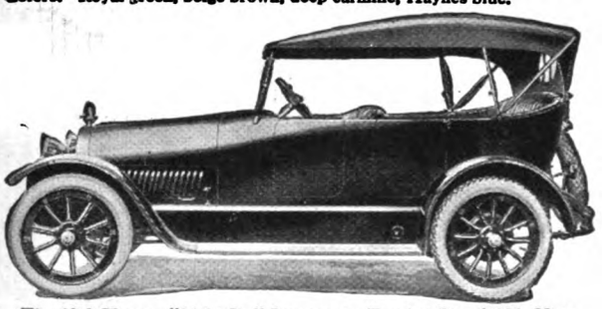
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The 25th Successful Year of HAYNES

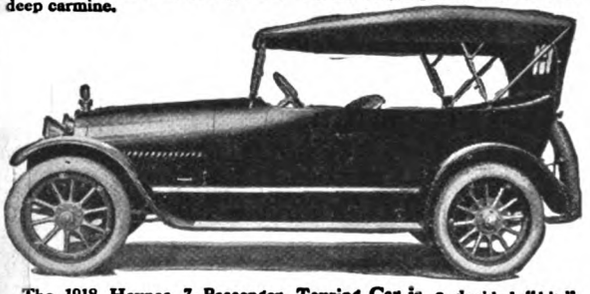
"America's First Car"



The 1918 Haynes Ultra-Smart Town Car. Seats seven—five inside and two in the driver's compartment. The plate glass windows may be lowered by means of convenient lifts. Perfection heater. All the luxuries. Colors: Royal green, beige brown, deep carmine, Haynes blue.



The 1918 Haynes "Light Six" 5-passenger Touring Car. $1725. Note the broad-chested, high-arched hood, the straight lines, the curve to the fenders, the double cowl, the rakishly tilted windshield. Plenty of room and "then some" for five. Deep springs in the comfortably shaped cushions increase the riding-ease. Colors: Royal green, beige brown, deep carmine.



The 1918 Haynes 7-Passenger Touring Car is a decided "hit." The center cowl panel is of beautiful American walnut. Auxiliary seats fold into it. A convenient package compartment is at the center. The upholstery is deeply cushioned and French pleated. All the "little details" are correct. Colors: Deep carmine, royal green, beige brown.



"The Prettiest Roadster in America" is the Haynes 1918 Roadster for Four—The "FOURDORE." The lines speak for themselves. Built upon the 127-inch 7-passenger chassis, ample leg-room is provided both in rear and front for "six-footers." Carrying compartment in rear. *Four doors.* A stunner! Colors: Beige brown, deep carmine, royal green.

DEALERS:

THE mature Haynes motor, America's Greatest Light Six Engine, now in its 42nd month of success, virtually without change, is continued. Over a quarter billion miles of driving by more than 20,000 average owners, have proved it the best "six" in its class for performance, durability and *low upkeep.*

The chassis now has six-inch side members. 39 x 2¼ inch front springs and 58 x 2¼ inch rear springs assure maximum easy-riding by reason of their generous size and resiliency.

There are six beautiful new bodies in a range of colors for 1918. Note the high, broad-chested hoods, tilting windshields, double cowls, etc.

Haynes, "America's Greatest Light Twelve," winner of fast racing events this past season, is also offered in five new bodies of striking appearance. Wire wheels and cord tires are regular equipment.

Haynes national advertising—pages both in colors and black and white—in leading weeklies and monthlies, and dominating space in a long list of the best farm papers, pages in motoring publications, etc., is exerting a greater selling force in behalf of the dealer than ever before in Haynes annals.

Haynes co-operation with the dealer in his local publicity is likewise intelligent, willing and liberal.

A beautiful automobile catalog portrays these latest Haynes offerings in full. Proudly will these be handed to prospects by Haynes dealers this year.

Send for a copy—and for the full "*Haynes 1918 Proposition to Live Dealers.*"

THE HAYNES AUTOMOBILE COMPANY
3 So. Main St., Kokomo, Ind., U. S. A.

HAYNES 1918 PRICES

	"Light Six"	"Light Twelve"		"Light Six"	"Light Twelve"
Sedan	$2585	$3385	5-pas. Touring	$1725	
Town Car	3250	3985	7-pas. "	1825	$2785
Coupe	2535	3335	"Fourdore"	1825	2785

Regular equipment: Wood wheels, fabric tires, on "Light Sixes." Wire wheels, cord tires, on "Light Twelves." Demountable tops for open models, $300.

Above prices f. o. b. Kokomo. Add $44 to all models to cover war tax. Colors, other than regular, extra.

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Champion Toledo

Dependable Spark Plugs



1918 Dealer's Window Display

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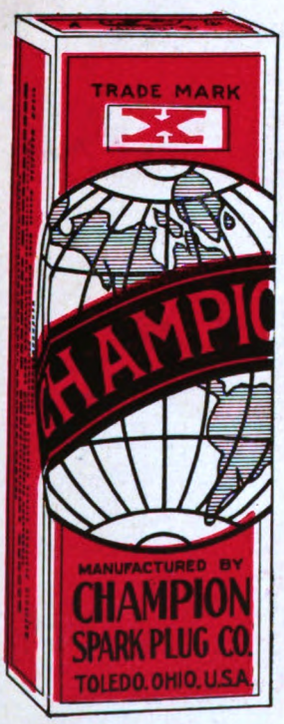
Champion Toledo

Dependable Spark Plugs

The Conservation of Retail Profits in Spark Plugs

Because the Retailer's business is on a smaller scale than the Jobber's he is more apt to overlook those factors which dissipate his profits.

In an unguarded moment the busy Retailer may thoughtlessly accumulate profitless stock.



Stock that moves slowly or stalls in the Retailer's shop dissipates the Retailer's profit just as it does the Jobber's.

The normal sale of Champion-Toledo Dependable Spark Plugs will yield the Retailer more spark-plug profit than he can possibly exact from even the forced sale of other spark plugs.

Likewise, and for the same reason, a little selling effort behind Champions yields bigger results than a like amount of effort behind any other plug.

And that reason?

It is the normal demand of an experienced and appreciative buying public.

That normal public demand for Champions is greater by far than for all other spark plugs combined.

And it is a dependable demand because it is based on the superior efficiency and durability of Champions demonstrated and proven by the motor car owner's experience.

If you as a Retailer doubt the greater volume of Champion business, note the prominence and space given to Champions in all Jobbers' catalogues and ask yourself why.



Champion Spark Plug Co., Toledo, Ohio

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Champion Toledo

Dependable Spark Plugs

How Jobbers Conserve Their Spark Plug Profits

Two things are apt to dissipate the jobber's profit,

—slow selling goods that tie up capital until carrying cost eats into profit,

—goods that move not at all until profit is sacrificed by a cut in price or in costly special selling effort.



Jobbing profits are in those articles that sell steadily in large volume.

From such articles the jobber may by skillful buying extract the last penny of possible profit.

One of the best examples of profitable jobbing merchandise is the Champion-Toledo Dependable Spark Plug.

Champions have a sales impetus which makes them "flow" through the jobbing channels in a big steady stream.

They pause in his stock room barely long enough to be checked in.

And in paying quickly they pay big.

So those jobbers who carefully conserve their profits, stock Champions liberally so as never to miss profits through inability to make prompt and full delivery.

And they restock fully and promptly to keep the stream flowing in largest possible volume—yielding its steady toll of maximum profit in ever increasing amounts.

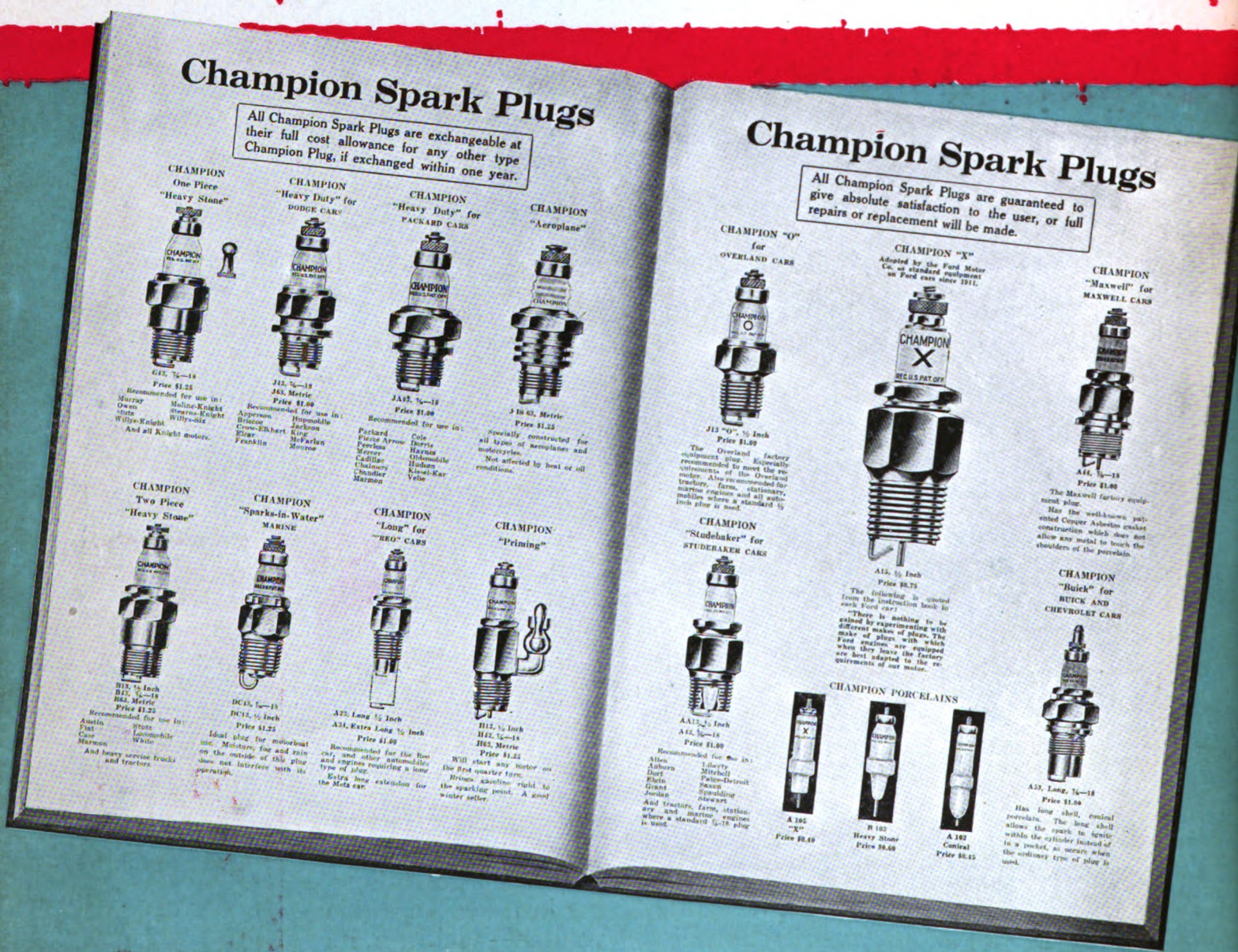


Champion Spark Plug Co., Toledo, Ohio

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Champion Toledo

Dependable Spark Plugs



Champion Spark Plugs

All Champion Spark Plugs are exchangeable at their full cost allowance for any other type Champion Plug, if exchanged within one year.

CHAMPION One Piece "Heavy Stone"

G15, ⅞—18
Price $1.25
Recommended for use in:
Murray, Owen, Cuto, Willys-Knight, Moline-Knight, Stearns-Knight, Willys-Sls
And all Knight motors.

CHAMPION "Heavy Duty" for DODGE CARS

J13, ¾—18
J63, Metric
Price $1.00
Recommended for use in:
Apperson, Briscoe, Crow-Elkhart, Elmar, Franklin, Hupmobile, Jackson, King, McFarlan, Monroe

CHAMPION "Heavy Duty" for PACKARD CARS

JA13, ¾—18
Price $1.00
Recommended for use in:
Packard, Pierce Arrow, Peerless, Mercer, Cadillac, Chalmers, Chandler, Marmon, Cole, Dorris, Haynes, Oldsmobile, Hudson, Kissel-Kar, Velie

CHAMPION "Aeroplane"

3 16 63, Metric
Price $1.25
Specially constructed for all types of aeroplanes and motorcycles.
Not affected by heat or oil conditions.

CHAMPION Two Piece "Heavy Stone"

B13, ½ Inch
B13, ¾—18
B63, Metric
Price $1.25
Recommended for use in:
Austin, Fiat, Case, Marmon, Stutz, Locomobile, White
And heavy service trucks and tractors.

CHAMPION "Sparks-in-Water" MARINE

DC13, ¾—18
DC13, ½ Inch
Price $1.25
Ideal plug for motorboat use. Moisture, fog and rain on the outside of this plug does not interfere with its operation.

CHAMPION "Long" for "REO" CARS

A23, Long ½ Inch
A24, Extra Long ½ Inch
Price $1.00
Recommended for the Reo car and other automobiles and engines requiring a long type of plug.
Extra long extension for the Mota car.

CHAMPION "Priming"

H13, ½ Inch
H14, ⅝—18
H63, Metric
Price $1.25
Will start any motor on the first quarter turn.
Brings gasoline right to the sparking point. A good winter seller.

Champion Spark Plugs

All Champion Spark Plugs are guaranteed to give absolute satisfaction to the user, or full repairs or replacement will be made.

CHAMPION "O" for OVERLAND CARS

J13 "O", ½ Inch
Price $1.50
The Overland factory equipment plug. Especially recommended to meet the requirements of the Overland motor. Also recommended for tractors, farm, stationary, marine engines and all automobiles where a standard ½ inch plug is used.

CHAMPION "X"

Adopted by the Ford Motor Co. as standard equipment on Ford cars since 1911.

A15, ½ Inch
Price $0.75
The following is quoted from the instruction book in each Ford car:
"There is nothing to be gained by experimenting with different makes of plugs. The Ford engines are equipped when they leave the factory are best adapted to the requirements of our motor.

CHAMPION "Maxwell" for MAXWELL CARS

A44, ⅞—18
Price $1.00
The Maxwell factory equipment plug.
Has the well-known patented Copper Asbestos gasket construction which does not allow any metal to touch the shoulders of the porcelain.

CHAMPION "Studebaker" for STUDEBAKER CARS

AA13, ½ Inch
A43, ⅝—18
Price $1.00
Recommended for the in:
Allen, Auburn, Dort, Elgin, Grant, Jordan, Liberty, Mitchell, Paige-Detroit, Saxon, Spaulding, Stewart.
And tractors, farm, stationary and marine engines where a standard ⅝—18 plug is used.

CHAMPION PORCELAINS

A 165 "X" Price $0.40

B 102 Heavy Stone Price $0.60

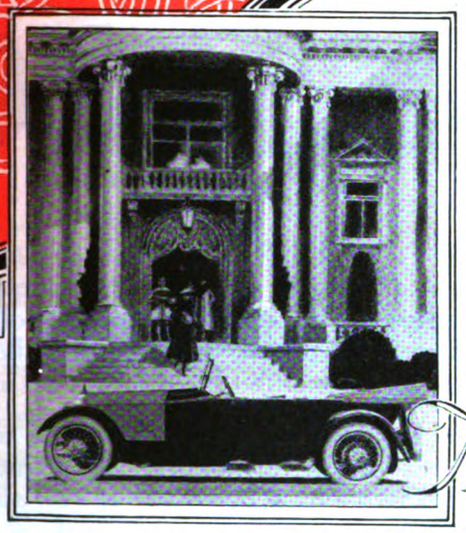
A 103 Conical Price $0.45

CHAMPION "Buick" for BUICK AND CHEVROLET CARS

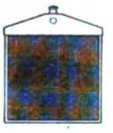
A53, Long, ⅞—18
Price $1.00
Has long shell, conical porcelain. The long shell allows the spark to ignite within the cylinder instead of in a pocket, as occurs when the ordinary type of plug is used.

1918 Jobber's Catalogue Pages

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To the svelte, smart lines of Roamer European body design have been added new aristocracies. To high mechanical merit have been added new qualities of time and distance dominance. Again this year, as heretofore, Roamer leadership is acknowledged.



The ROAMER

America's Smartest Car

An unimagined speed radius and control flexibility at a minimum usage of fuel and oil is now available in the new Roamer Six, with its special Roamer Continental motor.

To the pride of possessing this masterly motor car is added the new pride that will come from its performance under all sorts of driving conditions.

Besides the four-passenger Continental-motored Six, the new Roamer models also include a new six-passenger triumph of body-building on the same sturdy Roamer chassis.

As before, each Roamer is supplied, at no increase in price, in the purchaser's option of body finish, color, upholstery materials and top.

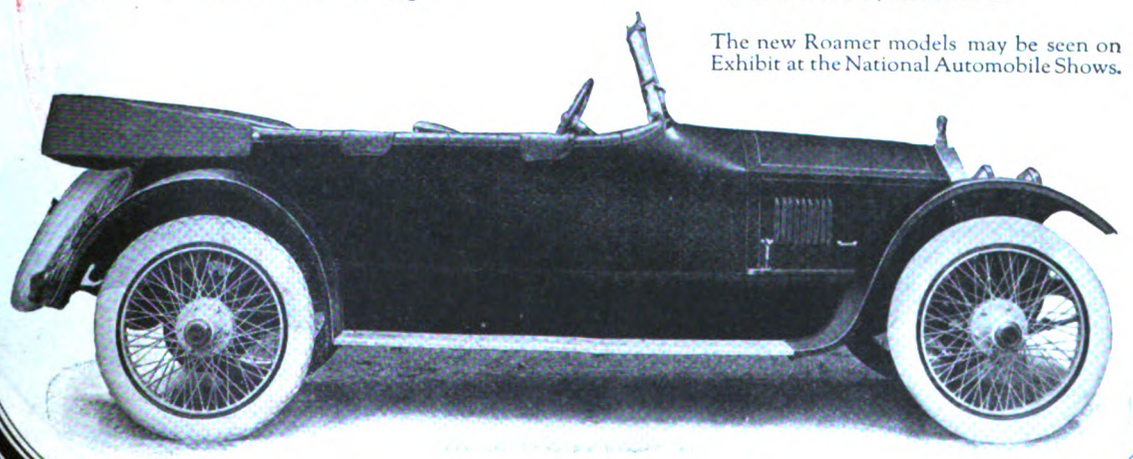
Each Roamer is equipped at no extra cost with a sylphon thermostat, Boyce motometer, Bosch magneto, wire wheels and Goodyear cord tires.

The ROAMER with Duesenberg Motors

The present needs of the nation have limited our expected production of Roamer models equipped with Duesenberg motors. A few orders for deliveries of four-cylinder Duesenberg-motored Roamers in four-passenger sport type models will be accepted. These are identical with the Roamers in which Eddie Hearne and Pete Henderson recently made their record-breaking track performances at Chicago, Uniontown and Los Angeles. Available also, a limited quantity of the standard 6-90 Roamers in sport car and seven-passenger types.

Barley Motor Car Company
KALAMAZOO, MICHIGAN

The new Roamer models may be seen on Exhibit at the National Automobile Shows.



Roamer 4-passenger Continental-motored four

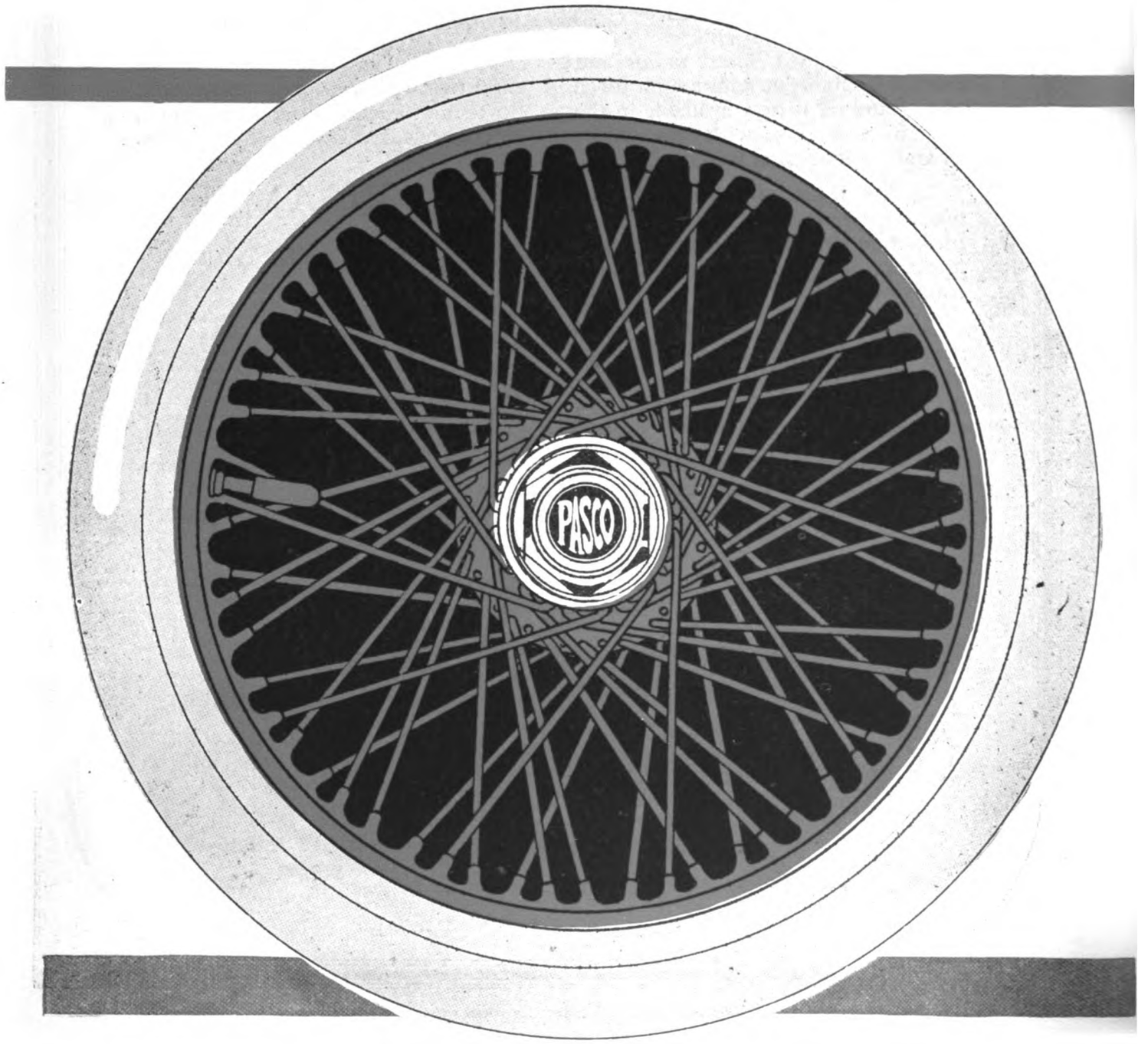
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Three Exclusive of PASCO

1. **THE PASCO WIRE WHEEL** has a PATENTED FOUR series method of Rim Punching and Spoke Lacing which makes it stronger than any other wire wheel and 60% stronger than wooden wheels. All spokes cross four others in both the front and rear rows, forming a strong double web in the spoke lacing of the wheel hub and rims. Previous methods allow but two or three crossed spokes.

2. THE PASCO HUB CAP is made of a strong, indestructible metal that stands up in crowded traffic collisions, where aluminum, brass and other soft metal compositions will strain or break.

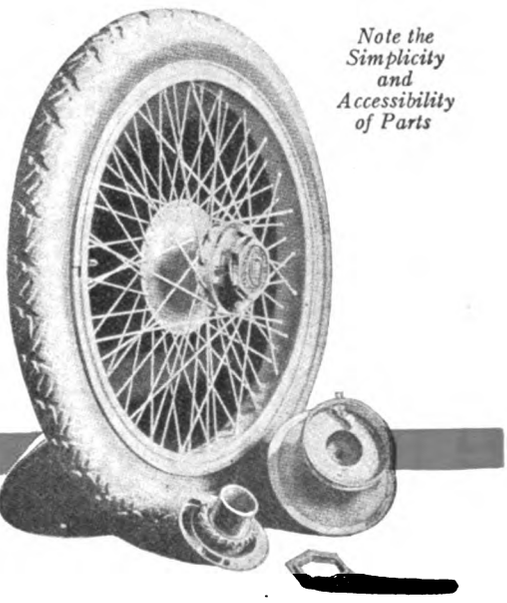
Unusual care has been taken to make it sturdy, massive looking, yet attractive.



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Patented Features
WIRE WHEELS

3. THE PASCO PATENTED SAFETY LOCKING DEVICE locks the hub cap and wheel on to the threads of the inner fixed hub and axle with a vise-like grip. The device absolutely cannot work loose and allow the wheel to come off from a moving car. It is positive insurance against accident from such a cause. The only possible way to remove a hub cap is to loosen the locking device and use a Pasco wrench.



Note the Simplicity and Accessibility of Parts

Dealers and Users

Pasco Wire Wheels Are Tire Savers. As they revolve the angle of the steel wire spoke lacing produces much the same effect as a radiator fan. A continuous current of cool air encircles the tire and dispels the heat, which is its worst enemy. In actual practice the saving in tires amounts to from 25% to 50%—more than enough in a year to repay the extra cost of the Pasco Wheels.

Pasco Wire Wheels Are Economical. Their very lightness allows a quicker car "get-away" and a quicker stop—with less power —which means a distinct saving in fuel consumption.

Their shock absorbing construction reduces road strains to a minimum and saves repair bills.

The speed and ease with which they can be replaced on the road means a further saving of time and money—it takes three minutes for the average car owner to change wheels and he doesn't need to get dirty doing it either.

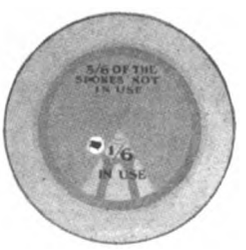
Pasco Wire Wheels give an air of distinctiveness and beauty to the car, an impression of style and speed and class which will appeal to all motorists.

Write today for particulars and prices.

Our Dealer Proposition Is Most Liberal



Pasco Wire Wheels



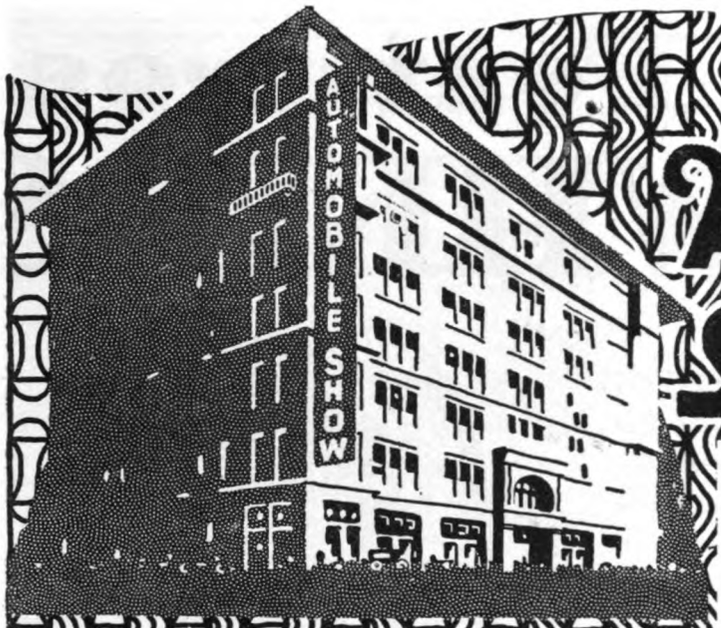
Wooden Wheels

National Wire Wheel Works

Geneva, N. Y. (Incorporated) **U. S. A.**

PASCO TRADE MARK

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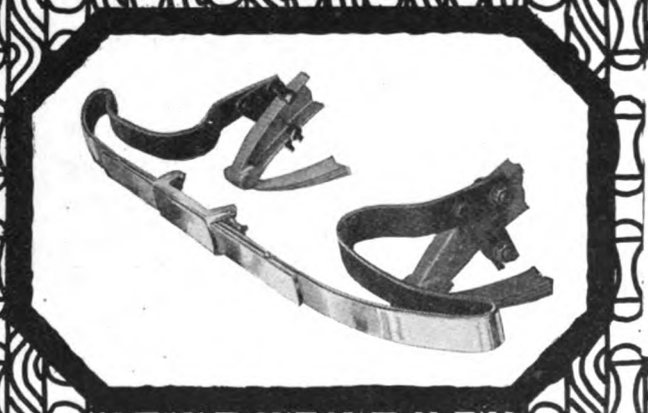
AT THE SHOW

★Hartford EQUIPMENT

★ Hartford Shock Absorber

See it practically demonstrated. Learn how it *constantly* controls every move on an automobile spring. Note the smoothness with which the spring contracts and recoils. No harshness, abruptness. Then the realization will come of its necessity to broaden your range of riding because it really *Makes Every Road a Boulevard.*





★ Hartford Bump Absorber

The car guard which protects in fullest measure. Practically break-proof, positively bump-absorbing. Flexes when striking, taking the sting out of the blow, saving not foreparts alone but all the car from strain and its passengers from jar. See it at the show.

★ HARTFORD AUTO JACK

All that jack de luxe should be—*Strong* with the strength of solid-steel working mechanism and tough malleable-iron case; *Easy-working*—it lifts a heavy car with a wrist movement; *Handsome*—beautifully finished in black and gold; *Convenient*—Easily slipped under an axle and operated without stretching or straining. Long handle, short stroke; firm, solid base. Try it at the show.

EDWARD V. HARTFORD, Inc.
144 Morgan St., Jersey City N. J.
Branches: NEW YORK, BOSTON, CHICAGO
Distributors in Principal Cities. Dealers Everywhere.



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LAMINUM

OF COURSE!



IN ENGLAND—AND FRANCE

Laminated Shims will be used in the

English Military Motor Transport Service

and will be stocked by the M. M. T. Depots of the British Army. They have also been introduced to the Air Board and will be used by all transport vehicles in the air service.

IN AMERICA

Specifications of the S. A. E. are as follows:

"89. The main and connecting rod bearings shall be provided with laminated metallic Shims, made up of sheets of equal thickness. The shim sheets shall be not more than 0.002 in. thick."

Extract from Standard Specifications for Motor Trucks, classes A & B, prepared by Motor Transport Board of War Dept. on recommendation of S. A. E.

THE REASONS

The reasons for these official endorsements of laminated shims are that they have all the advantages of solid shims—plus the advantages of loose-leaf shims. They allow quick, accurate adjustments, and present a clean, smooth surface *always*.

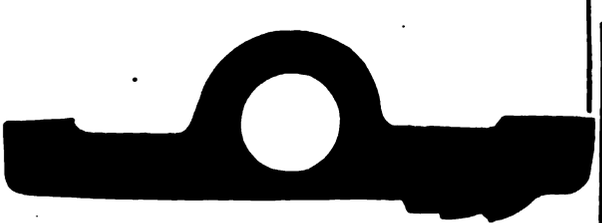
If you do not know Laminum, send for a sample

Laminated Shim Company

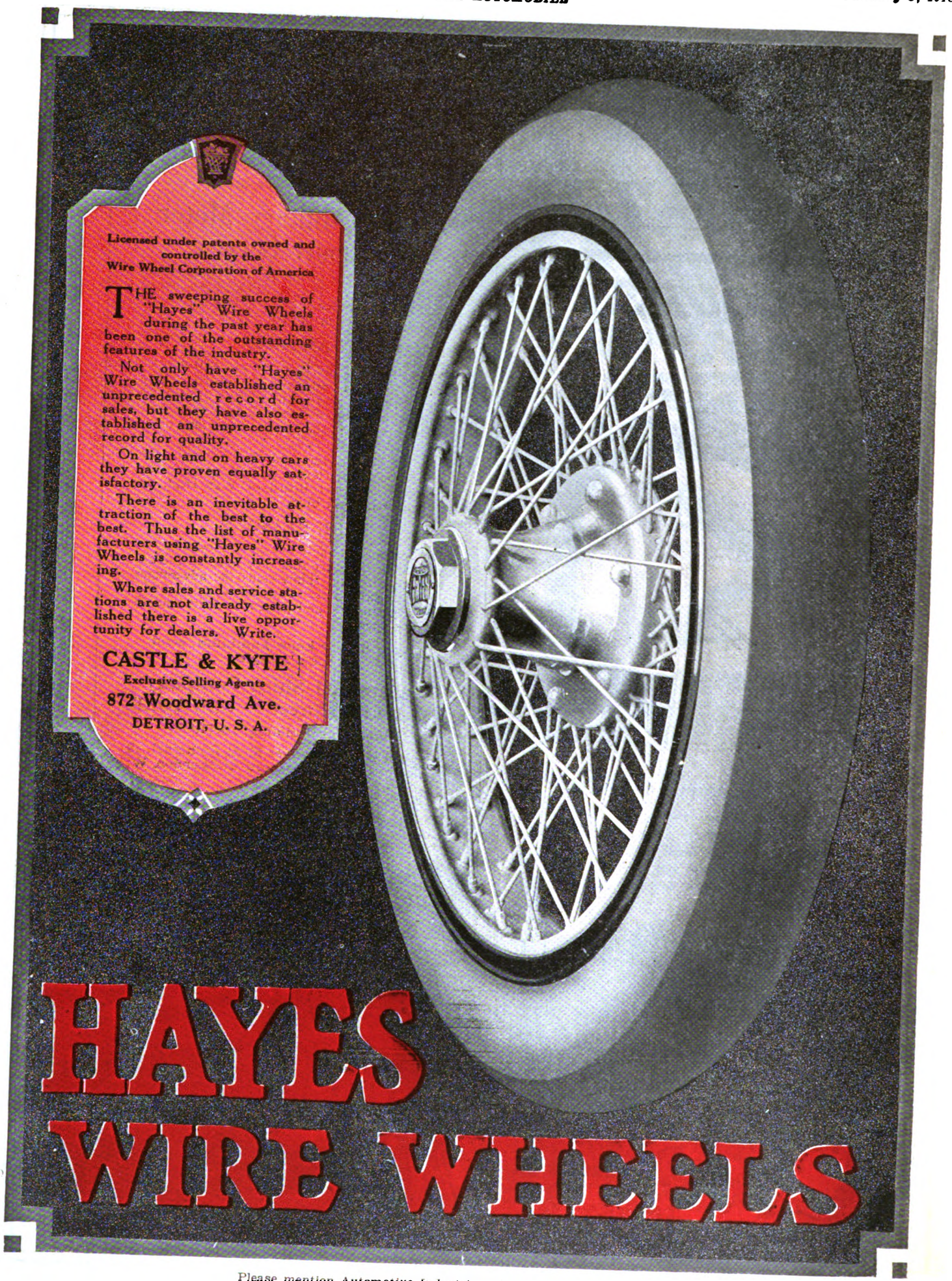
533-41 Canal Street NEW YORK

Dime Bank Building, DETROIT

English Representative: R. A. Rothernel, 18 Poland St., Great Marlboro' St., London, W.



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Red Head



TRADE MARK REG. U.S. PAT. OFF.

Vitristone PLUG





Vitristone is making good.

Vitristone is standing up in motors that are terrors to porcelain plugs.

Vitristone makes porcelain plugs obsolete.

Vitristone is not a substitute—it is the successor of porcelain as a spark plug insulator.

Vitristone is to porcelain what a stone crock is to a China cup.

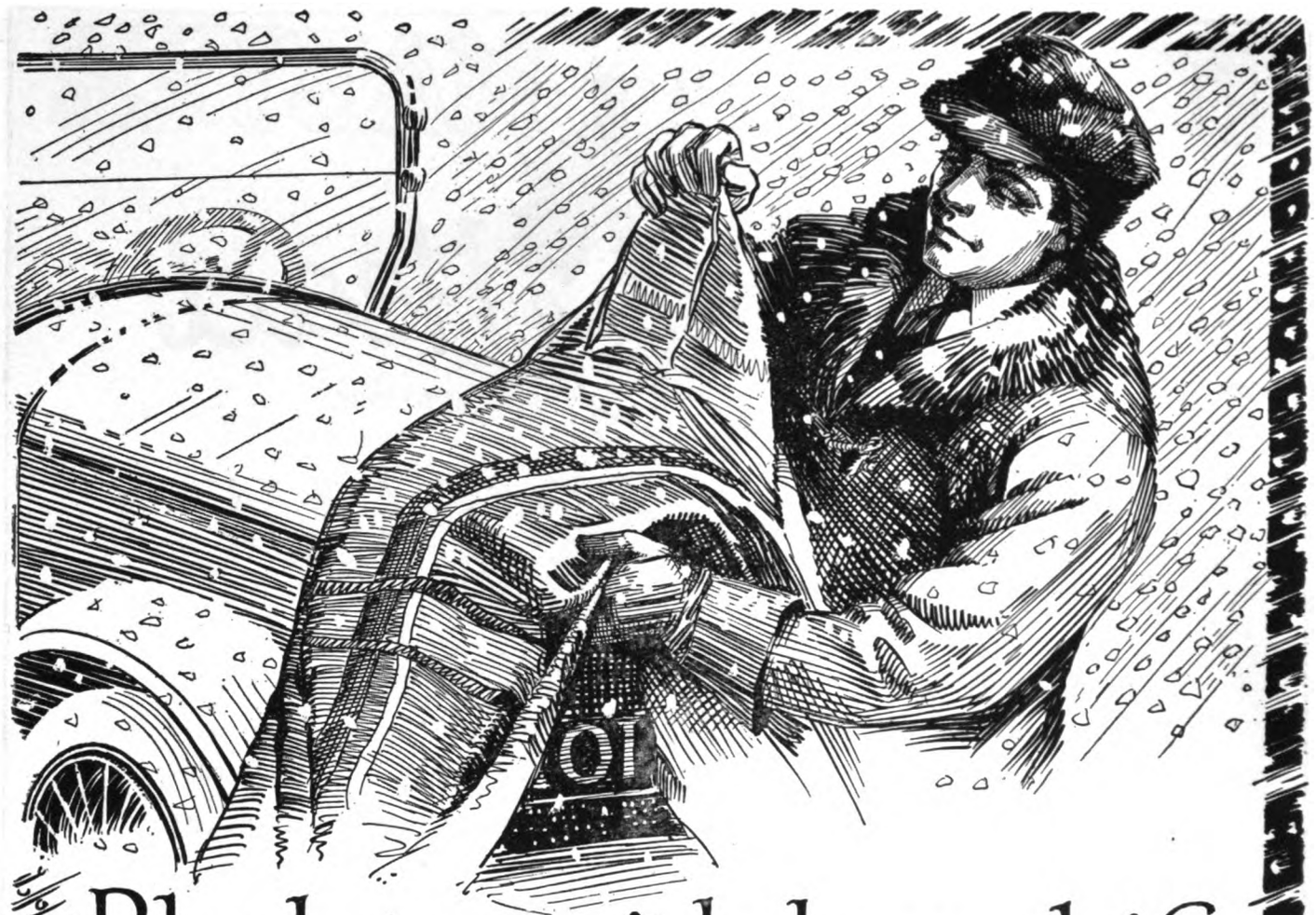
You don't have to pay more for Red Head Vitristone Plugs, but you must buy Red Heads to get Vitristone—it is made for and used exclusively in Red Heads.

When you buy Red Heads, insist on plugs with the red-enameled bushing—as shown in the cut. Only then are you sure of Vitristone.

Emil Grossman M'f'g Corp'n
Bush Terminal
Model Factory No. 20
Brooklyn (New York City)

See the Red Head Exhibits, New York Show
Grand Central Palace, 4th Floor, Space D-159 & 160
Chicago Show, Congress Hotel, Room 1136

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Blankets won't help much if—

the oil you are using does not flow freely at Zero.

SUPREME AUTO OIL flows freely at Zero.

STARTS WITH THE ENGINE

THIS is most important during the Winter months. You should know whether the oil you are using "flows freely at Zero." All oils do not possess this feature—notably the paraffine-base oils, which thicken up under cold and often cause great damage to the motor.

The safe way is to ask for SUPREME AUTO OIL—it "Flows freely at Zero" and leaves less carbon, owing to the fact that it is a Southern Asphalt-base oil containing no paraffine to gum, stick or thicken.

MANUFACTURED BY

GULF REFINING COMPANY

The Largest Independent Refining Company in the World

General Sales Offices: Pittsburgh, Pa.

District Sales Offices:

New York Philadelphia Boston Atlanta Tampa New Orleans Houston



There is MORE POWER in

THAT GOOD GULF GASOLINE AND SUPREME AUTO OIL

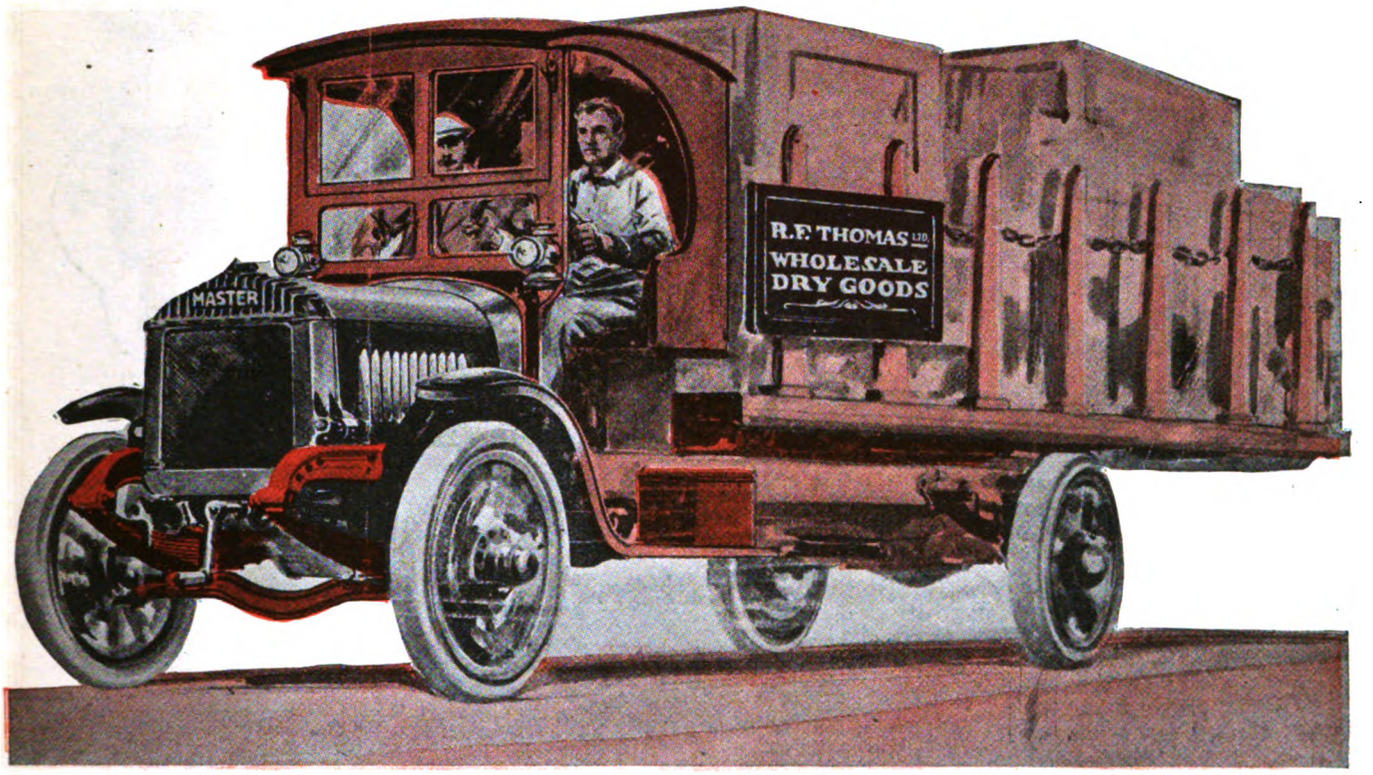
MANUFACTURED BY

GULF REFINING COMPANY

PITTSBURGH, PA., U. S. A.

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THE MIGHTY MASTER



MASTER of the Load on ANY Road

MASTER 2 Ton Truck - $1990 **MASTER 5 Ton Truck - $4490**
MASTER 3½ Ton Truck 3390 **MASTER Tractor (6 Ton) 2250**

War Tax to be added

Built in either internal gear or worm drive axle

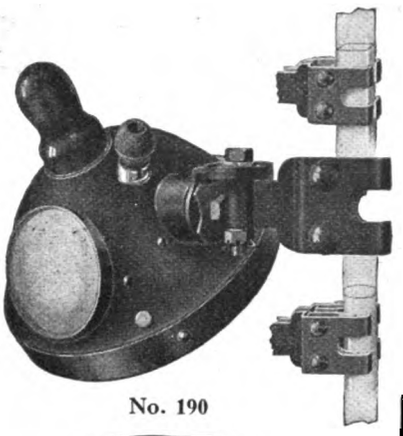
The MASTER Agency offers wonderful opportunity to the dealer. It means Dealer Mastery in the 2, 3½ and 5 ton truck fields.

Write for complete information and dealer's proposition, or if in New York during Automobile Show call on Mr. E. Goldman, Vice-President and General Manager, or on Mr. Theo. Zumstein or Mr. W. R. Mason, Eastern Sales Managers, at the Hotel Chatham, Vanderbilt Avenue and 48th Street, from January 7th to 12th inclusive. A MASTER Truck will also be on exhibition at the hotel.

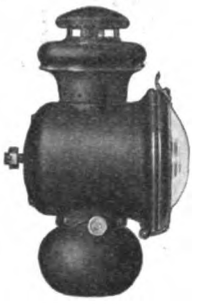
MASTER TRUCKS, Inc.

3141 S. Wabash Avenue CHICAGO, ILL.

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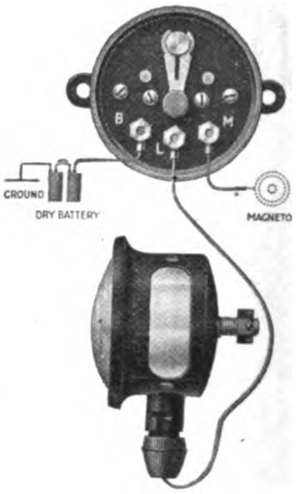
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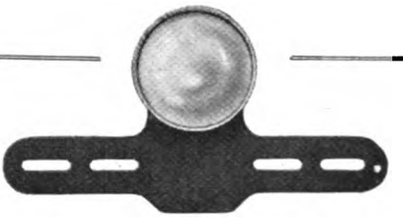
No. 440



No. 456



No. 49 "H"



No. 364

BEHIND every individual lamp in the Victor line lies twenty years' experience in the business of making quality lamps.

No wonder the Victor designs are practical, that they give you more convenience, more service, more value for the money.

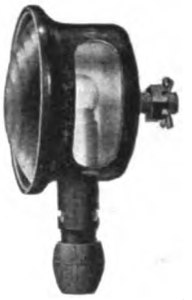
Lamps to meet every new condition and demand have been added to the Victor line. Write for the new 1918 catalog. See the complete Victor line at the New York, Chicago or Boston show.

The Corcoran-Victor Company
706 Reading Blvd., Cincinnati, Ohio

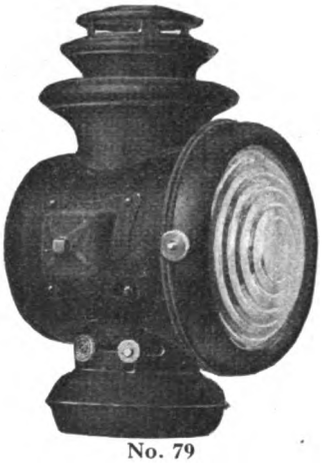
Victor
TRADE MARK



X-Ray



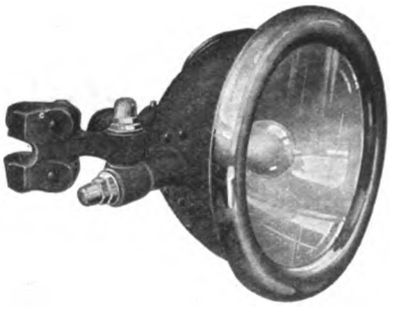
No. 49 "J"



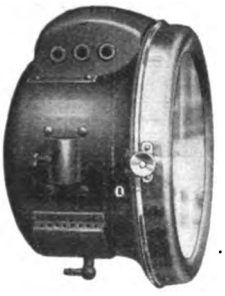
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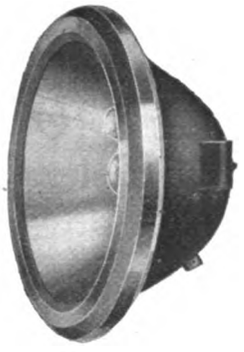
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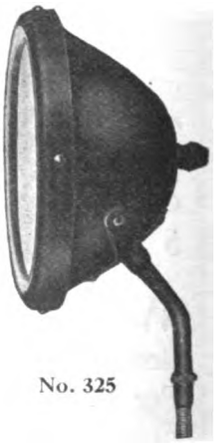
No. 50



No. 402, 403



No. 601, 608



No. 325



No. 622—Yale Lock

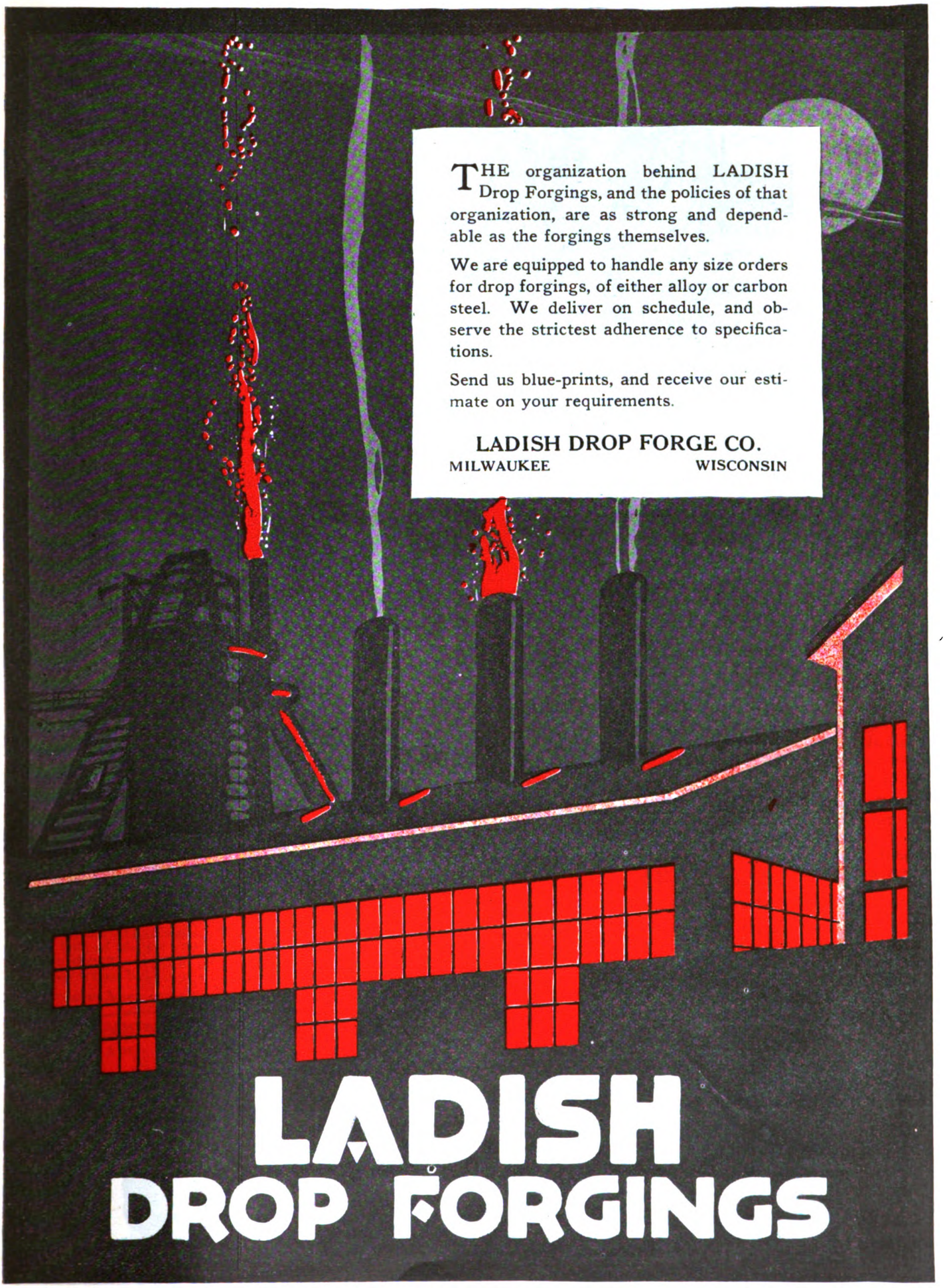


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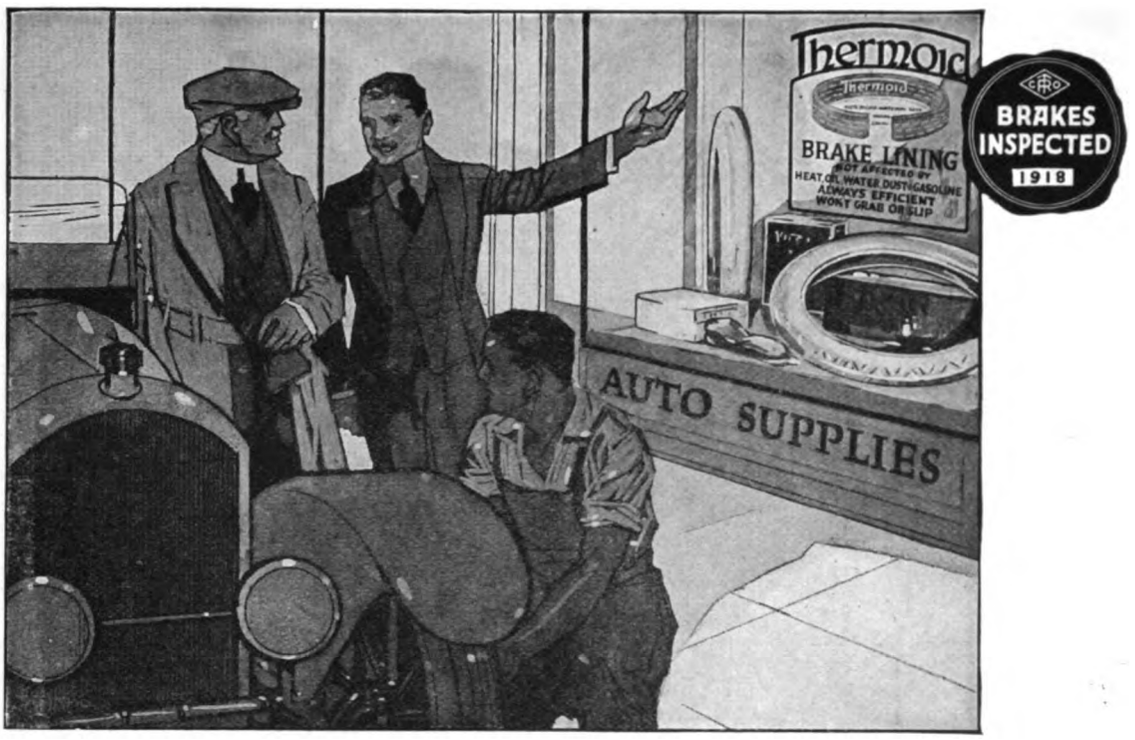


No. 622—Victor Lock

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Ask him about his brakes

The safety of his car depends on the brakes

When your customer stops for "gas" or comes in for supplies, ask him about his brake lining. Because it is hidden out of sight most car owners do not give it the attention it deserves.

The safety of the car and everyone in it depends on the efficiency of the brakes. Call this to his attention and you are sure to increase your volume of relining business.

When you reline his brakes put on brake lining that will make him a satisfied customer. Thermoid Brake Lining makes satisfied customers for three reasons:

More material, greater service

There is over 40% more material and 60% more labor used in the manufacture of Thermoid Brake Lining than in any woven brake lining. This abundance of material and labor means longest wear, greatest safety and lowest final cost.

Grapnalized

Thermoid Brake Lining is Grapnalized, an exclusive process which resists oil, gasoline and moisture. Under ordinary conditions of service Thermoid is impervious to the action of water, gasoline or oil. Moisture of any kind causes ordinary brake lining to swell, making it grab or slip.

Ideal surface, uniform wear

Every inch of Thermoid is compressed under 2000 lbs. of hydraulic pressure.

Because of this process Thermoid is uniformly hard all the way through. It cannot squeeze down after it is applied. There are no soft spots to wear out quickly and cause the brakes to grab or slip. That is why it is 100% brake lining. Thermoid Brake Lining will wear better and last longer because it is hydraulically compressed. It is brake lining clear through.

Make this comparison

Actual comparison between woven brake lining and Thermoid Brake Lining quickly shows why Thermoid is the safe brake lining. We will be glad to send sample of Thermoid. Simply put your name on a postal and send it in.

Brake Inspection Movement

Within the past few weeks a movement has been started to promote the regular inspection of brake equipment by every motorist. This movement is endorsed by leading individuals and organizations in the automobile industry throughout the country.

The first object of the movement is to have all brakes inspected before the touring season opens. This will decrease the accidents due to faulty or improperly adjusted brakes. This movement merits your support because it will increase your brake lining business.

A larger campaign than ever before will run throughout the year to convince motorists of the superiority of Thermoid Brake Lining. When they ask for Thermoid be prepared. Your jobber will supply you.

Our Guarantee: Thermoid will make good, or we will

Thermoid Rubber Company

Factory and Main Office: Trenton, N. J.

Branches:
New York Chicago San Francisco Indianapolis Detroit
Los Angeles Philadelphia Pittsburgh Boston London Paris Turin

Canadian Distributors: The Canadian Fairbanks-Morse Company Limited, Montreal. Branches in all principal Canadian Cities

Winter business—cold weather made profitable



Makers of "Thermoid Tires" and "Thermoid Garden Hose"

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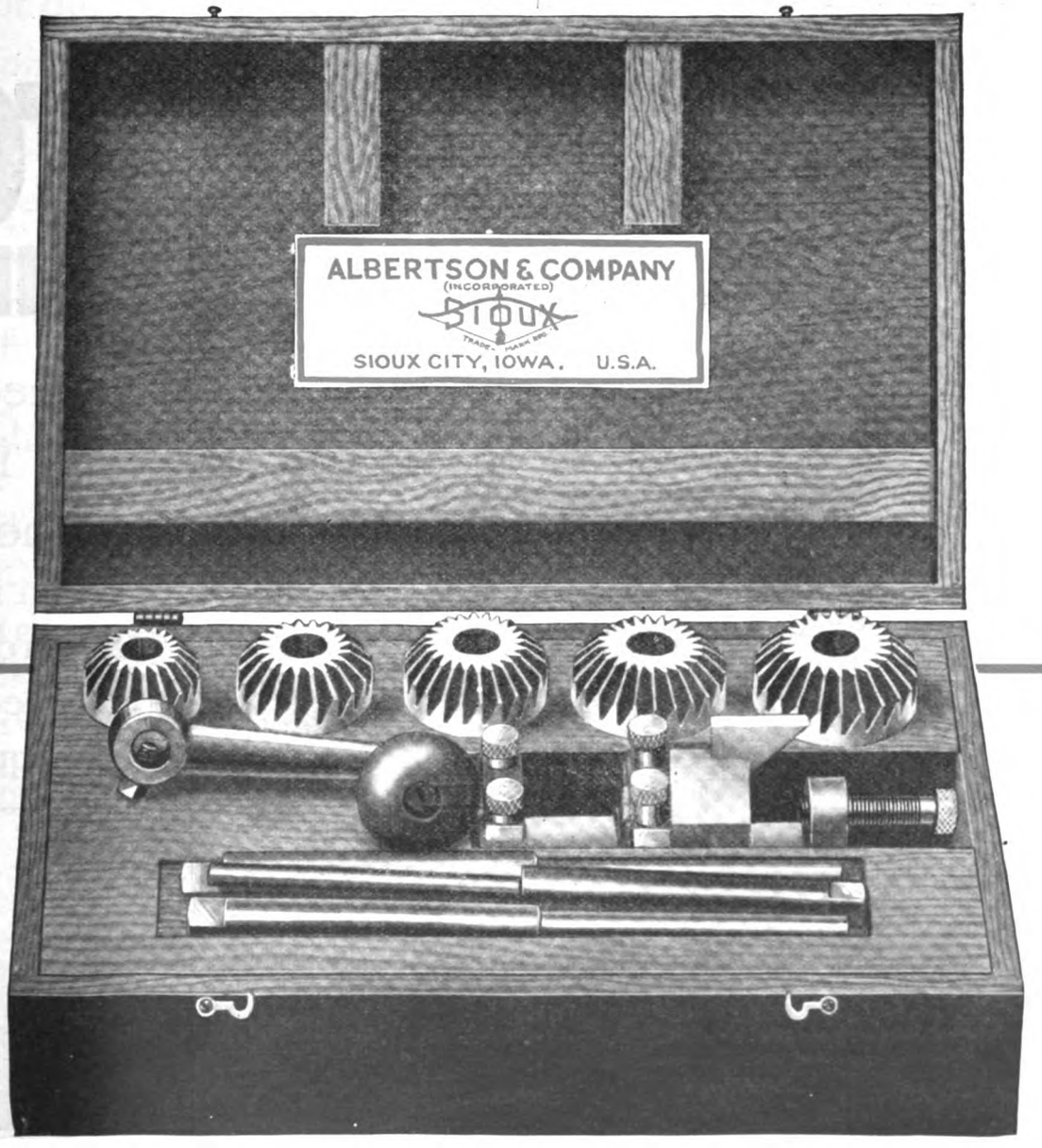
THE SIOUX WAY

Superior Tools
BACKED BY
Real Service

Sioux Valve Seating Tools are superior in working principle, material and workmanship. Every one is a time-saver and a profit-booster.

We Keep Them Sharp. Send your Sioux Tools to us at any time. We keep them properly ground and sharpened. You pay only the transportation charges. Get them from any live jobber.

COMPLETE SET AS ILLUSTRATED $22.50
LIBERAL DISCOUNT TO DEALERS



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For the past six years Multibestos has been the first choice of engineers and manufacturers who select their brake lining on the basis of competitive tests.

MULTIBESTOS
BRAKE & CLUTCH LININGS

This well-known product needs no introduction, as the service it has given since being placed on the market has proved it to be without a peer in its field. The adoption of Multibestos as standard equipment on such cars as the Packard, Pierce-Arrow and Locomobile is proof of its superior quality.

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Multibestos is manufactured complete in our own factory. This is a fact worth considering, for it places upon us the full responsibility for quality. Not only do we weave Multibestos—we spin every strand of the yarn that goes into its make-up. Every process is under the direction and close inspection of our own experts.

By thus controlling the entire course of production, we are able to guarantee the quality of Multibestos and offer to each user the most complete satisfaction.

Back of every foot of Multibestos stands the largest and most complete factory devoted to the manufacture of brake and clutch linings.

STANDARD WOVEN FABRIC CO.
WALPOLE, MASS.

New York Branch and Export Office
1834 Broadway

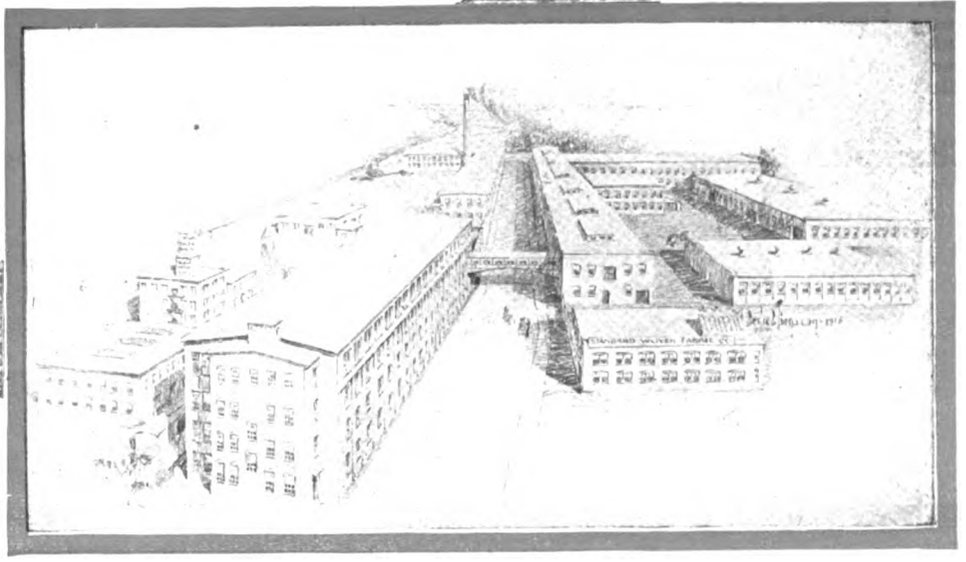
Chicago Branch Office
1430 Michigan Avenue

Detroit Branch Office
306 New Telegraph Building

Philadelphia Branch Office
406 Colonial Trust Co. Building

Other Stanwal Products

Stanwal Brake Lining and Clutch Facing
Tire Tapes
Stanwal Friction and Insulating Tapes
Splicing Compounds
Cable and Specification Tapes
Moulded Rubber Goods
Stanwal Matting
Stanwal Rubber Heels
Stanwal Fiber Soles
Tire Taps



Please mention Automotive Industries when writing to Advertisers

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MR. Dealer: Don't let Old Demon Trouble get a "permanent place" on your shelves. He is coming—sure—sneaking in behind the innocent-looking spark plug which has no name or reputation but wants *you* to be responsible for him. Let the old reliable "trouble-shooter" AC come in and see how quick he'll put the other fellow to rout—and Old Trouble will go along with him, never to return.

Here are the highest references a spark plug maker can give:

List of Manufacturers Using

AC Spark Plugs

The Standard Spark Plug of America

Cadillac	Buick	McFarlan	Jackson	American-La France	Federal Trucks
Pierce-Arrow	Oakland	Paterson	Apperson	Henderson Bros.	G. M. C. Trucks
Packard	Oldsmobile	Davis	Anderson	Old Reliable Trucks	Netco Trucks
Marmon	Nash	Lexington-Howard	Phianna	Gabriel Trucks	Sandow Trucks
Hudson	Kissel Kar	Scripps-Booth	Locomobile	Gramm-Bernstein Trucks	Signal Trucks
Chalmers	Premier	Crane-Simplex	Disbrow	Moreland Trucks	Brockway Trucks
Hupmobile	Knox	Stearns-Knight	Daniels	Wilcox Trux	Samson Tractor
Chandler	Abbott	Saxon	Westcott	Sterling Trucks	Acme Trucks
Haynes	Pathfinder	Stutz	Monroe	Republic Trucks	Menominee Trucks
Chevrolet	White	National	Singer	Diamond T Trucks	Riker Trucks
Dort	Delco-Light	Velie	Dodge Brothers	Four Wheel Drive	Stewart Trucks
Cole	Murray	Stephens	McLaughlin (Canada)	Titan Truck	Wisconsin Trucks
Reo	Case		Dorris	Maxim Trucks	RobinsonFireTruck
Paige	Economy		Duesenberg	Case Tractors	La Crosse Tractor
Peerless	Jordan		Hatfield		Advance-Rumely Tractor
Pilot	Liberty				Lombard Tractors

Champion Ignition Company—Sole Manufacturers, Flint, Michigan

AC Carbon Proof

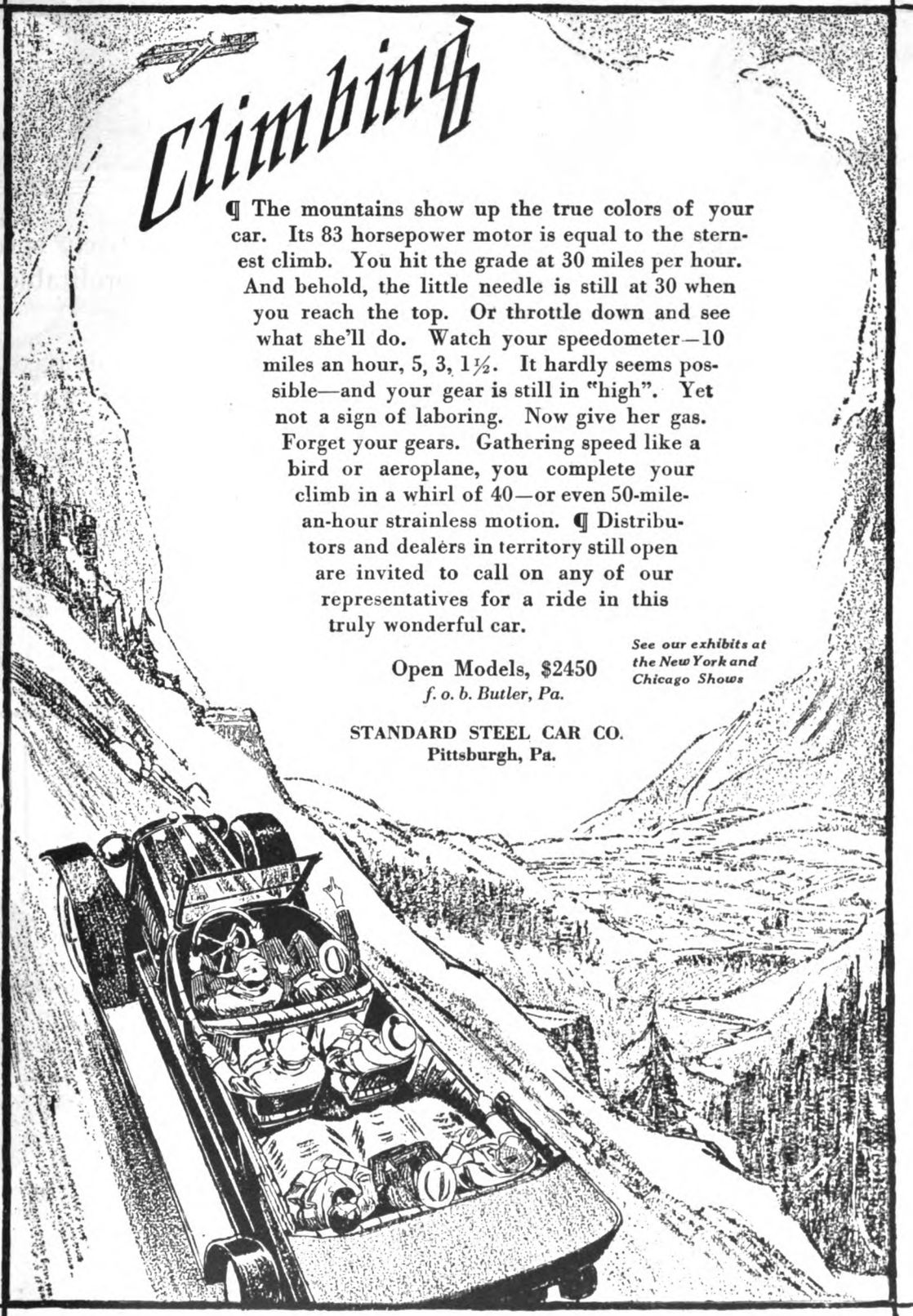
For Fords, Overlands and Studebakers





⅞ in. Regular for Maxwells A C Titan

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Climbing

¶ The mountains show up the true colors of your car. Its 83 horsepower motor is equal to the sternest climb. You hit the grade at 30 miles per hour. And behold, the little needle is still at 30 when you reach the top. Or throttle down and see what she'll do. Watch your speedometer—10 miles an hour, 5, 3, 1½. It hardly seems possible—and your gear is still in "high". Yet not a sign of laboring. Now give her gas. Forget your gears. Gathering speed like a bird or aeroplane, you complete your climb in a whirl of 40—or even 50-mile-an-hour strainless motion. ¶ Distributors and dealers in territory still open are invited to call on any of our representatives for a ride in this truly wonderful car.

See our exhibits at the New York and Chicago Shows

Open Models, $2450
f. o. b. Butler, Pa.

STANDARD STEEL CAR CO.
Pittsburgh, Pa.

STANDARD "8"
The Magneto Equipped Eight

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Stan

WITH resources and facilities of a vast and varied nature we are equipped to serve the motor car industry in many ways, usual and unusual.

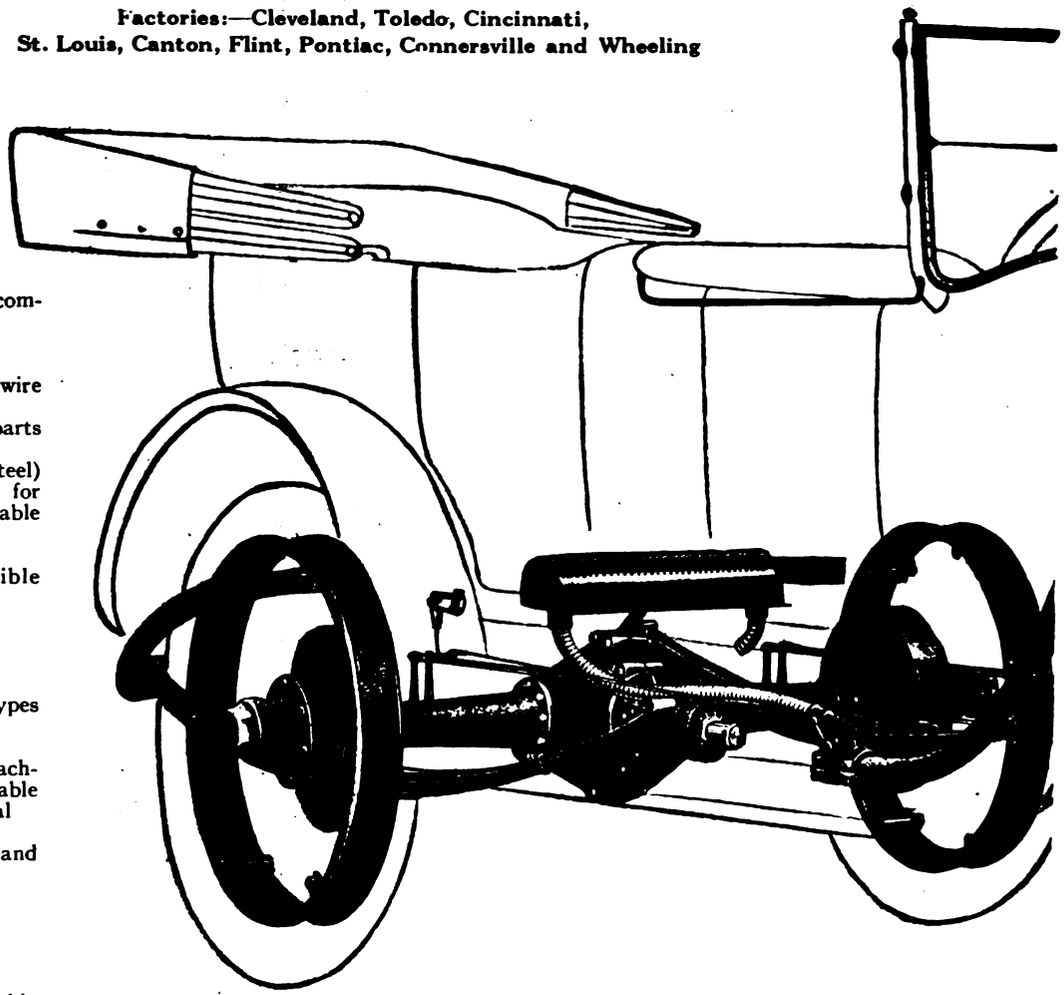
We seek to make your problems our problems and to evolve the solution thereof in a manner so distinctively successful as to establish mutually profitable relations that will prove enduring.

Tell us what problem you have that will put us to the test—now? Let us demonstrate our equipment to serve you.

Factories:—Cleveland, Toledo, Cincinnati, St. Louis, Canton, Flint, Pontiac, Connersville and Wheeling

For Motor Vehicles

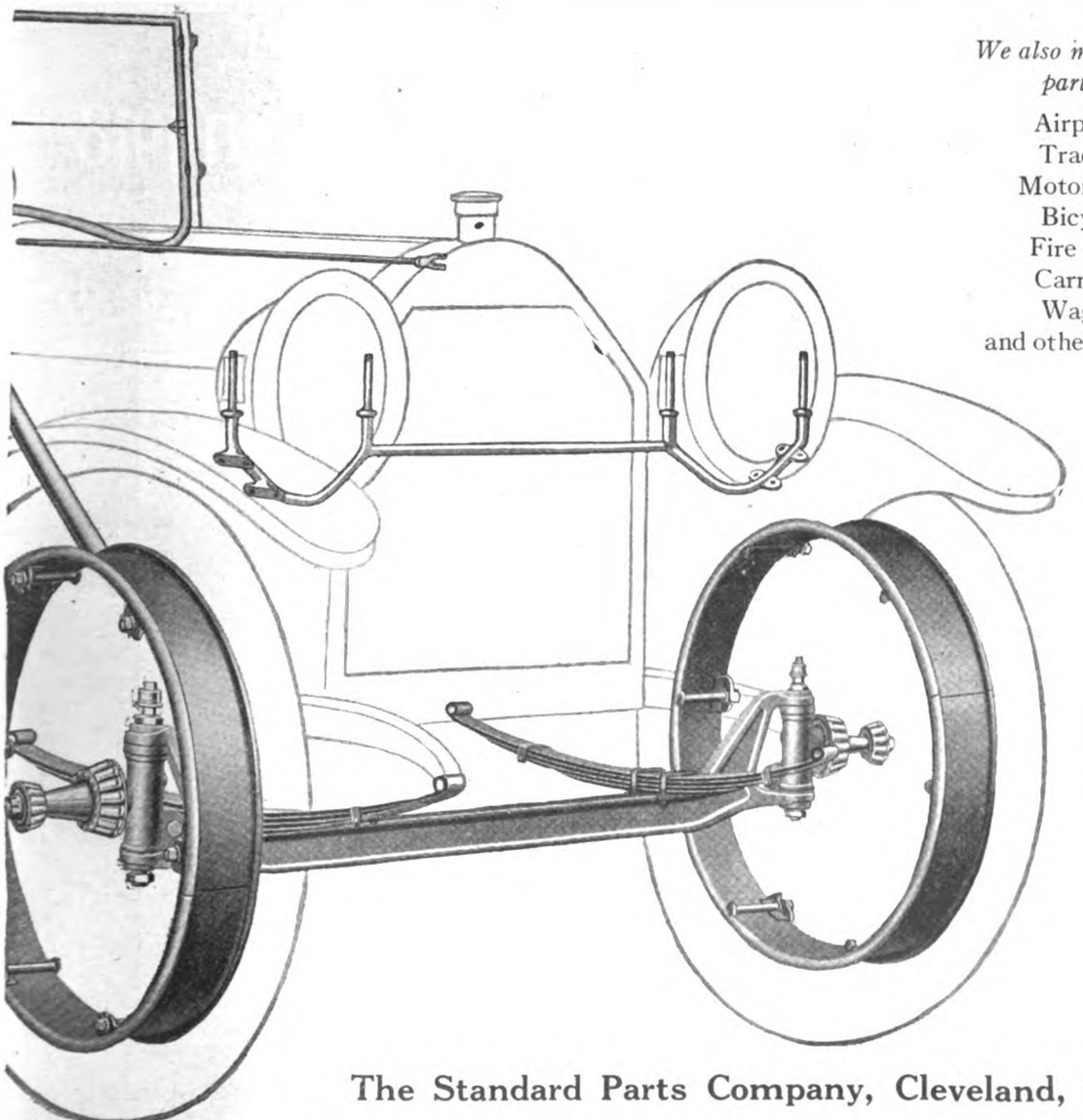
Axles
Axles (dead rear)
Bearings
Brake rod assemblies complete
Clincher rims
Cranks (starting)
Detachable rims for wire wheels, special
Electric welding of parts
Exhaust tubes
Felloe bands (S. A. E. Steel)
Flanges and fittings for attaching demountable rims
Formed Tubing
Forgings for convertible trucks
Heaters
Hubs
Ignition wiring tubes
Mast sleeves
Millimeter rims, all types
Oil tubes
Radiator rods
Rims—clincher, detachable and demountable for single and dual equipment
Starting gear rings and boxes
Straight steel tubing
Steering gear tubing
Springs (regular)
Springs (thin leaf)
Tail pipes
Tire bases in demountable and pressed on channels
Torsion tubes
Truss rods
Tubing (straight and formed)



The Standard Parts Company, Cleveland, Ohio

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dard parts



We also manufacture parts for

Airplanes
Tractors
Motorcycles
Bicycles
Fire Arms
Carriages
Wagons
and other vehicles

The Standard Parts Company, Cleveland, Ohio

Please mention Automotive Industries when writing to Advertisers

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Miller Carburetor

For a Faster, More Powerful, More Economical Car in 1918

THIS year it will mean more than ever to you and your car—a speedy, high-power, big-economy Miller Carburetor.

It will help put your motoring on an efficiency basis—a patriotic basis.

It will help you get a whole lot more out of your motor by thoroughly vaporizing the present low grade fuel.

Miller is acknowledged WORLD'S CHAMPION on speedway and race course. And in everyday service on passenger car, truck, tractor or aeroplane, its performance is every bit as remarkable.

Positive, automatic action and unequalled simplicity are the reasons.

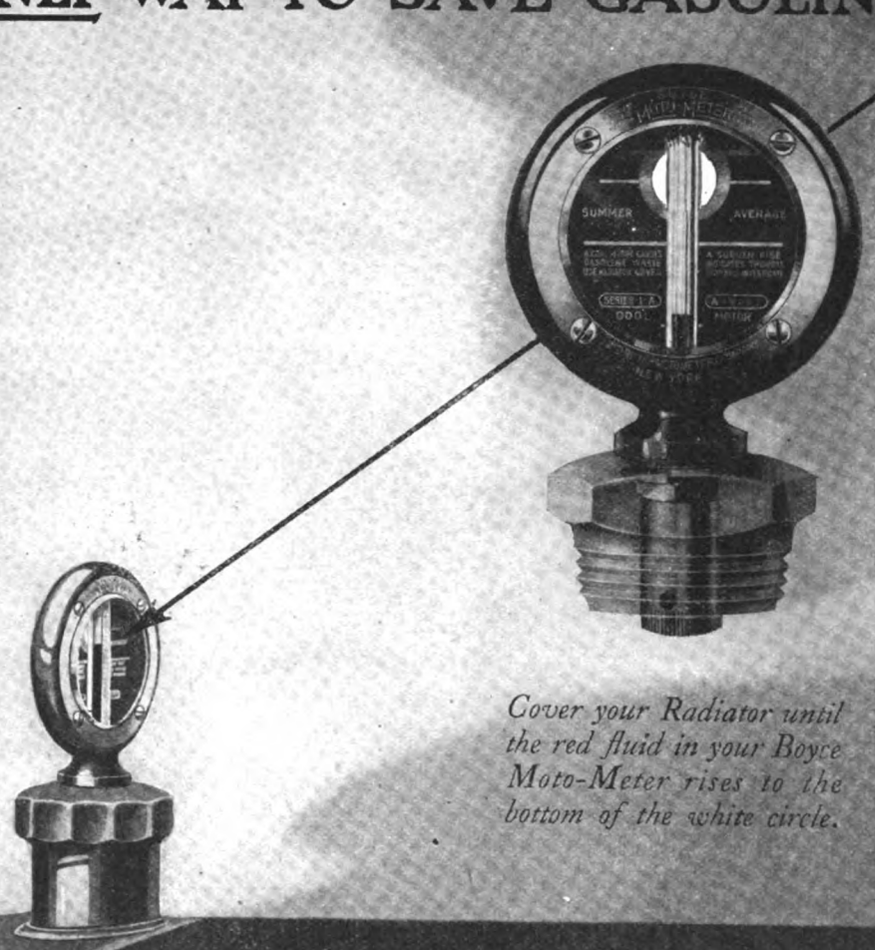
Let us show you how to make your car a **better** car. Write us.



Miller Carburetor Distributors, Inc,
256 Broadway, New York
2351-2359 INDIANA AVENUE, CHICAGO

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THE ONLY WAY TO SAVE GASOLINE!



Cover your Radiator until the red fluid in your Boyce Moto-Meter rises to the bottom of the white circle.

ENGINEERS have been telling us for years that the only way to save gasoline is to operate the motor at a high temperature.

If this is not done 30 to 40% of your gasoline goes out the exhaust pipe unburned and wasted.

Don't blame the manufacturer of your car for poor gasoline mileage. His duty was at an end when he supplied you with a Boyce Moto-Meter.

Cover your radiator until your Boyce Moto-Meter reads Summer Average. Then and then only will you start saving gasoline—simple isn't it?

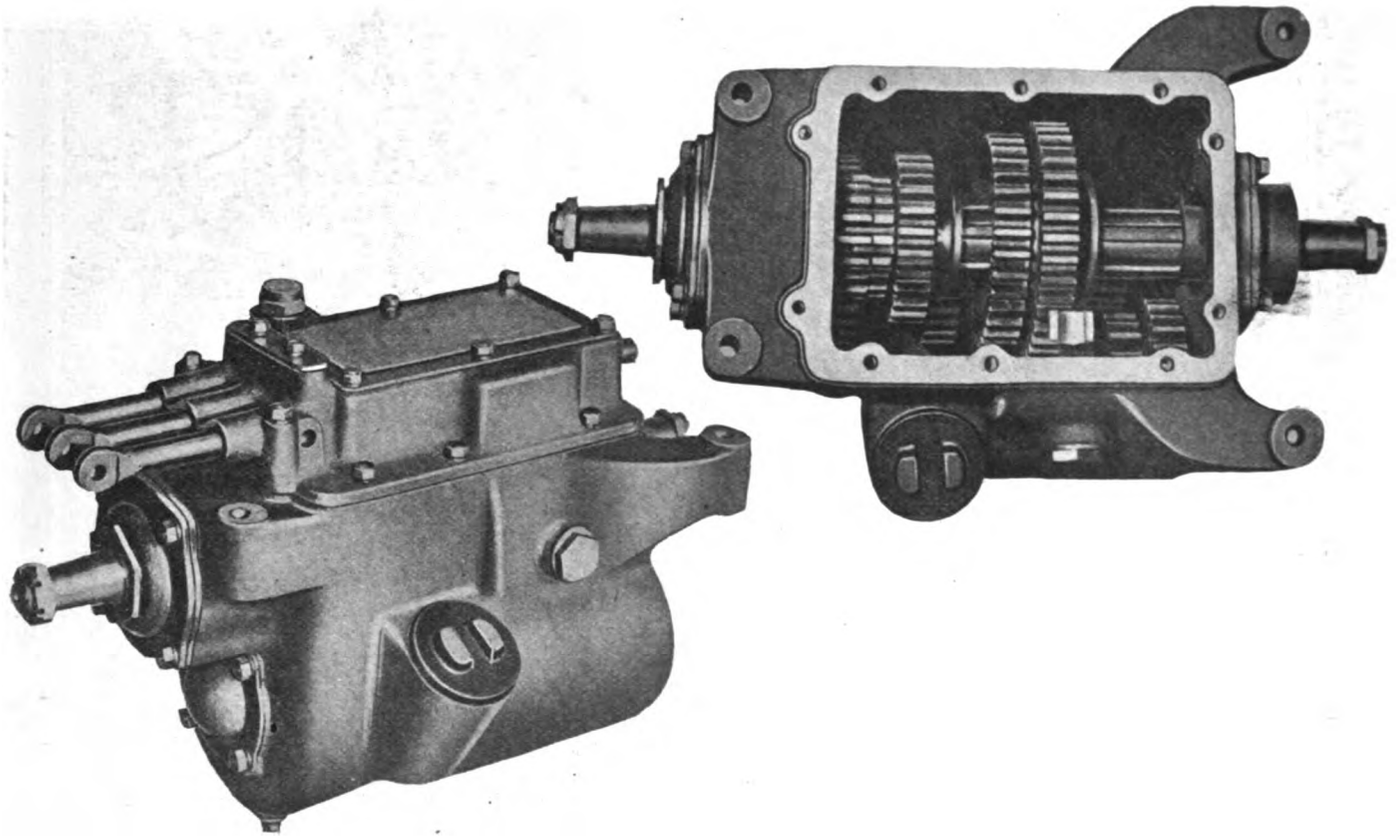
THE MOTO-METER CO., Inc., Long Island City, N. Y.

BOYCE MOTO METER

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DETROIT TRANSMISSIONS

DETROIT GEAR & MACHINE CO.



MODEL H TRANSMISSION

Amidship Type Truck Transmission for 1½, 2 and 2½-Ton Trucks — 4 Speeds

A new design transmission of the amidship type which carries 4 speeds forward and one reverse It makes possible a more even distribution of the weight of the truck and eliminates the whipping of a long drive shaft. Mounting is on cross members, permitting easy inspection and removal.

The logical transmission for 1½, 2 and 2½-ton trucks of the better class that are designed for strength. The transmission is in production and ready for immediate delivery

Gears are 6-8 pitch, 1" width face, made from drop forged, heat treated high carbon 3½% nickel steel. Shafts are heat treated and carbonized alloy steel, mounted on ball bearings. Gear ratios are as follows:

High—Direct Second—3.08 to 1
Third—1.76 to 1 Low—4.4 to 1.
Weight as shown 145 lbs.

DETROIT GEAR & MACHINE COMPANY

Detroit **Michigan**

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We Recommend
MONOGRAM
OILS AND GREASES
Service and Quality



The Franklin CAR

DODGE BROTHERS
MOTOR CARS

Signs Like These

Get priceless advertising space on agency windows without cost. It's advertising that focuses public attention on your selling agencies at the right time and place.

THE Gould
STORAGE BATTERY

COLE 8

MEYERCORD
GENUINE DECALCOMANIA
WINDOW SIGNS

Are oil paint color designs easily applied on the windows. Made in any size and style in colors and gold. Bright and attractive for years. Surpass hand-painted signs. Dealers like them. Not in their way, yet live business-getting trade-magnets night and day. Can you get the same utility from any other sign?

Used by over eighty-five per cent of the Automobile manufacturers, Tire and Accessory people and every leading national advertiser.

The cost of Meyercord Decalcomania Window Signs is not great. At a small outlay thousands are reached daily. Beg n now to get your share of dealers' window space. This is just the time to get started.

Write today for samples and prices

Visit our Display Rooms, 11th floor, Chamber of Commerce Building, during the Show

THE MEYERCORD CO.
CHICAGO
The Meyercord Co., Ltd.
Toronto
Makers also of Decalcomania Transfer Name Plates

Goodrich Tires

Knight Tires

PAIGE
MOTOR CARS

HUDSON
SUPER
SIX

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The Motor Dictograph

Starts 1918 with a Record Unequalled in the History of the Automobile Industry

FIRST displayed in the 1917 Salon and Shows—during the year it has been adopted by the great leaders in the motor world. It is standard equipment in Packard, Cadillac, Hudson, Winton, Willys, Jordan, Cunningham, Murray, Roamer, Owen-Magnetic, McFarland, Cole, Chalmers, Liberty, Pierce Arrow and others. Holbrook Company and other famous body builders use it exclusively in the finest custom work.

The Motor Dictograph is the *Automobile Telephone Par Excellence.* Nothing else can take its place—nothing else can be near as good.

The Motor Dictograph is fully protected by patents. All infringements will be rigorously prosecuted.

For 1918 we will bring out our CABINET TYPE MOTOR DICTOGRAPH for installation in closed cars now equipped with obsolete type telephones. Manufacturers, engineers, designers, dealers and service stations are invited to correspond.

Our Exhibit in the 1918 Shows will be in the cars of OUR CUSTOMERS

General Acoustic Company

CHAS. H. LEHMAN, Vice-President and General Manager

The Dictograph System

220 West 42nd Street New York

Branches in all principal cities throughout the world

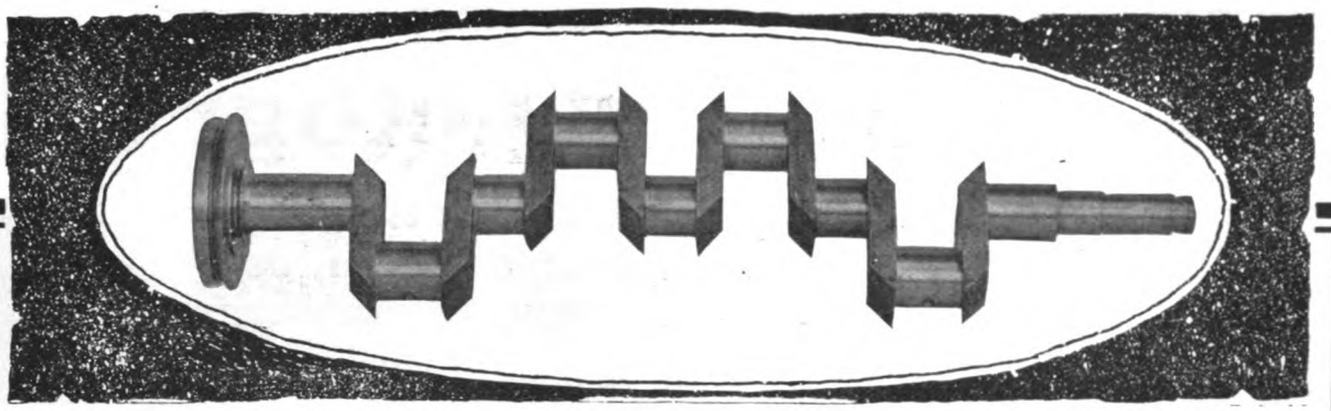
SEND for circulars describing the famous Dictograph system of Inter-Communication, the Aviaphone, the Navalphone, the Acousticon for the Deaf—all Dictograph products.

Our new Aviaphone revolutionizes the system of communicating between the pilot and observer in an Airplane—ready early in 1918.

Executives—Attention

If you have an inter-communicating problem of any kind, the Dictograph will solve it as it has solved similar problems for the world's greatest executives. Our new booklet, "An Essay on Efficiency," will be sent free to any executive who mentions Automotive Industries in writing for it.

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Crankshaft Machining

There's a mighty desirable feeling of security—a satisfying sense of safety—in the consciousness that behind your crankshaft machining there are over twenty profitable years of experience. Isn't it *something* to have applied to your work the supreme skill and thorough knowledge which have sprung from these long years of specializing?

MOLTRUP

But experience is not the sole reason for MOLTRUP leadership. Untiring vigilance over every detail—extreme care in every operation—an equipment unsurpassed in value and completeness—*these* are the factors that have enabled us to so successfully capitalize that experience.

These things mean *certainty*. They mean the kind of workmanship that quality finishing demands—the *only* kind that you can afford to employ, if you would avoid those fatal inaccuracies that the slightest oversight, or the smallest defect in tool or machinery, would render inevitable.

A Newer and Bigger Plant

Not long ago our plant had to be enlarged to take care of the rapidly increasing contract work we were receiving. Naturally new lathes, grinders and other equipment were installed: and now throughout our entire plant will be found the most up-to-date crankshaft machining devices in the country.

Work Done Expertly and Promptly

This greater capacity places us in a better position than ever to handle your work with gratifying promptness.

And our new equipment, backed by all that MOLTRUP stands for in expertness and quality, insures positive accuracy of alignment and balance.

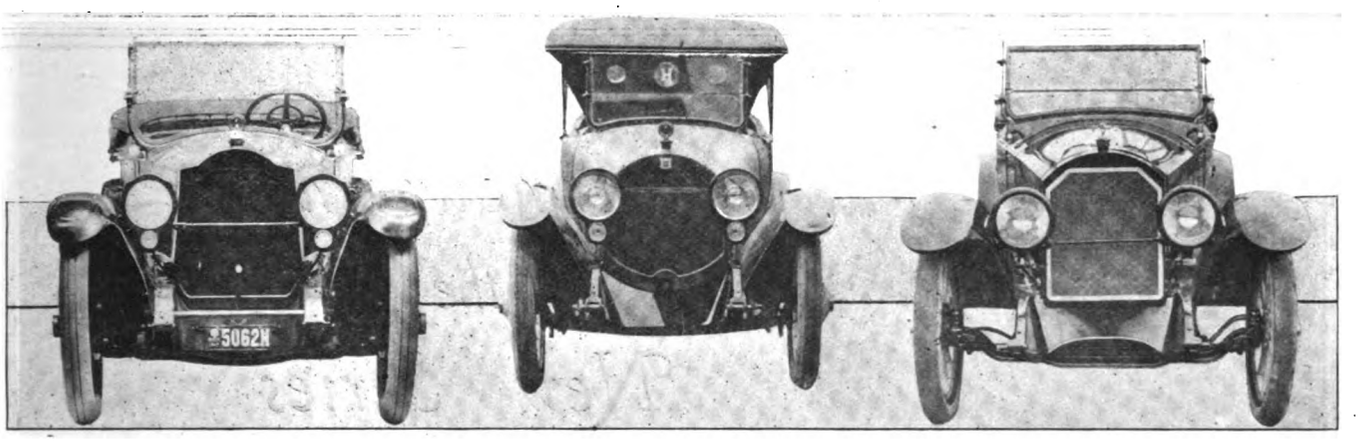
Can you safely accept *less* than MOLTRUP gives? Can you possibly get *more* in any other plant? Think how all-important it is to be sure of absolute dependability—the *vital necessity* of correct machining—

And then send us your blueprints and let us submit quotations.

MOLTRUP STEEL PRODUCTS CO.

BEAVER FALLS, PA.

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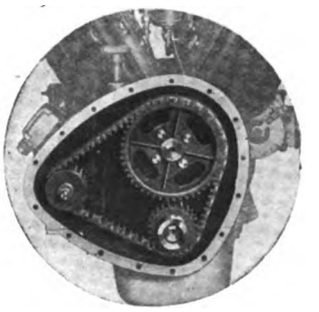
MORSE SILENT CHAIN FRONT ENDS

33 Cars of Distinction Rely Upon Them

Visit the MORSE Booth
(C-42)
At The New York Show
And Become Acquainted with

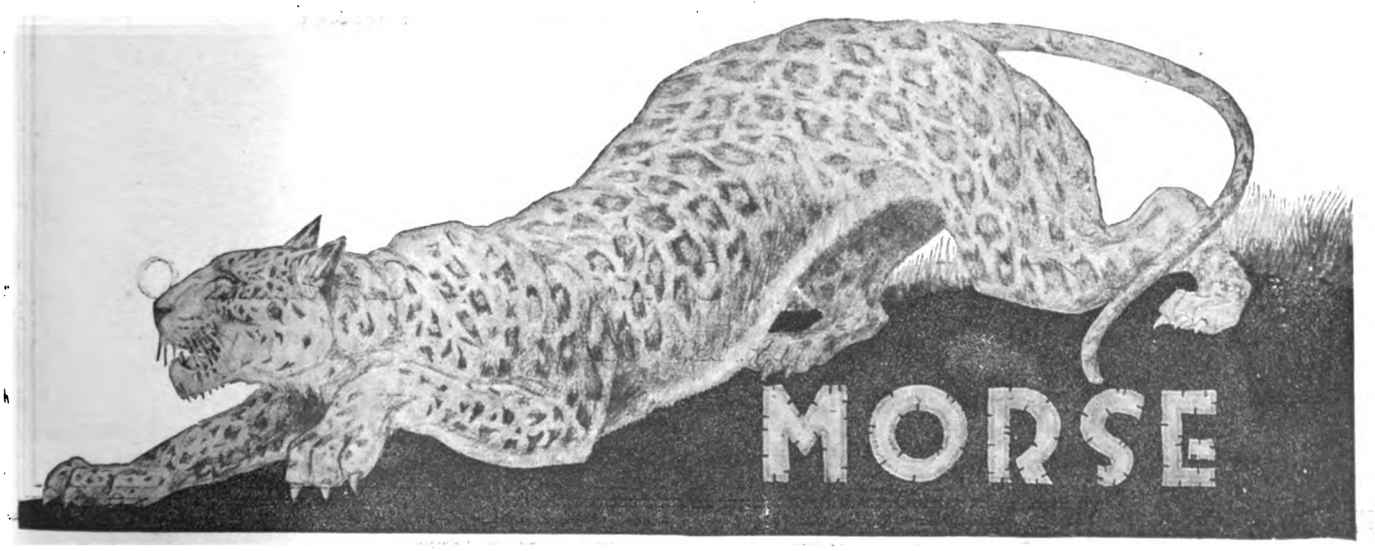
The Most Satisfactory of Front End Drives

SILENT PARTNERS OF THE MOTORS



Investigate Them at the New York Show Space C-42

MORSE CHAIN CO., Ithaca, N.Y.
Largest Manufacturers of Silent Chains in the World



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Announcing
the
New Series

OWEN MAGNETIC



Entz Transmission

Powerful Valve In Head Engine, Detailed Refinements Throughout, Longer Wheel Base (142 in.), Luxurious and Distinctive Bodies,
Touring Cars,
Limousines,
Sedans.

We Exhibit—Space B-29
Grand Central Palace

The BAKER, R. & L. CO., Inc. - Cleveland, O.

Eastern Sales Office:
57th and Broadway, New York City

Please mention Automotive Industries when writing to Advertisers

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Your Safeguard is the "UNITED" Reputation

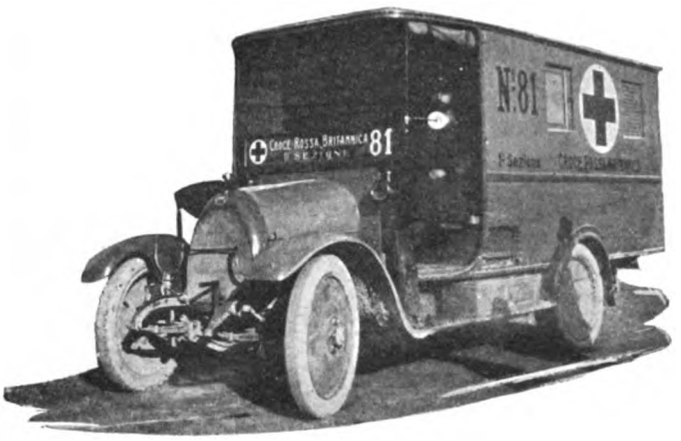
With many years of steel making experience, backed by a reputation for quality of product and service, there's assurance of *safety* in specifying

"UNITED" Alloy Steels

Manufacturers of automobile and aeroplane parts, etc., where unusual excellence of quality is required, insist on "United" open hearth or electric furnace steels. This unquestioned leadership has built up a large clientele of satisfied users.

UNITED ALLOY STEEL CORPORATION
Canton, Ohio
Specialists in Alloy Steel

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"It Is Well Known At The Front

that some ambulances can travel over rough roads faster than others, not on account of their higher power, but entirely because of their better riding qualities."

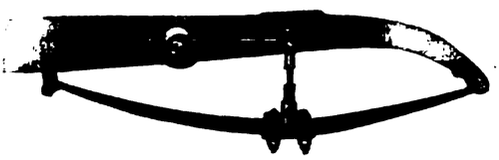
"The easiest riding ambulance of which the writer has had any experience was * * fitted with Houdaille Shock Absorbers."

(Extract from article by Mr. W. F. Bradley on the Army Ambulance Service)

The Houdaille Hydraulic Suspension (or Shock Absorber) is well known not only "at the front" but throughout Europe, where before the war it was standard equipment on 14 makes of Automobiles. It is built on the principle of the hydraulic recoil checks which have so thoroughly proved their efficiency on the French "Seventy-Fives."

HOUDAILLE

(PRONOUNCED HOO-DIE)



HYDRAULIC SUSPENSION

The simplicity of its attachment is illustrated above.

Not the slightest change is required in the body or chassis of any car.

No matter how great a resistance the Houdaille is adjusted to exert in one direction (and this adjustment is made exactly to fit your necessities by one twist of a screw driver) in the other direction it will always move with ease, so that the wheels easily drop into hole or rut without taking the car body with them.

This is a very important point in the smooth, easy running of a motor car.

Prices (including installation):

Half set, two instruments.....$50.00
Full set, four instruments.....100.00

The Houdaille Shock Absorber Co., Inc.

1737 Broadway, New York

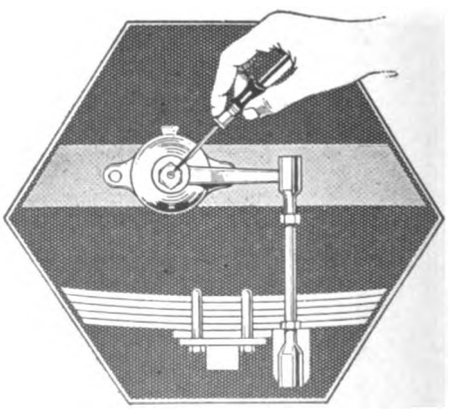
PHILADELPHIA:
Auto Equipment & Service Co.
1435 Vine Street

CHICAGO:
The Arthur Jones Electric Co.
55 East 28th Street

This Shock Absorber has

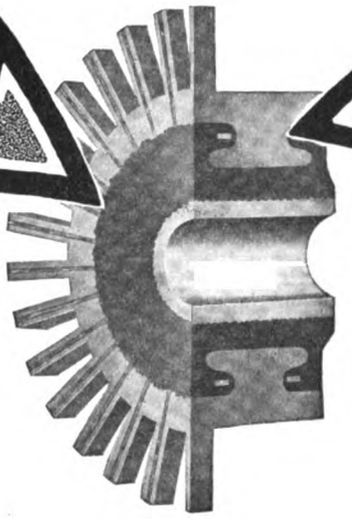
ONLY ONE ADJUSTMENT

As shown in the illustration below, a slight turn of the screw fits the resistance of the Houdaille to fit the weight and spring equipment of any car.



It has only one moving part, and contains no springs. All the strain comes on the oil (Castor Oil or Glycerine) in the interior, which is forced though numerous by-passes by a rotary paddle.

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SAFER AT HIGH SPEEDS— AND THE COST IS LESS

Whether you are a manufacturer of small motors, or a user, the fact that

BAKELITE
MOULDED COMMUTATORS

are safer at high speed and cost less should interest you.

Moulding the commutator segments in Bakelite means an oil-tight, water-tight, dust-proof commutator which will not work loose at high speeds because Bakelite is mechanically strong and grows harder under heat instead of softening.

When a commutator of considerable diameter is to run at high rotative speed, steel reinforcing rings may be moulded in at either end inside the sector lugs. These rings reinforce the commutator against centrifugal strain. Commutators of small diameter, such as used for small motors and fans, may not need these reinforcing rings.

Many styles of commutator are made at less cost when moulded in Bakelite for Bakelite saves the cost of mica V-rings and eliminates expensive and unsatisfactory assembling.

GENERAL BAKELITE COMPANY
2 RECTOR STREET NEW YORK
55-170

BAKELITE

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$3
per set of 3

Saves Ford Rear End

Rear end trouble! That's a big bugaboo with Ford owners. One of the chief contributing causes is inefficient transmission lining. It gets hard and polished —then grabs and slips—and *then* there's *trouble to pay*. The Ford comes to a stop amid heavy vibration and noisy chattering. The back end vigorously jumps up and down. The *direct shock* of this vibration is communicated through the drive shaft and gearing to the rear axle. No mechanism can stand such strain indefinitely. Rear end trouble is the *natural result*. Cork Insert Transmission Linings stop the grab and slip—eliminate the chatter and permit velvety smooth transmission action. They *save* the Ford rear end—prolong greatly the life and efficiency of the car. This alone would make the use of these linings economical and advisable. In addition they outwear two to three sets of ordinary linings.

A Non-Slip Fan Belt for Fords

Cork Insert Products Exhibited at New York and Chicago Shows



One Dollar for 1917 Fords
85c for preceding models

Authorities say that up to 50% of the "drive" goes to waste from slippage in the ordinary Ford fan belt. It gets so hard and glassy that the fan speed is reduced, the engine is not properly cooled and overheats. Cork Insert Fan Belts do not slip—they keep the fan fanning, keep the engine cool, are very long lived and economical.

Dealers: Order Cork Insert Transmission Linings and Fan Belts from your jobber. Ask him how Cork Inserts are moving. He will tell you they are a BIG WINNER. Stock them—recommend them—push them. They will make you a lot of profit.

Advance Automobile Accessories Corporation
Dept. A 16-1
56 East Randolph Street
Chicago

Dealer's Coupon Check and Mail today

Advance Automobile Accessories Corporation
Dept. A 16-1 56 E. Randolph St., Chicago

- ☐ Send one dozen sets of Advance Cork Insert Transmission Linings for Fords.
- ☐ Send one dozen Advance Cork Insert Fan Belts, 1917 Ford.
- ☐ Send one dozen Advance Cork Insert Fan Belts, 1916 or earlier model Ford. (Regular dealer discounts to apply.)

Name .....
City ..... State .....
Jobber's Name .....

Ford Owner's Coupon Check and Mail Today

Advance Automobile Accessories Corporation
Dept. A 16-1 56 E. Randolph St., Chicago

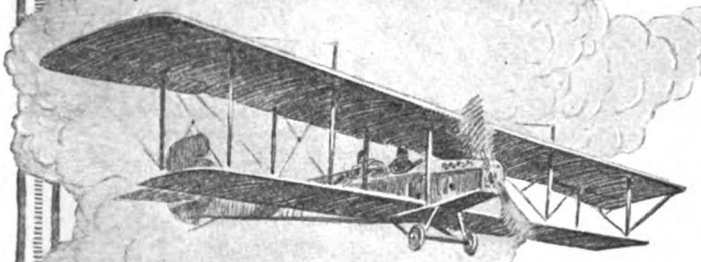
Enclosed find $..... Send me:—

- ☐ 1 set Cork Insert Transmission Linings $3.00
- ☐ 1 Ford Fan Belt (for 1917 Ford) 1.00
- ☐ 1 Ford Fan Belt (for 1916 or earlier Ford model) ..... .85

Name .....
City ..... State .....
Dealer's Name .....

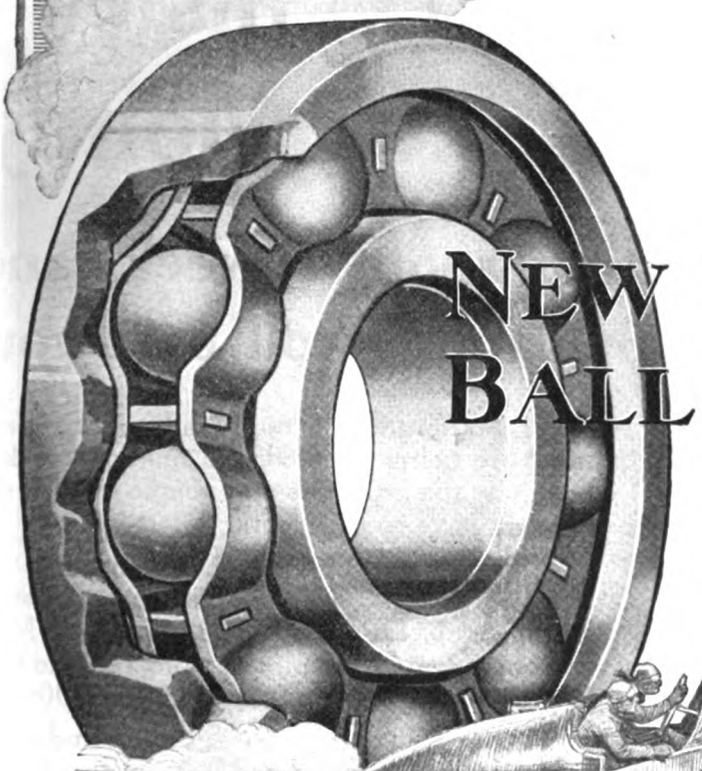
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The Miracle of the Ball Bearing



ON earth, sea and clouds man masters Nature by harnessing her own forces. He takes her own power and thereby rules her. Whatever saves power, increases its effect. The conquest of friction is a prime engineering victory.

No other form of matter rolls as easily as a sphere. New Departure inventors have applied this principle so ingeniously and successfully that great mammoths of stationary power plants and also the fastest of "far-darting" machines employ the supreme economy of



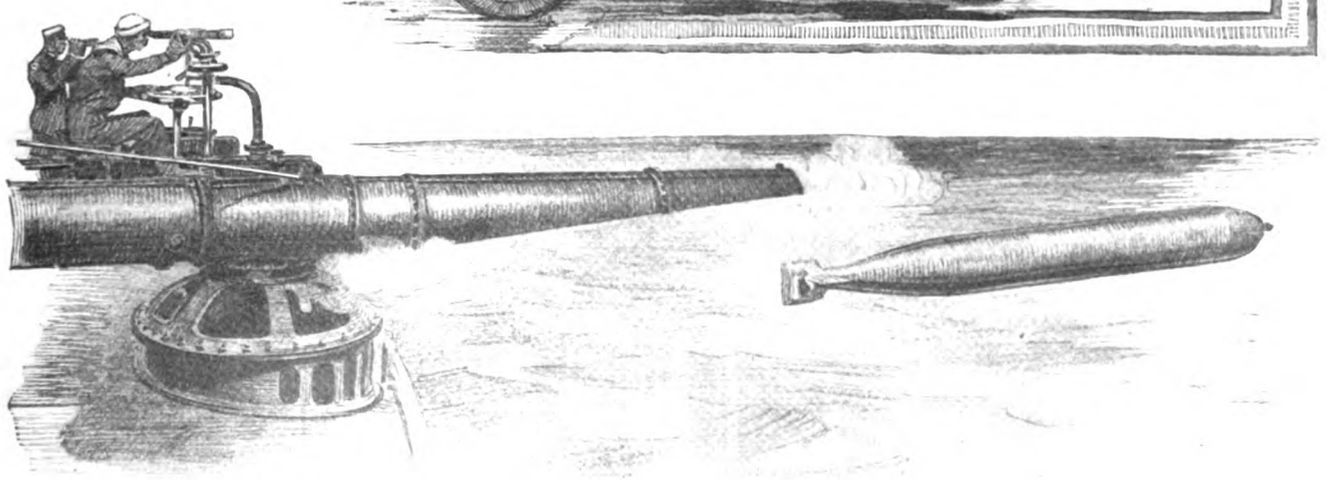
NEW DEPARTURE BALL BEARINGS

New Departure Ball Bearings are remarkable not only for their saving of power, but also because they are size for size stronger *than any other type of bearing made.* And the same factors which make them strongest and "smoothest" also make them the most durable.

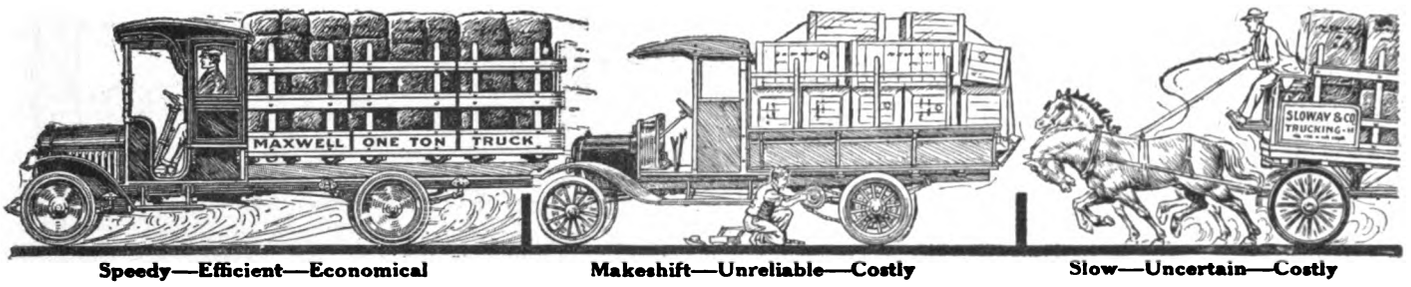
Your machine, whether it is a great tractor or a fine electrical instrument, would ask you for New Departure Ball Bearings if it could talk. The evidence in our free book *does* talk. Please write for it.

The New Departure Manufacturing Company
Bristol, Conn., U. S. A.
Conrad Patent Licensee





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Speedy—Efficient—Economical | Makeshift—Unreliable—Costly | Slow—Uncertain—Costly

Reach Quick for This Sudden Flood of Truck Money

Don't stand there, waiting another week, and watching this big profit opportunity roll past you.

They must have trucks. They are all waking up to it at one time. The whole trend of up-to-the-minute transportation science is sending business towards the dealer who has Maxwell One-Ton, Worm-Drive Trucks.

The one-ton unit is now recognized as the key to the solution of the problem the country is facing. The traffic experts' standards of 1916 are not the standards of today.

Country — town — agricultural — mercantile — industrial — bus — express — long haul — short haul — few stops or straight run — steady volume or fluctuating volume of traffic — no matter what the work of your district is, no matter how many different forms of traffic are being handled, the one-ton truck is the key to the problems that people in your district will have to cope with.

And of all the one-ton trucks the one that gives maximum service, at minimum cost, is the Maxwell Truck with the time-tried Maxwell engine and the same durable, reliable type of worm drive as in trucks costing $5,000.

The Maxwell is pure truck design and truck construction in every detail—steels of automobile quality, but not a transformed automobile. It carries a ton and at the same time can haul three tons.

Write for our offer to dealers while these trucks of maximum efficiency are still procurable.

Maxwell Motor Sales Corporation

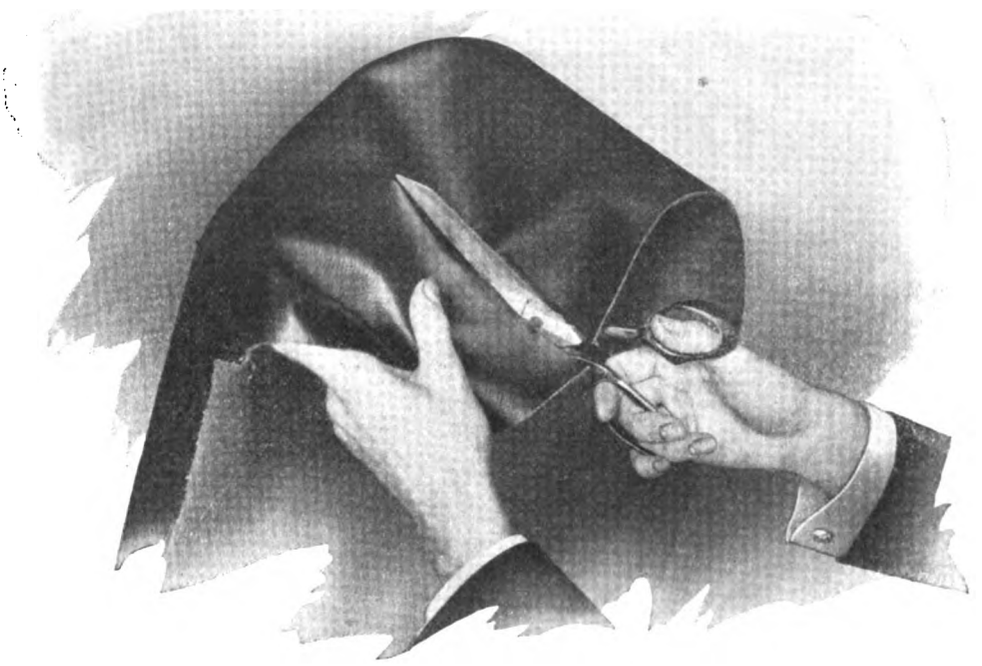
Detroit **Michigan**

MAXWELL ONE-TON WORM-DRIVE TRUCK

MOST MILES PER GALLON - MOST MILES ON TIRES

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O'BANNON COATED FABRICS



Let Us Cut You a Sample

O'Bannon "Moleskin Quality" upholstery material and "Nonleek" motor topping will add to the character and beauty of your car. Their distinguished appearance and extraordinary endurance are remarkable in any company.

Let us send you samples of our latest designs

O'BANNON CORPORATION
200 Fifth Avenue, New York

Detroit Representative:
Matthew L. Sullivan, Lenox Apartments

Chicago Representative:
James F. Sanborn, 5311 Harper Avenue

O'BANNON INTERNATIONAL
TRADE MARK

O'BANNON ARTIFICIAL LEATHER
REG. U. S. PAT. OFF

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A·O·SMITH
CORPORATION
MILWAUKEE-WISCONSIN

Pioneer Manufacturers of
PRESSED STEEL
"FRAMES"
In the Largest and Best Equipped
Frame Plant in the World

SERVICE PARAMOUNT-QUALITY UNIFORM
WORKMANSHIP UNEXCELLED

We also manufacture Pressed Steel Rear Axle
Housings, Heavy Stampings and Drop Forgings
Let Us Know Your Requirements

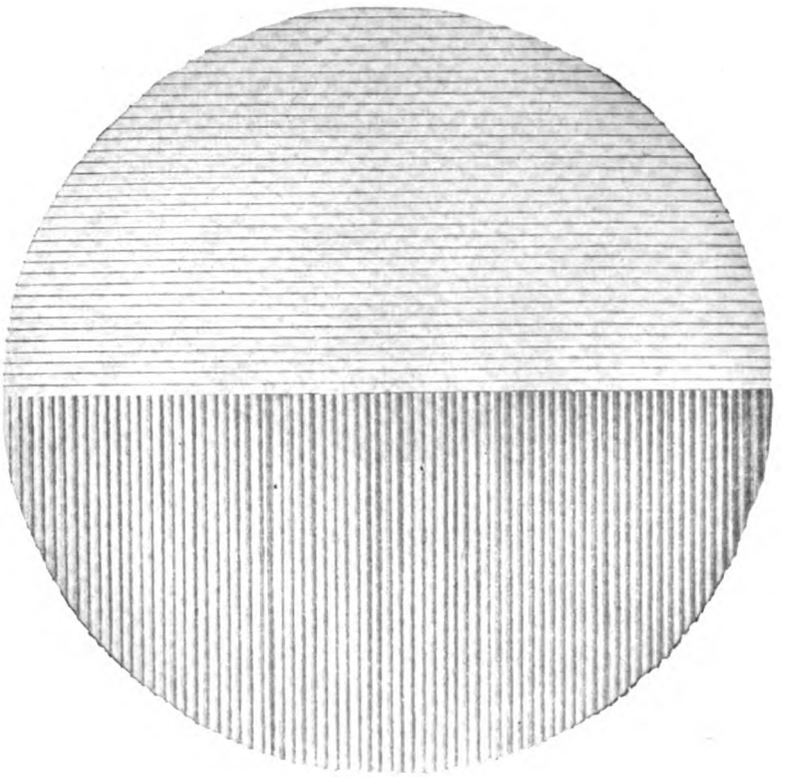
"Once a Smith Customer-Always One"

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SAFERLITE

Deflecting and Diffusing Head Lamp LENSES

The scientific method of road lighting



High projection over 400 feet ahead with the light kept below the horizontal and slight diffusion, so that you can see the full traffic width of the road,

And the price is not excessive.

PRICES

Up to 8⅛	$1.50	per	pair
8¼ to 9	1.75	"	"
9⅛ to 10	2.00	"	"
OVER 10	2.25	"	"

NOTE—A really worth while proposition for dealers; make inquiry.

Saferlite Lens Co.
Room 1704
220 Fifth Avenue
New York

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On Display at the New York and Chicago Automobile Shows

ANDERSON SIX

Convertible Sport Car

Changeable in a twinkling from real roadster to real 5-passenger touring car



Prices

Sedan Convertible	$2,100
Convertible Sport Car	1,395
Touring Car, with straight front seat	1,395
Touring Car, with divided front seat	1,395
Victoria Top	150
Houk Wire Wheels, extra	100

Brief Specifications

Continental Six Motor—*Zenith* Carburetor—*Westinghouse* Lighting and Starting System—*Connecticut* Ignition—*Borg & Beck* Clutch—*Gemmer* Steering Column—*Columbia* Axle with Noiseless Spiral Differential Gears.

120 Inch Wheelbase—Semi-Elliptic Underslung Spring Suspension—Rear Springs 56 inches long—Weight 2750 lbs., ready for the road.

Regular equipment: There is a *Boyce* Motometer, a *Kellogg* Engine Driven Tire Pump, a *Stewart* Speedometer, a *Utility* Combination Heater and Foot Rest, a Muffler Cut-out, a Semi-Victoria One-Man Top of *Rayntite*, Quick Inside Attachable Storm Curtains, a *Klaxon* Warning Signal, *Duff* Jack and Complete Set of Tools.

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The most *useful* car of them all

THE Anderson Convertible Sport Car is, we believe, the greatest utility car of the year, for it offers the buyer of a single car the use of two entirely different models—touring car *and* roadster.

It will be either—just as the owner desires and whenever the occasion requires.

As a touring car it is roomy and exceedingly comfortable — complete in every particular. It will accommodate five grown people without the slightest crowding or cramping.

Entrance to the tonneau is by an aisle between the divided front seats. The seats themselves are luxuriously wide and soft, tailored in real leather, French pleated. The top—a Semi-Victoria type—covers both the front and rear seats, just as it should. A UTILITY Combination heater and foot rest is provided for cold weather driving.

Or would you drive a roadster to-day?—then just fold the rear seats, tonneau and all, entirely away out of sight. It's a matter of seconds and requires no effort.

Now, in place of a tonneau, you have a graceful sloping deck of the smartest and most fashionable design. Underneath you will find liberal storage space, completely dust proof and lockable, for any amount of luggage, wraps and the many things such as two would carry "en tour."

Thanks to its pleasing individuality and refinement of design, it is a car that invariably commands favorable attention. It looks like a custom built car, *and it is.*

All Anderson Bodies are custom built in our own big body plant, where we have specialized in the production of fine coach work for 28 years.

As a result Anderson bodies possess a pleasing individuality aside even from the originality of their design. The bodies are more substantially built—more carefully constructed, less subject to rattles and metallic rumbles. The finish is more lustrous and lasting. It is hand applied and hand rubbed—a finish ordinarily used only on the most expensive custom built bodies.

As for performance, the Anderson SIX will do all the things any stock SIX will do. All of the mechanical units used are of nation-wide reputation—everywhere regarded by motor wise men as the finest.

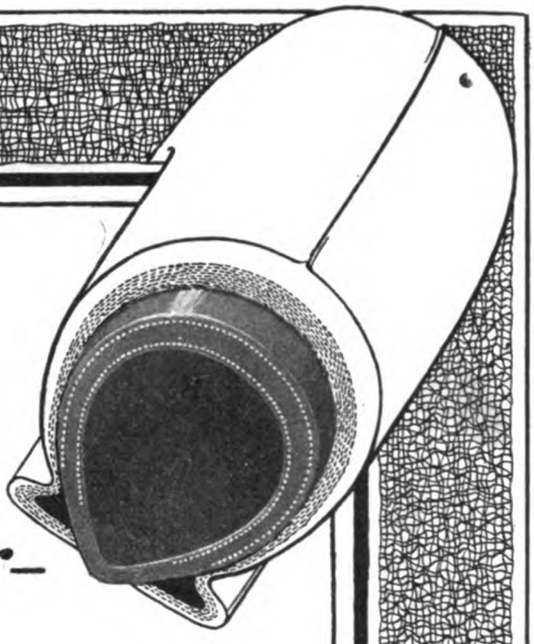
It has more speed than any amateur driver should use. It will average 16 miles to a gallon of gas. It will throttle down to two miles an hour on high. It will take hills more easily than most cars you see. These are the things any Anderson owner will tell you, or things you can prove for yourself.

Dealers: Here is a car with which to meet war-time conditions. It possesses just the extra margin of chassis value needed to outstrip competition and stands in a class by itself when utility is considered. Some territories still open. *Descriptive literature available and will be mailed on request*

ANDERSON MOTOR COMPANY, Rock Hill, South Carolina

Foreign Department—8-10 Bridge Street, New York

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Five Million Motorists Are Waiting For—

Sternwear

—the Practical Tube!

It is many times as thick and consequently many times as strong as the old style wafer-like tube you now are using.

Its fabric reinforcing prevents expansion, except under the protection of the rim, and absolutely *prevents blowouts.*

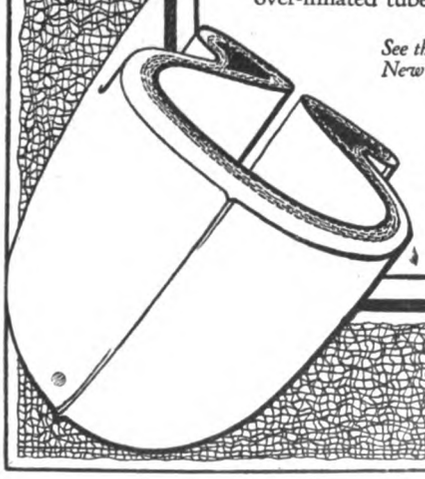
Its neutral, (non-expanding), self-closing rubber provides a defense against the cause of ninety per cent of *punctures* common to the old-style tube.

Its adequate and proper inflation with fifteen per cent less air pressure *provides cushion* not possible with the old style over-inflated tube.

Its non-expanding, blowout-proof, puncture-preventing construction holds the air, and *holds the cushion.*

Its exactness of size and predetermined fit to the casting cavity *prevents trouble from friction heat.*

Its sturdy construction holds it intact regardless of a weak or worn casing. You can take a plain or non-skid tire, wear it down to the fabric, or carcass, put a STERNWEAR tube in it and that worn casing will give you equally, or more than, as much road service as it was intended to give you when you bought it new.



See the Sternwear Reinforced Pneumatic Inner Tube Exhibit at the New York Automobile Show, Grand Central Palace, Spaces D4 and D5; Coliseum, Chicago, Space 17B.

STERNS TIRE & TUBE CO., *Inc.*,
Factory and General Offices:
SAINT LOUIS, MISSOURI

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"Bridgeport"

TRADE BRASS CO. MARK U.S.A. U.S.A.

PUMPS

FOR more than twenty years Bridgeport Pumps have been the leading tire pumps on the market. They lead because they are the best pumps that engineering skill and unlimited manufacturing facilities can produce. They are the only pumps manufactured complete under one roof, from the ingot to the finished product. Made by the largest manufacturer of hand pumps in America.

A selection from the Bridgeport line is assurance that you have a good pump—one that can be relied upon in any tire emergency—seamless drawn brass barrels—rust proof, non-leakable joints—an easy-working, built-for-service, dependable pump. No matter which Bridgeport model you select, you will find it a reliable pump, and the best value for the money you spent for it. Bridgeport Pumps have been supplied in the factory equipment of hundreds of thousands of cars.

Improved Aeolus



Bridgeport No. 16



Improved Aeolus—A powerful, double-action pump with two heavy, seamless drawn brass cylinders. As strictly high grade, efficient and durable a pump as can be made.

Bridgeport No. 16—A high grade, single-action pump. The heavy seamless drawn brass cylinder is 1½ x 17 in., providing the greatest volume of air per stroke of any single-action pump on the market.

Crown—A very serviceable single-action pump for small size tires. Heavy, seamless brass cylinder, 1¼ x 17½ in.

Crown





No. 4575—Combination Grease and Oil Gun—A powerful well made gun that handles all grades of oils and greases. Seamless drawn brass cylinder. Has removable screw tip for oil. Invaluable around the car and garage.

We also make many other types of pumps and grease guns. Write today for catalog.

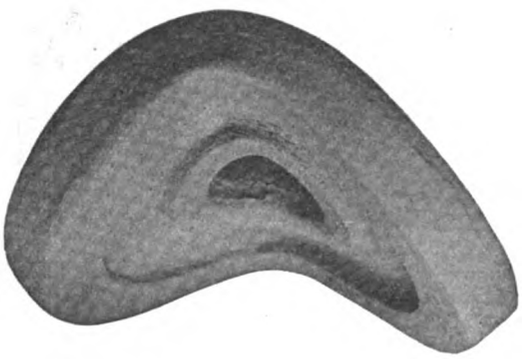
Sold by Leading Dealers and Jobbers

Bridgeport Brass Company
Bridgeport Connecticut

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VANADIUM GEARS







CENTRAL STEEL COMPANY'S CHROME-VANADIUM STEEL

BY sheer force of superior merit, Vanadium steel has won its way as the standard of quality for Gears.

Convinced by their own tests, one after another of the leading pleasure car and truck manufacturers have abandoned steels which they have been using for years and adopted Vanadium Steel Gears.

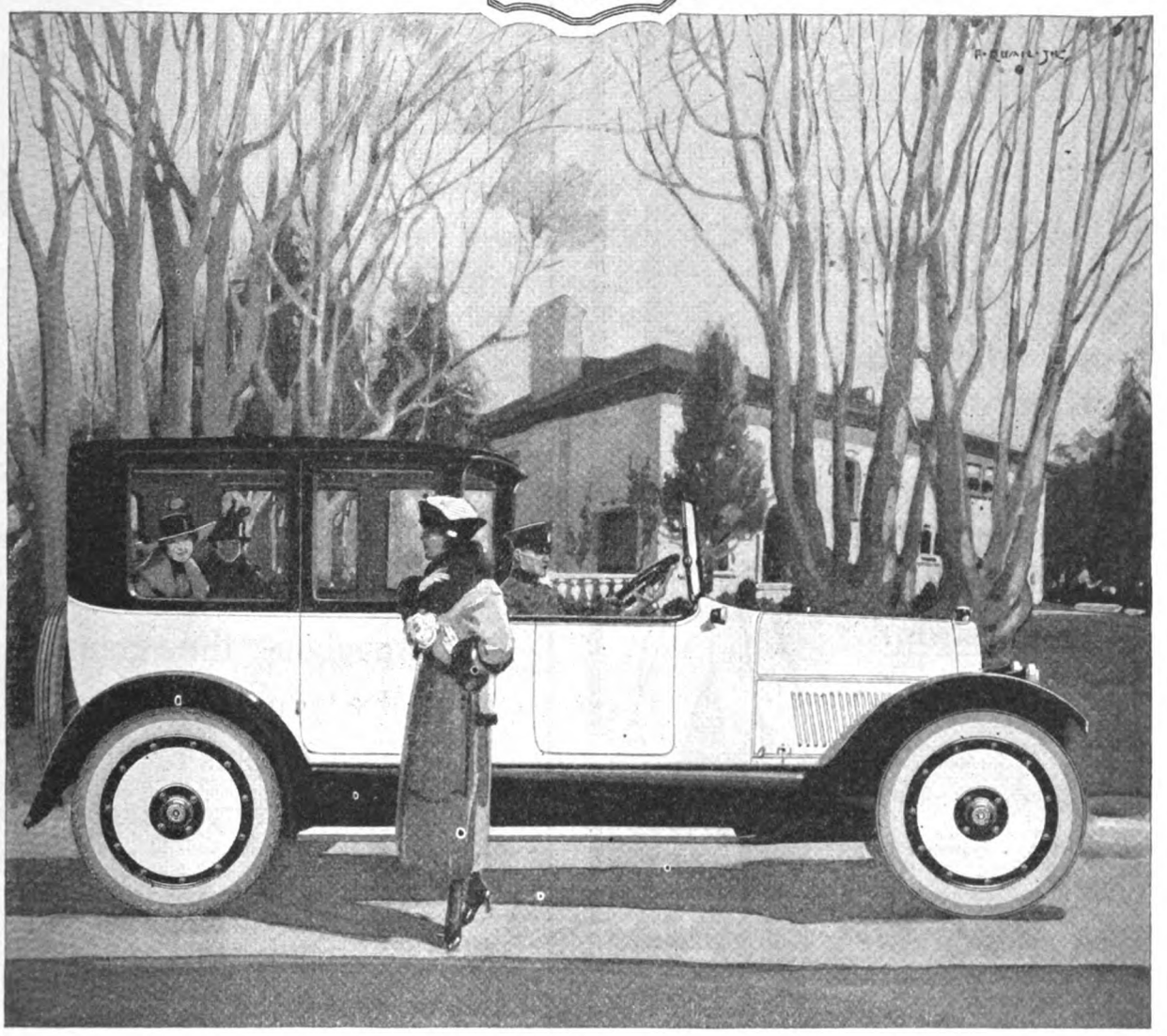
The unequaled combination of strength and toughness, of which the accompanying illustration gives graphic proof, coupled with exceptional machining qualities, have overcome every opposing argument, every doubt and have established the economy of Vanadium Steel Gears from the standpoints of both service and production.

AMERICAN VANADIUM COMPANY

NEW YORK LONDON
PITTSBURGH

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DISTEEL WHEELS



DISTEEL WHEELS

The favorable trend of public opinion is definitely established as to the vitally important factor of appearance of spokeless wheels. ~ ~ Disteel Wheels, in addition to distinctiveness, have many exclusive mechanical advantages over other types. Our proposition to dealers selling medium and high priced cars will be sent on request. ~ ~ ~ ~ ~

DETROIT PRESSED STEEL COMPANY
1800 Mt. Elliott Ave. Detroit, U.S.A.

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VENUS PENCILS

for every technical use VENUS' are standard!



MORE VENUS' are sold than any other drawing pencil because VENUS' are the best pencils it is possible to make. VENUS means perfection.

In the VENUS Drawing Competition, details of which were given in this publication last year, awards were made as follows:

William H. Lloyd, Freeland, Pa..	$50.00
R. F. Bergman, Logansport, Ind..	20.00
J. N. Lohman, Coatesville, Pa...	10.00
B. F. Johnson, Racine, Wis.....	5.00
J. E. Cooley, Hartford, Conn....	5.00
H. W. Ricks, Los Angeles, Cal..	5.00
Harry Ward Lyon, Schenectady, N. Y.	5.00

17 black degrees from 6B softest to 9H hardest and hard and medium copying. Look for the VENUS finish.



VENUS ERASER Superfine Quality — Rubs out Cleanly and Easily
Will not soil or streak. 12 SIZES, FROM 100 TO BOX, TO 4 TO BOX. BOX PRICE $2.00



FREE!

This trial box with five VENUS Drawing Pencils, and VENUS Eraser, sent free!

Please enclose 6c in stamps for packing and postage.

Write for it

American Lead Pencil Co.

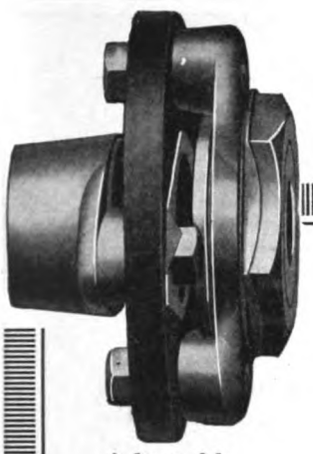
245 Fifth Avenue, New York
and Clapton, London, Eng.

THERE are hundreds of Machine Shops throughout the country that are fully equipped to handle surplus or special manufacturing work.

For further information see page 271 of this week's number.

CONTRACT WORK DEPARTMENT

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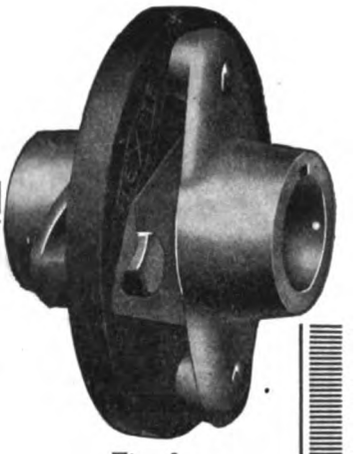
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SINCE JANUARY 1917

More Than Fifty Manufacturers of

Motors, Motor Trucks, Passenger Cars and Tractors

Have Adopted



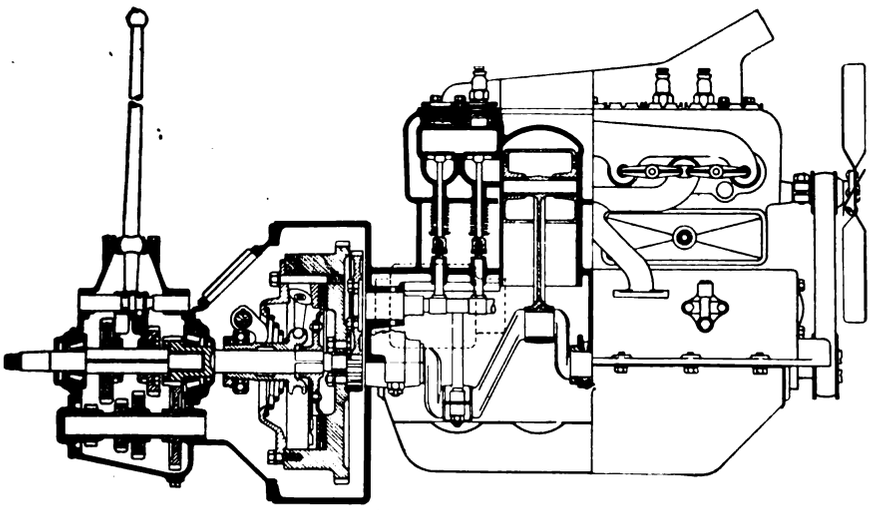
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STANDARD FLEXITE MAGNETO COUPLINGS

Because of Their Strength, Simplicity and Positive Adjustment

FLEXITE Magneto, Pump and Generator Couplings are made without small nuts, lock washers, Cotter pins or locking wires, yet every thread is positively locked. They **cannot** become loose or noisy. Write for our data sheet of standard sizes.

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Motordom's Latest —the A. B. R. Unit Power Plant

A new but highly efficient power plant that is bound to become one of the most popular in the motor truck industry. Read over a part of the startling specifications:

30 H. P. (4 cylinders cast en bloc)

3¾ bore x 4" stroke

3 speeds forward—1 reverse

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The complete A. B. R. Unit Power Plant includes spark plugs, wiring, generator and carburetor. Capacity production for 1918 20,000 units. Write today for complete specifications and literature.

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Stamford, Connecticut

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MARVELITE is produced from formulas of the Schlesinger Laboratories, largest producers in the world of pure radium. It should not be confused with the short-lived phosphorus preparations which require exposure to light.

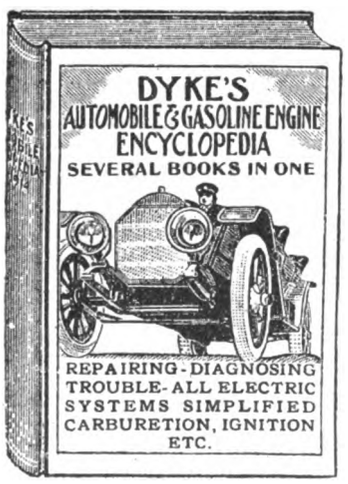
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We will either sell the material to the manufacturer or apply it to his dials. Sample dials and hands prepared and estimates furnished upon request without charge.

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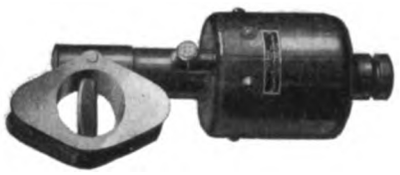
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Higher R. P. M.
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We have shipped 57,862 Counterbalanced Crankshafts to Dec. 28th, 1917

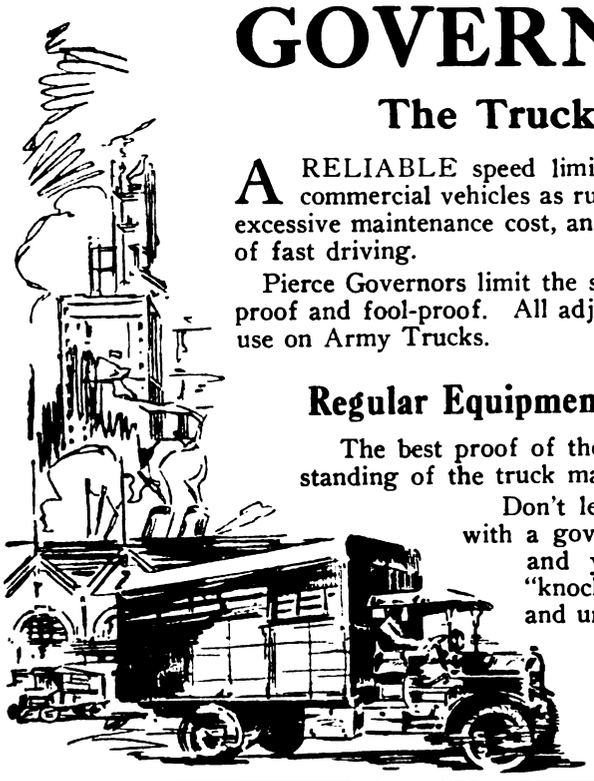
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Pierce Governors limit the speed without limiting the power of the vehicle. Trouble-proof and fool-proof. All adjustments sealed. Approved by the U. S. Government for use on Army Trucks.

Regular Equipment on Sixty-seven Different Makes of Trucks

The best proof of the efficiency of Pierce Governors is found in the number and standing of the truck manufacturers who use them.

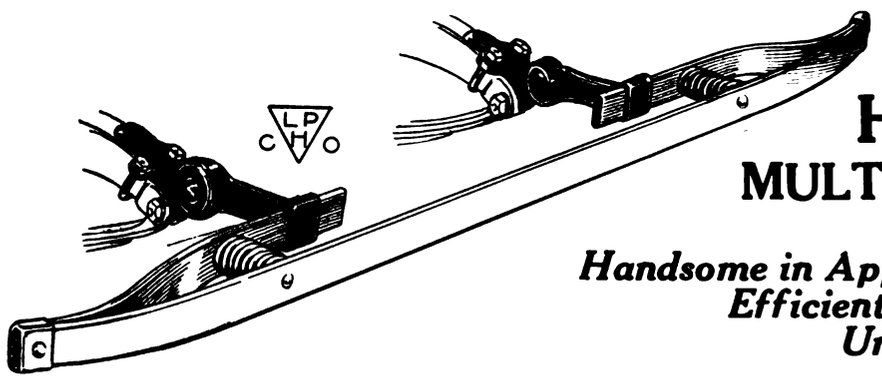
Don't let any manufacturer persuade you to sell trucks equipped with a governor that is "just as good." Demand Pierce Governors and your customers will be boosters for you, instead of "knockers," and will not be continually demanding unnecessary and unprofitable service on their trucks.

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Handsome in Appearance
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Supplied with special fittings as shown or with any fitting of the HALLADAY Line

The shock resisting qualities are derived from a combination of three steel spring bars and two heavy spiral spring buffers. The spring ends are joined by a hinge connection which eliminates breakage at this point.

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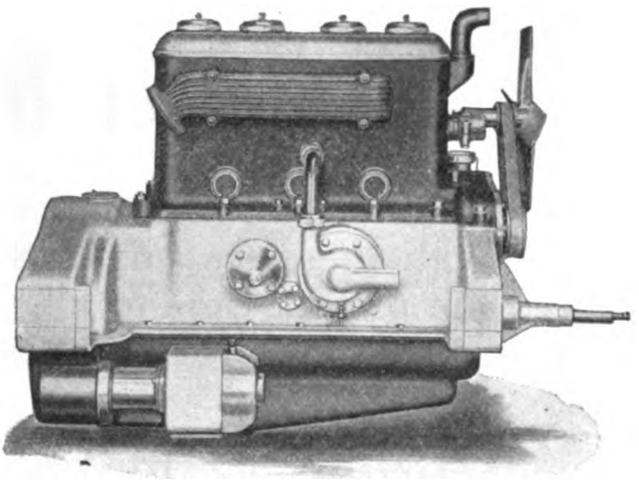
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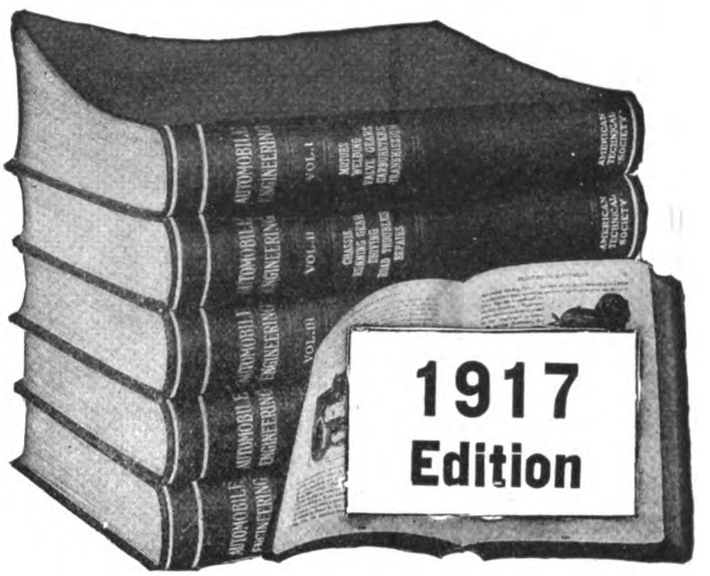
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The round tube in connection with fins is the strongest possible construction of core.

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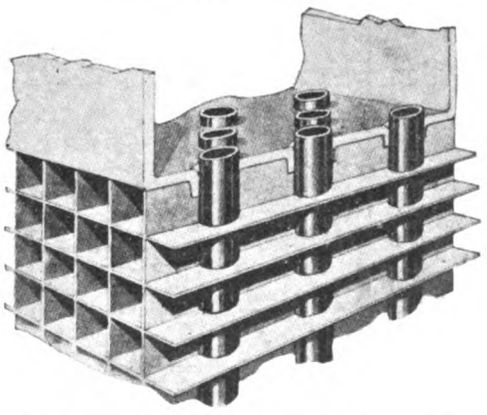
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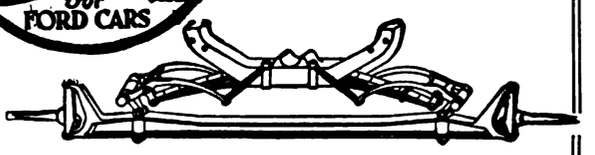
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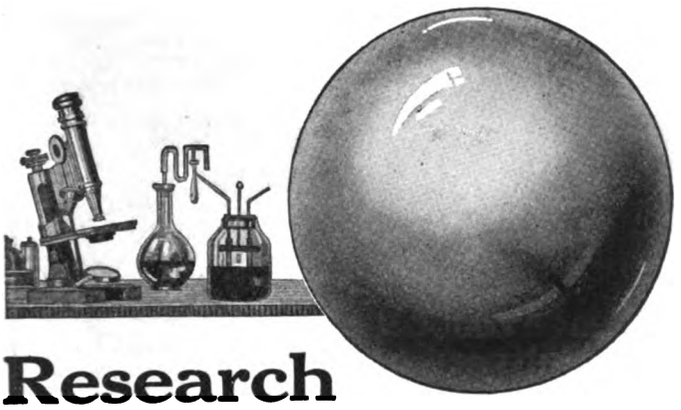
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With Automatic Shut-Off Attachment

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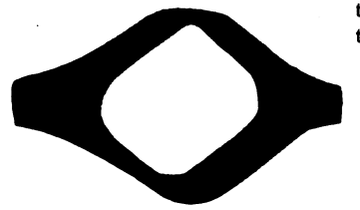
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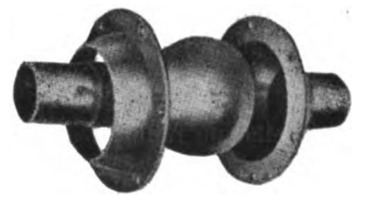
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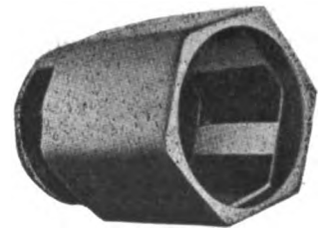
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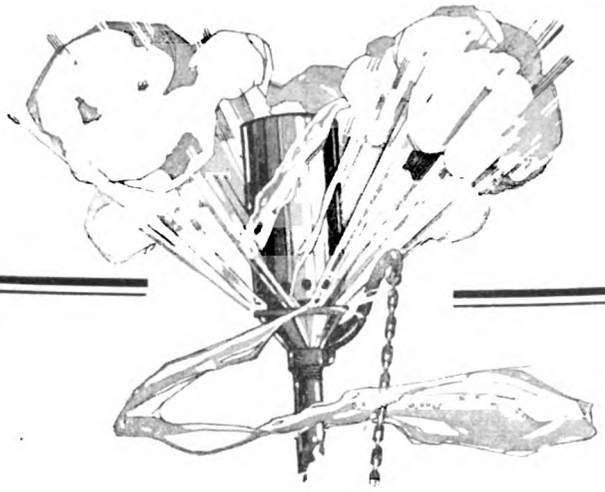
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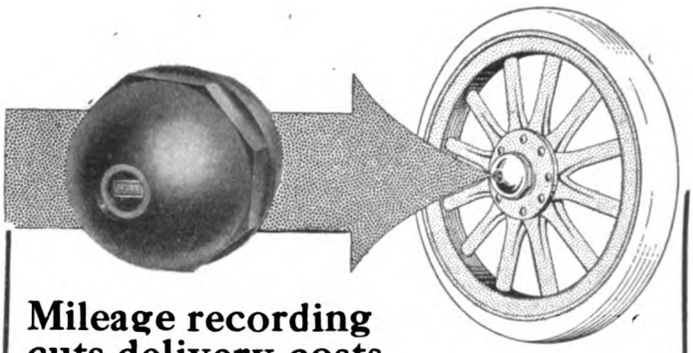
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Gasoline carried in an ordinary tank is a constant menace to your automobile—that is the reason that many prominent motor car manufacturers—both pleasure and commercial—make the

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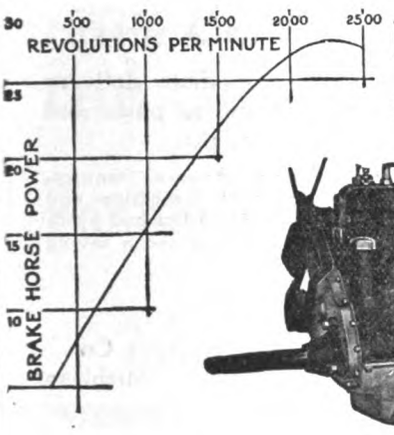
standard equipment on their product. Being made of the finest steel, seamless, tinned and tested, the "Jasco" Tank positively cannot spring a leak even under the most severe strain.

There is a size and style for ***your*** car.

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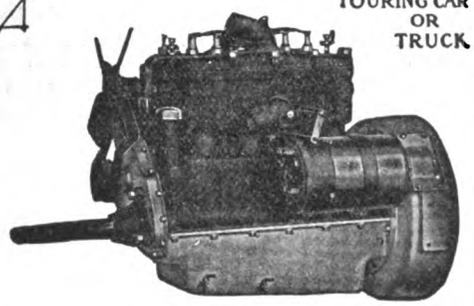
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LE ROI MOTOR

3⅛×4½ MODEL C

FOR THE LIGHT ROADSTER TOURING CAR OR TRUCK



Used by leading manufacturers of best-known American-made light trucks.

The business of manufacturing Le Roi Engines, formerly conducted by Milwaukee Machine Tool Co., is now carried on by

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Uniformity in Brake Lining

is just as essential as even flow of power from the motor. One starts and keeps the car going smoothly—the other controls and stops the car effectively but without vibration. Both are necessary in the well built automobile.

RUSCO BRAKE LINING

is uniform. It is woven on special looms built in our own shops. These looms represent the accumulated experience gained through three-quarters of a century in weaving—an experience that has taught us how to make Rusco so uniform that even when it is worn down to less than an eighth of an inch it still gives the same sure, even grip on every point of its breaking surface.

Several car manufacturers have used Rusco brake lining as standard equipment for a number of years. If you haven't, we would like the opportunity to furnish samples for test and also the services of our engineering experts on any special requirements.

Also makers of

Clutch Discs—Cone Clutch Facing

37 factories representing on equipment of 25,000 shuttles and 450,000 sq. ft. of floor space guarantee immediate deliveries.

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The handiwork of experts—specialists trained in their art—insures unwavering perfection. It is one reason why OBENBERGER service is unconditionally *guaranteed*.

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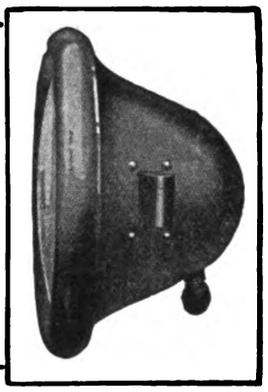
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SINGLE UNIT and TWO UNIT Equipments
Booklet on Special Ford Equipment
DYNETO ELECTRIC CO., Syracuse, N. Y.

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Quantity production and immediate delivery of castings for cylinders, gas engine parts and kindred work up to one ton in weight.
The most exacting physical and chemical requirements are complied with and constant inspection and tests of raw material, work in progress and finished product insure a minimum of defective castings and a saving of machine shop losses.
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Detroit Office: Suite 411, Union Trust Building.

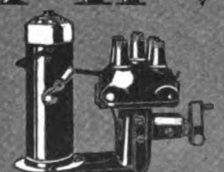


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BOSCH MAGNETO IGNITION
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Service Stations in Every State

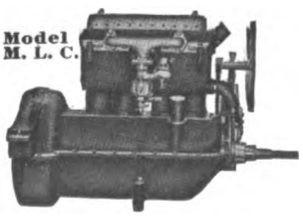
Models—FOURS
Model N.....3½x5
Model N.....3¾x5
Model C.....3¾x5¼
Model C.....4⅛x5¼
Model E.....4½x5½
Models—SIXES
Model 7W ...3¼x4½
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"America's Standard Motor"
Continental Motors Corporation
Offices: Detroit, Michigan
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Largest exclusive motor manufacturers in the world.
Continental Motors

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USING the BROWN Service as a factor of their plant.
Spring shackle bolts, valve lifts, bushings, wrist pins, harden and ground Truck and pleasure car parts.
Automatic machine pieces from ⅛" to 2". An organization backed by 10 years of successful manufacturing.
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SCIENTIFIC IGNITION
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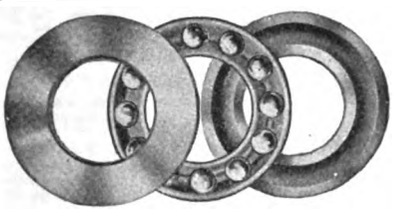
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LANCASTER, PA.



The Kant-Klog Primer

is rapidly being adopted as standard equipment by automobile builders because—

it is an innovation of efficiency and low cost—

it solves the problem of cold weather starting to the entire satisfaction of the user and can't clog with carbon because of its very construction.

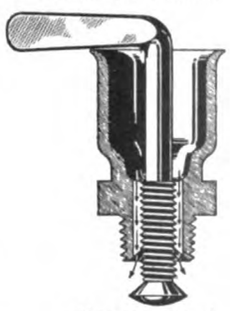
The simplicity of the Kant-Klog Primer is seen in the sectional view. No part of the valve is exposed. There is plenty of clearance for the free flow of gasoline direct without waste when priming. There is no chance of carbon getting past and collecting on the seat. There is no need of removal even after months of non-use.

The more Kant-Klog is used the better its seating action.

Quotations on variations of our standard design to suit different type motors—promptly furnished.

Kant-Klog prices are surprisingly low.

Write today for particulars and free sample.



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CASTOR MOTOR OIL

Is guaranteed to possess greater heat resistance, higher flash, greater viscosity and to give two to three times more mileage than any other oil.

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If you think it will, you will change your mind the first time your lights, spark and starter fail without warning, perhaps on a dangerous road or far from a garage.



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Model 354 Ammeter

is dependable. Built by the world's acknowledged leaders in the manufacture of electrical indicating instruments, each Weston Ammeter bears, and must help to maintain an enviable reputation for superiority in accuracy and durability.

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90,000 Springs. 588 Types.

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DETOUR to RIGHT

This sign can be seen perfectly with an E & J Spotlight No. 94, and the dangerous ditch that will upset you can also be avoided.

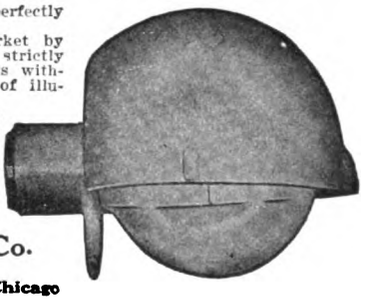
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See your source of supply or write the

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437 Lawton Ave., Detroit, Mich.

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80% More Light Below the Horizontal—No Glare—Perfect for Driving in Fog or Mist

A scientifically designed and perfectly constructed optical device.
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We guarantee that with the Ames Deflector a parabolic headlight reflector will project 80% more light below the level of headlight axis, and over 45% more than any known so-called non-glare headlight device on the market.



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Are Doubling Profits for Some Dealers
Write for Our Interesting Offer

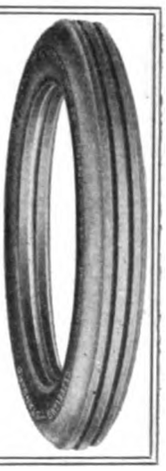
These tires are sold without a guarantee. Write and ask us how we do it. They are positively *not* seconds, but first-class fresh casings.

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30x3	$ 7.55	$1.90	32x4	$14.75	$3.05
30x3½	9.85	2.15	33x4	15.75	3.10
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are sold—years of successful usage *back* of them—the new, improved principle of construction give you *positive protection* against imperfections—breakage, and bother.
Best for the *dealer* because they deliver greatest worth in wear to *user*. Write for Trade Discounts and Big Catalog C-1917 listing 500 different styles.

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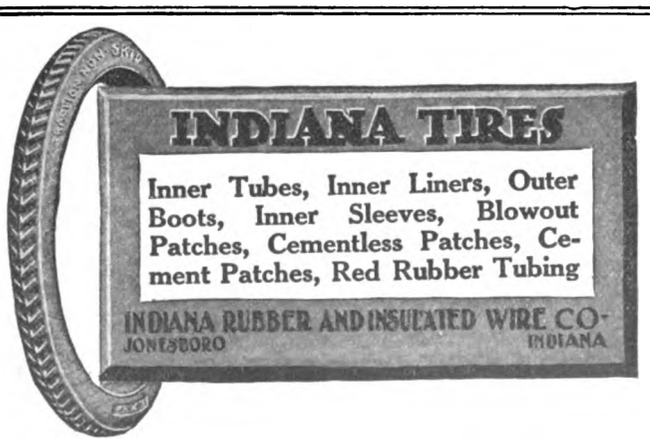
NO BOLT — NO HOLE — NO HUMP — NO JOLT

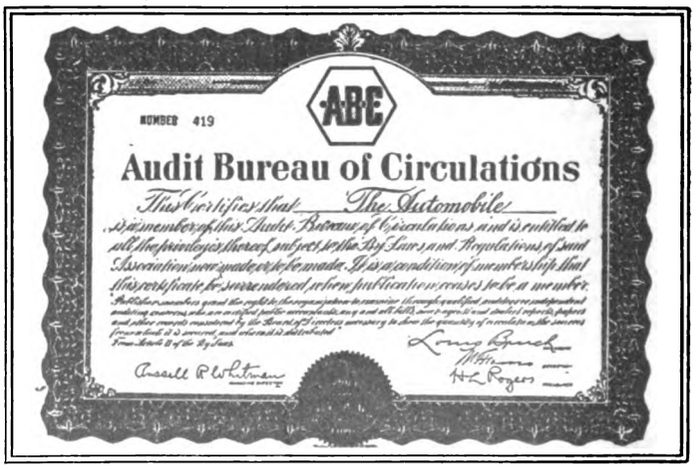
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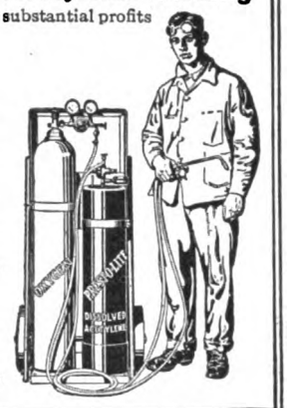


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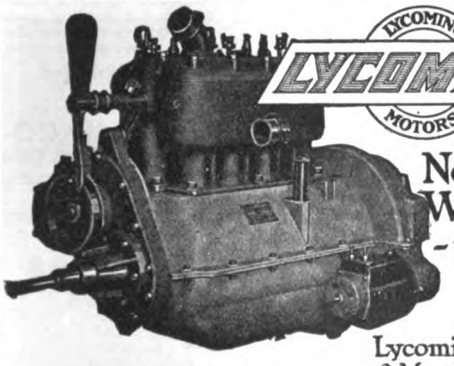
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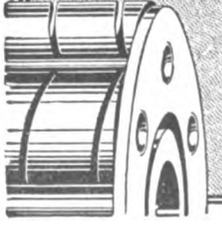
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For Sliding Gears That Grit Their Teeth—Use K-OO Special
NON-FLUID OIL

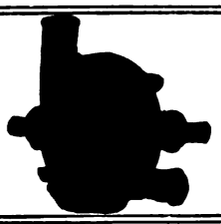
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We call your attention to our large and fully equipped

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First class work only

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SPECIAL MACHINES BUILT

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that can anticipate their 1918 requirements for special parts in quantity lots.

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Satisfaction in Workmanship, Deliveries and Prices.

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We Use JOHANSON GAUGES

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WE ARE BUILDERS *of*

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We gladly submit designs and specifications
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We're Serving Some of the Largest

No matter how *big* the order, we have the capacity to handle it. No matter how *small* the order, we'll give it the same expert attention.

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BRASS FOUNDRY DEPARTMENT
of F. F. Smith M. W. Hardware Co.
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TAKE IT TO YORK

CUT DOWN THOSE FREIGHT COSTS!

STOP DELAYS

Let York do *all* Your Contract Work

Think of the freight rates and *delays* you will save by having your contract work done—*in its entirety*—in York, Pa. Everything is here, from raw materials to finished product.

And furthermore, excellent labor conditions and low overhead give York firms a *decided edge* on scattered and isolated concerns in the matter of high grade workmanship and moderate quotations.

Here are a few of them. You will find their announcements on other pages. Let them quote on your specifications.

These firms can handle it

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They're All in York, Penna.

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PATTERNS

PATTERNS

Wood and Metal

WHERE AT?

WHY AT

The Standard Pattern Works

North George St. and Hamilton Ave., YORK, PA.

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We have been awarded a five years' contract of Army and Navy gun-sight pattern work.
Why not let us quote you on your pattern requirements?
Our patternmakers are bright—they will make your patterns right;
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Our patterns are a high-grade product and are guaranteed to bring results.
Our large capacity enables us to make good deliveries.
No order too small for our best attention. No order too large for our capacity.

Best wishes for a Prosperous 1918.

PATTERNS

PATTERNS

PATTERNS

Wood and Metal

PATTERNS

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We want to show *you* how completely we stand behind our guarantee of skilled workmanship. Give us an opportunity to figure on your needs for 1918.

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to our friends in the automobile business.

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Large Government orders have necessitated a considerable increase in our manufacturing capacity, so our foundry has been enlarged.

This places us in a better position than ever to take care of your casting needs. You'll have the same high-grade product—and **early deliveries.** Let us figure on your specifications.

Send us your blueprints

THE COCHRANE BRASS FOUNDRY

YORK, PENNA.

Make Our Factory Your Own

Enlarge your output and increase your profits by using our plant, our equipment, our organization.

Gray Iron Castings—Machine Shops—Steel Bar Forming and Assembling—Metal Stampings—Electric Spot Welding up to ½ inch thickness—Woodwork.

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Also for as much longer as needed.

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This Is Our Equipment

Note it carefully. You can determine whether it suits your needs.

LATHES—10", 11", 14", 16", 18", 21", 22". Nine in all—Lodge & Shipley mostly.
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Bolt and Threading Machine work up to 2½ inch capacity

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Let us submit quotations on your 1918 requirements

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Send us your blue prints for low quotations and quick deliveries. We specialize on experimental work of every description.
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Metal Stampings and Sheet Metal Work of all kinds. Complete Plating, Buffing and Finishing Department.
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We have a completely equipped plant for manufacturing parts of all kinds. Mail blue prints for quotations.
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We have three foundries and are able to turn out castings in large quantities.
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We have large PATTERN shop in connection.
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Prompt Delivery and Accuracy Our Guarantee

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from ½" to 2½" diameter. Our screw machine products are handled on new Gridley automatics.

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Milled from high grade quality steel bars—therefore they must be of superior quality.
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For a good factory in any line of machine shop production.

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Accuracy and prompt delivery.

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A large factory with facilities for contract work on complete articles —either Struck or Press Work.
Also equipped to serve your every requirement in nickel plating, bronzing, japanning, etc.
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Promptness and accuracy guaranteed

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Gauges, Jigs and Fixtures

All Work Gauged by Johansson Gauging System

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STAMPINGS OF ALL KINDS

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PROMPT DELIVERIES.

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33 x 4	15.55	3.35	7.50	1.70	7.80
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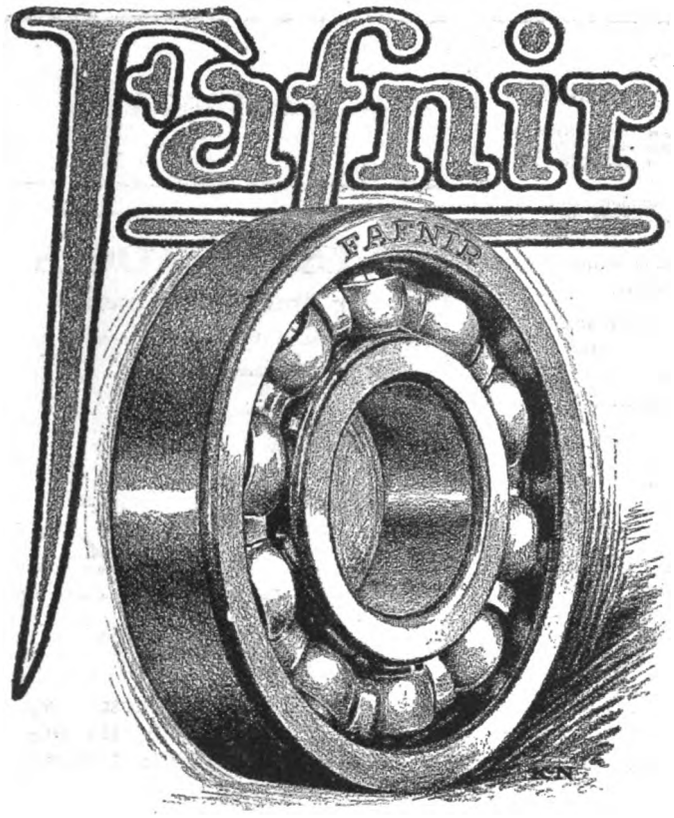
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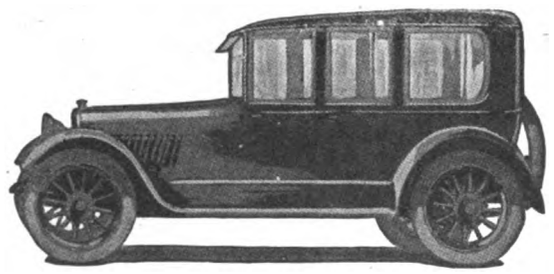
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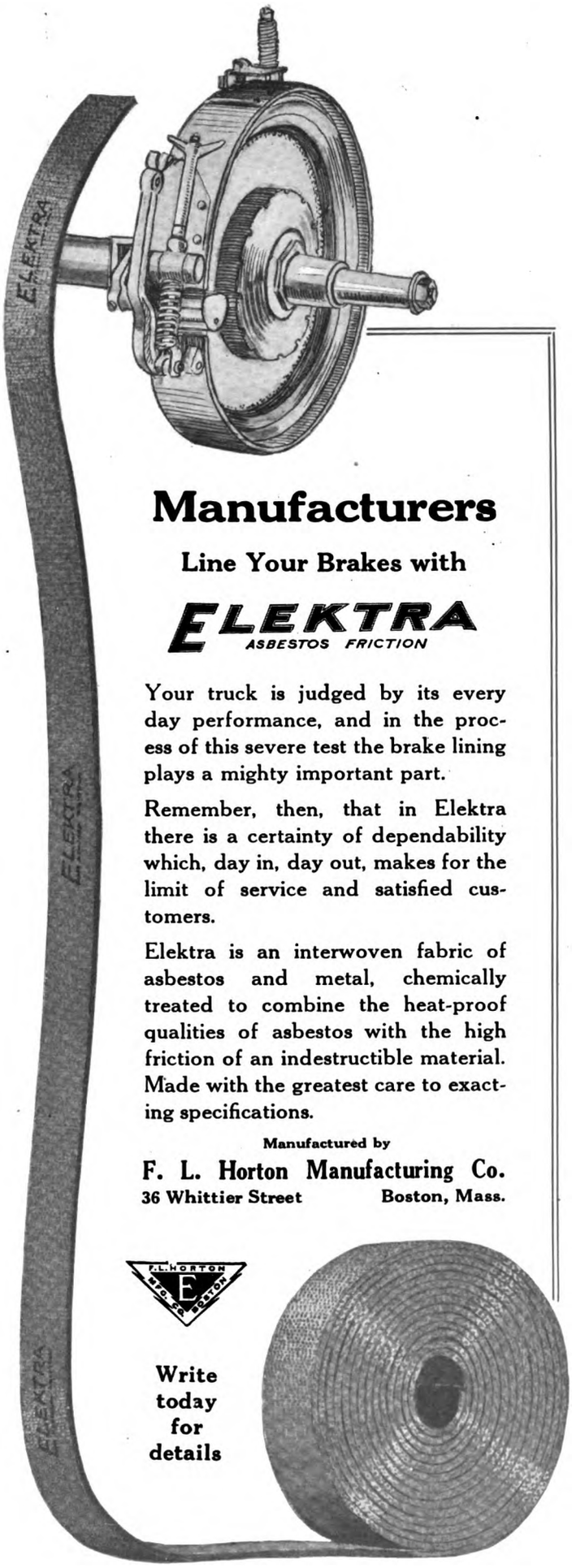
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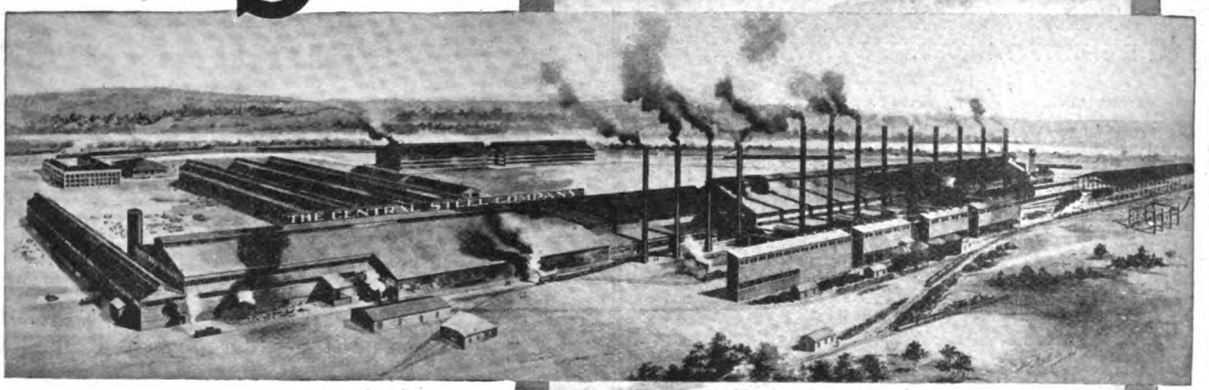
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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Vol. XXXVIII
No. 2

NEW YORK, JANUARY 10, 1918

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Three dollars a year



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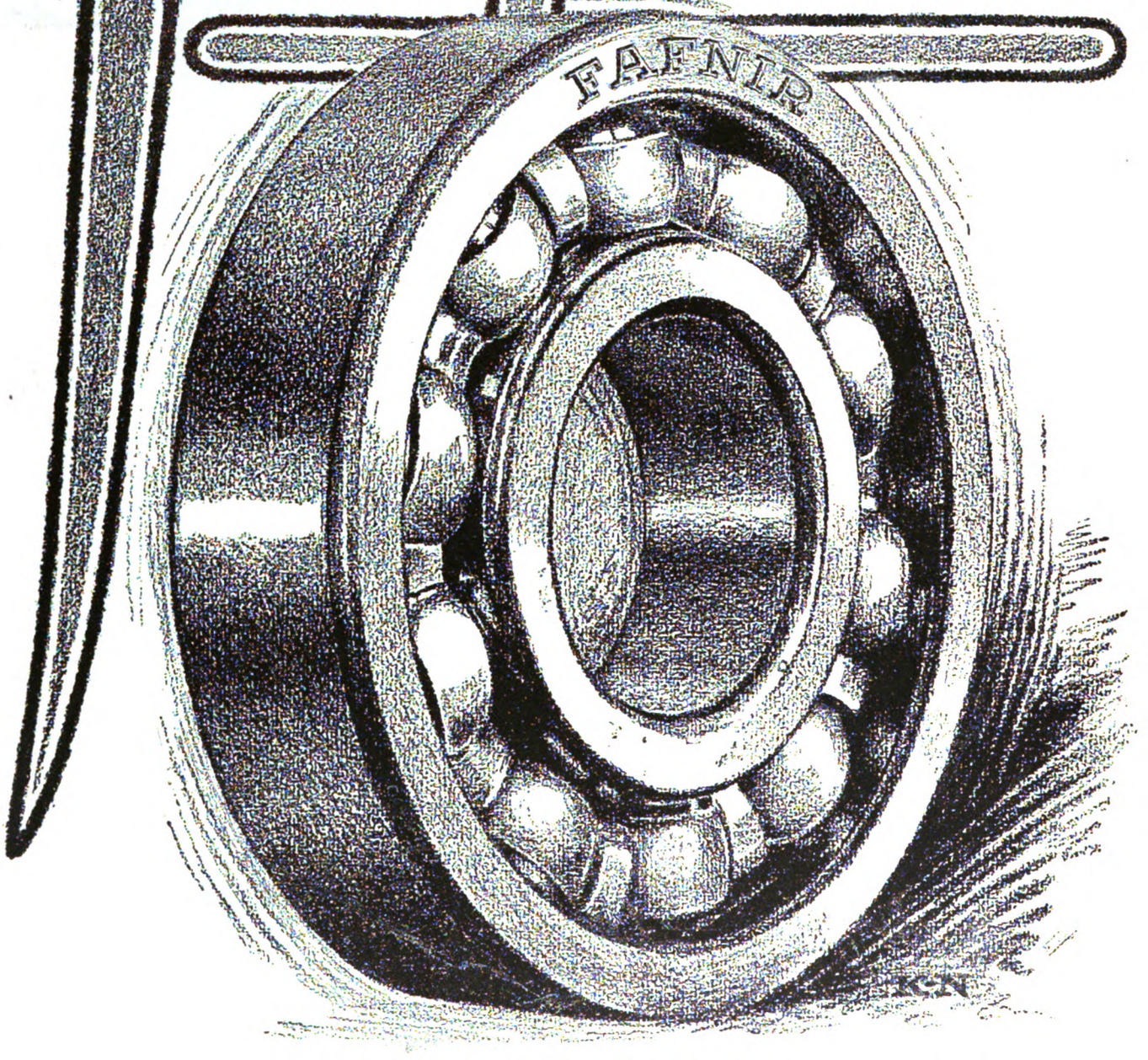
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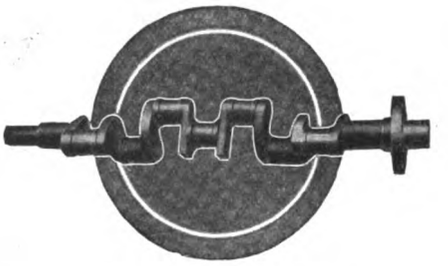
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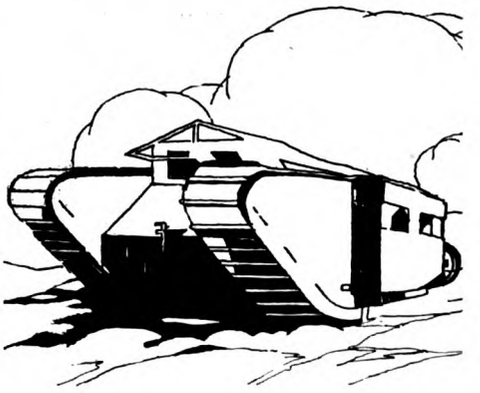
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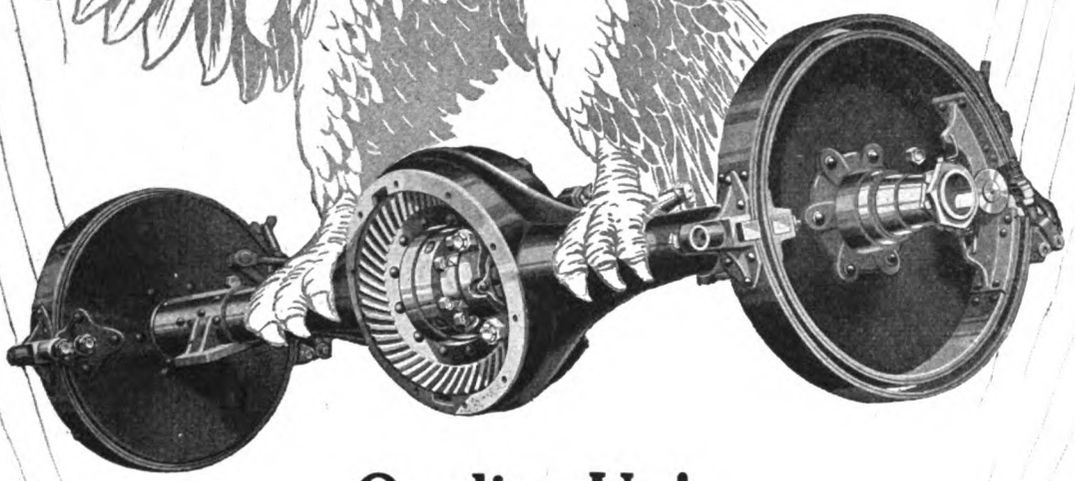
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What are you getting?

Let us show you what you *could* get.

The Columbia Axle Company

Cleveland, Ohio

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XXXVIII NEW YORK—THURSDAY, JANUARY 10, 1918—CHICAGO No. 2

First War Show Justified by Success

High Character of Attendance and Growing Business Gratify Manufacturers—Dealers Studying Conditions—Southeast Strongly Represented

GRAND CENTRAL PALACE, New York, Jan. 8—The first war show of the automobile industry, now three days old and with four days more to run, has already demonstrated that in spite of the war the public is still deeply interested in automobiles and the show gives promise of demonstrating that war shows should be continued. The attendance has not been up to that of former years, but the weather previous to the opening was the coldest in 60 years, which, coupled with the shortage of coal, froze up New Yorkers as they have not been frozen up before in the present generation; and it is only to-day that the crowds that have filled the aisles and exhibit spaces have been on hand as in former years, though not in such great numbers.

What the attendance to-day has lacked in numbers has been made up in character, and the catalog collector and the usual paper following are not present and are not missed, because the dealers have enjoyed a better opportunity of looking over the cars and chassis to-day than they have for several years past. The aisles are not crowded in the forenoons; they are snugly filled in the afternoons and in the evenings. The jam is not like in years past, but the space is comfortably filled. No figures have been given out on attendance, but it is expected that with a continuance of good weather the crowds will not fall far behind those of former years.

The wartime crowds, if the attendance to-day may be so designated, are a little different from those of last year. There are fewer of the young men between 20 and 30 years of age that have been seen at these shows for years, and as the young men are not present there is a proportionate absence in the attendance of young women falling within the same age limits. To-day the persons visiting the show are older—more of those that carry their overcoats slung over their arm instead of checking them downstairs. There is not so much dress as a year ago. The crowd does not resemble a New York crowd in the sense of last year or previous years. It looks more like an out-of-town crowd, and it is. The crowd has a big percentage of dealers from the Southeast, the cotton states which are booming with cotton selling at 30 cents, the highest price since the Civil War. In the Southeast every farmer is in the market for a car, and the de-

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mand for automobiles listing under $1,500 is greater in this section than ever before. The dealers from the Southeast are here in force. Many of them are placing more orders than they can possibly have filled for months.

The dealers, although a little later in arriving than in former years, are coming in in good numbers from other sections, such as New England and even the Middle West. New York State has large numbers, so has New Jersey, Connecticut and other states in the proximity of New York. Chicago has not so large a representation as in former years, but the most substantial ones are here and are going to remain all week.

Show the Opening Wedge of Year

The New York show is looked upon by most of the makers present as a kind of ice-breaking proposition, and as the opening wedge of the 1918 show circuit it is not seriously considered as a dealer show and is not ranked high as a retail show to the 10 per cent of the nation's population that might be said to reside in Greater New York and its environs. New York has been a strong retail show, and it will not do to become pessimistic if it is not this year. Locally New York is frost-tied worse this year than in any other year since the automobile inception in 1895. November and December are generally slow months in New York, and if they are as slow this year as last the trouble cannot be laid to the war, but to weather and general conditions. This year weather conditions have been unduly severe.

As a dealer show New York never has compared with Chicago, and the exhibitors are not expecting to get very close to the dealers, as they never come here in the numbers they come to Chicago, or perhaps Minneapolis or Kansas City or Boston.

The atmosphere within Grand Central Palace is not a subdued war atmosphere; more color meets the eye than at any previous show. This color is not splashed on a few intensified color studies of special show cars trimmed with white bridal ribbons and "keep off" signs, but is sprinkled through every exhibit, as substantial colors, such as grays, greens, blues, browns, carmines, buffs, yellows and reds. They are colors you can use on the street or road without being ashamed of them. They are inspirational colors, and it is indeed fortunate that sombre black has not been too liberally patronized. There are several exhibits of four or five cars in which there is not a single black model. In this list might be mentioned Franklin, Pierce, Velie and several others where only one or two cars are displayed.

Dominant Note of Newness

Besides a healthy variety of color, which is good merchandising in war times, and which is much more stimulating than black even if the colors are not perhaps so serviceable, there is a dominant note of newness in the show. It is not a "tale-that-is-told" type of show, but a show of new designs, some new cars and a few new names. The very general development of the straight-line, beveled-edge body has lent an atmosphere that is magnetic in that the new styles engender an interest that might be lacking if the body lines too closely resembled those of a year ago. Even if the chassis is that of last year, the body is like your new Easter hat. Its sharp corners catch the eye of the visitor who stops and is given an explanation by the salesman, thereby affording the desired audience which may eventually lead to a contract or a sale. It is good merchandising and the show would have needlessly suffered if this atmosphere of newness were missing.

Another aspect of newness is the sport four-passenger model. It is taking well in that it is attractive to the eye, looks considerably lighter than the five-passenger or seven-passenger touring model, and may be described as a war model. There are magnetics in just enough carrying capacity, in reduced weight, and in greater mileage per gallon of fuel this year.

A few makers have added a further touch by the disc wheel, which is with us for the first time. It carries very much of a war visage with its resemblance to the trusty warrior shield of the fifteenth century. There are enough new models such as the small Willys four, the new Studebakers, the Olympian, the Moore, and other changed models to keep up the interest and carry conviction to the visitor that the story of automobile development has not yet all been told and that many succeeding years will be needed before the final chapters of change will be written.

Smaller Advertising Campaign

The advertising campaign through the New York dailies has so far fallen 50 per cent behind that of a year ago. The amount of space is smaller. There are few full-page ads, very few half pages and none of the double pages of past seasons. A more careful expenditure of advertising appropriations is very conspicuous. A commendable feature in some of the advertisements is that they are more of a national nature, intended to carry conviction as to the essential aspect of the industry. John Willys has been a leader in this national sentiment. One advertisement reads: "What railroads are to the nation motor cars are to the individual." Another refers to the automobile as being the shortest distance between two points in the transportation field. These and similar brief messages should have a desirable influence at this time. In general the advertising copy carries quite a different message from that of a year ago.

As an accessory show the present exhibit is the biggest ever, if the expression may be justified. There are more exhibitors, but of a slightly different character. Each sees changes. The representation of pneumatic tire makers is very small. The gasoline storage tank maker that used to have space is not present this year at all. There is a dropping off of makers of parts such as ignition specialties, engines, axles, bearings, etc. There are a great many accessory concerns with small wares.

Unfortunately too few of these accessory makers take the arranging of their spaces as seriously as they should, and as a result the stands are not good places to do business. One maker has arranged his exhibit space into a sample room to display his com-

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plete line for jobbers attending the show. Instead of all being piled on a counter along the front of the booth, there are inside aisles on either side of which are sloping tables well stocked with samples of the entire line. This allows the jobber to move into the exhibit, entirely out of the aisle and look over the line and talk prices with that necessary seclusion. More accessory men should follow this example and thus make the show more of a real business center, because each successive year finds the potency of the show more centered in its business value than in its value as a place to satisfy the curiosity of a catalog collecting attendance.

Dealer Wields Big Influence

The dealers are analyzing in a much broader way. They carefully scan the product itself and before going into the matter of taking up representation they are acquainting themselves with the factory resources of men, money and materials. In other words, the strong dealer has become a power and is one of the dominating influences in the business to-day. This is so true that it is often found that it is the big distributor that is shaping the policy of the concern which he represents.

Big distributors seeking to change their lines are in a stronger position this year than ever. They are using, for this very reason, the greatest of care in making connections and it is also because of this that the greatest care is being taken with business transactions at the show.

The lack of a great variety in the real low-price class is commented upon quite commonly by distributors. Cars in the $750 class which would be particularly adaptable to the Southern trade are not to be found on every hand as they were 2 years or even a year ago. These cars have not graduated to the $1,000 class, and consequently the amount of money that the dealer has to put up to secure what is now considered a low-priced line has considerably increased.

Visitors Interested in Motor Development

People who attended the show were experts in motor car development, generally speaking. The exhibitors who employed trained talkers at their booths did not fail to draw an exceptionally large crowd. These people asked a great many questions and these tended to show that development has been followed by the public with marked closeness.

Following a growing tendency of the New York Show, the bigger factory executives were not on the floor. They could be found at the Biltmore, Astor, Belmont, Woodstock, or any of the other large hotels surrounding the Palace. Here suites are retained and used as consultation rooms away from the confusion attendant upon the show itself. The Palace is the showroom and the hotels are the business offices.

Practically all the manufacturers represented at the show are keeping demonstrating cars outside. The new dealer who is looking into a product is demanding a demonstration as well as the retail prospect. In the past years some of the manufacturers have not kept the demonstrator car in mind as well as they should and it has resulted in the loss of interest on many occasions. At the present show the space outside the building of the Palace is quite well filled with the demonstrators of the exhibitors.

There are several South American dealers present and others are expected to be at the show during the week. Reports of the closing of agencies in Brazil have been made by one of the concerns and this same organization has been approached with reference to Japan. One of the factors which has affected this phase of the situation is the scarcity of bottoms, and foreign business is of course subject to the shipping consideration to such an extent that it is not receiving the prominence as regards certain countries that it would normally.

Realizing the demands of the public for cars which have economy as one of the strongest features, dealers themselves are subjecting the chassis exhibited to scrutiny along the same lines. The developments of the year along this line have been largely due to the requests of dealers for the best possible showing on any economy basis and this is being followed up directly by inquiries at the exhibition. As pointed out on other pages of this issue, in the new cars the overhead valve engine predominates to a marked extent and the reason for this given by the manufacturers who have brought out these cars is that with them it is possible to secure the greatest possible returns from a minimum size engine.

A Feeling of Earnestness

The playtime attendant of the show is missing. There are fewer banquets of a formal nature. The N. A. C. C. banquet is only one of a great number of the show-time functions that have been abandoned this year. There is a feeling of earnestness in the air. The new manufacturers are depending on the business done by them through the show circuit to put their propositions on the map. In fact, with some of the newest of the concerns it is a matter of securing dealers on the show circuit or stop their enterprise. The drop in sales in specific territories must be made up by a wider distribution of the product and there is a tendency of expansion among concerns formerly satisfied with a local trade.

Stimulation of sales by offering the buying public something new is always a part of show business and the show of 1918 is no different in this respect. On this occasion we find that the straight-line and the beveled-edge body are offered as a stamp upon the product that it is of 1918 vintage and different from what could be bought a year ago. The four-passenger car of what is known as the sporting type, the addition to the number of stock colors, the addition of improved types of convertible and closed bodies are all parts of the new features of the show. There is a marked appreciation for all of these features in the crowd which has attended during the earlier days of the exhibition.

The New Yorker is always looking for something which is different. Extraordinary features are what hold his interest; however, the car with the magnetic clutch or gearshift, the two steam cars, a front-driven vehicle, will always be surrounded by the crowd who come out of curiosity or to satisfy a craving for the mechanical.

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New York's Eighteenth Annual Automobile Show



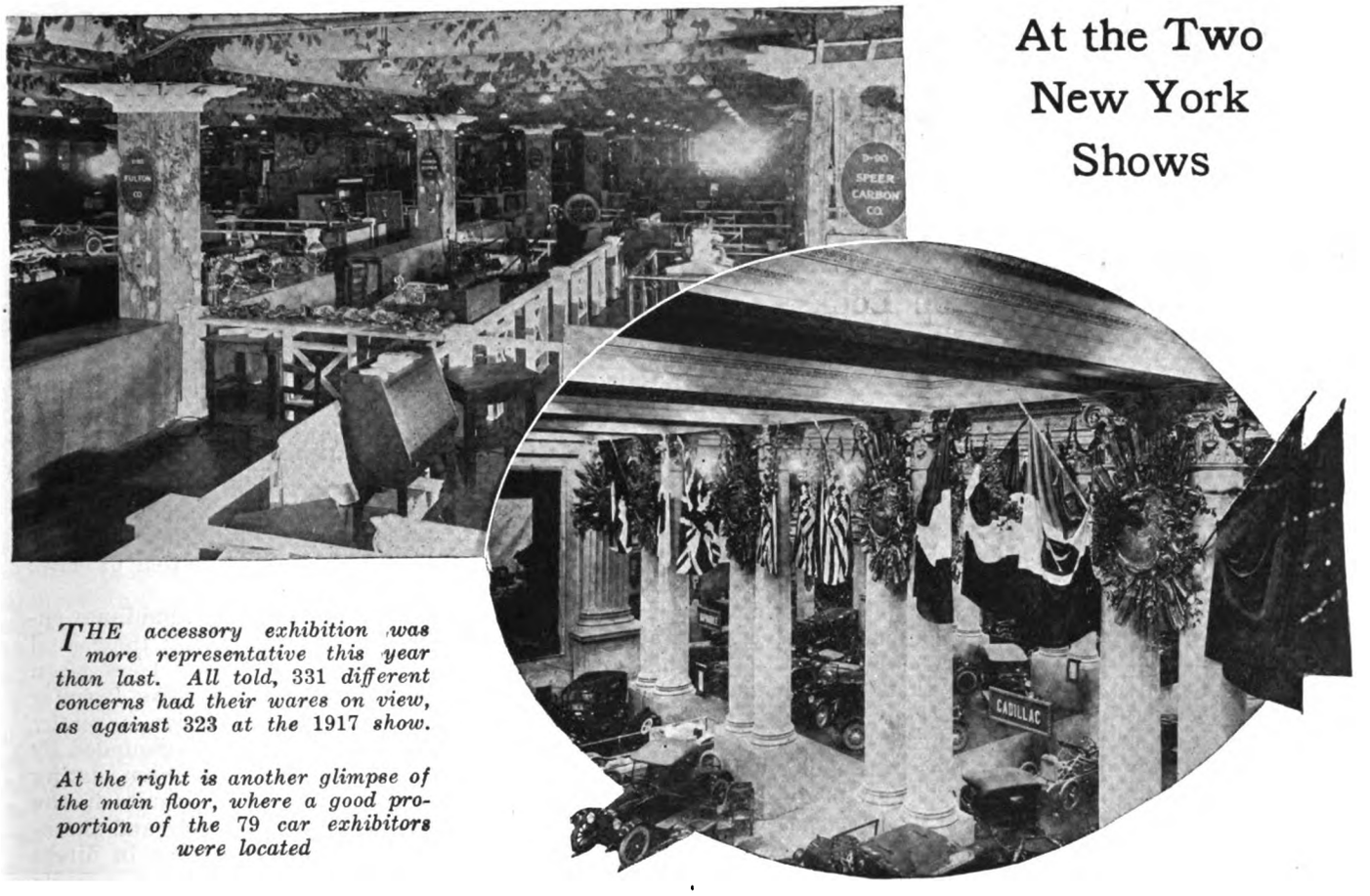
How the Show Compares With Last Year's Exhibition

	1917	1918
Total Number of Exhibitors	323	331
Number of Car Exhibitors	95	79
Number of Accessory Exhibitors	227	252
Cars and Chassis Exhibited	340	297
Number of Chassis Exhibited	54	34

No show has been more representative of the solidity of the industry

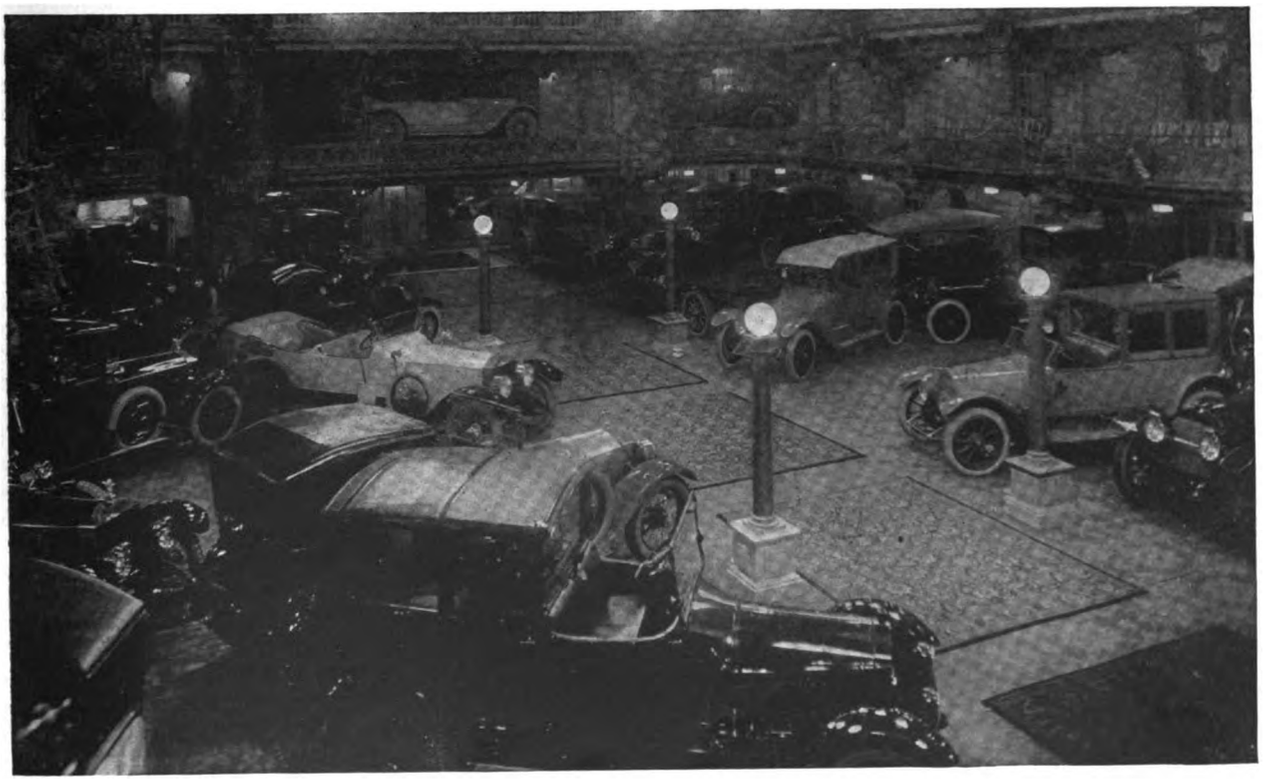
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At the Two New York Shows



THE accessory exhibition was more representative this year than last. All told, 331 different concerns had their wares on view, as against 323 at the 1917 show.

At the right is another glimpse of the main floor, where a good proportion of the 79 car exhibitors were located



The Astor Salon has always been an exposition of the last word in high-class, custom-built coach work. This year the exhibition was no exception to the rule

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Mechanical Tendencies Revealed By the Show

Interesting Developments in Piston Design—Combined Accessories Drives—Front Exhaust Pipe Take-Downs—Neater Wiring Schemes—Transmission Locks—Overland Small Car Features

By P. M. Heldt

IT is not a difficult matter in going through the show at Grand Central Palace to get up a long list of mechanical changes made in individual cars, but there are few new tendencies in mechanical design discernible. The changes made from last year's models depend in a large number of instances upon individualities in design, and there are not many cases in which the same or similar changes have been made by several firms.

If there is any particular motive that has guided a majority of designers it is that of economy. For example, in the inclosed-car class the inside-drive type of body has greatly increased in number, the underlying idea being that many car owners who heretofore have employed chauffeurs will henceforth drive themselves, and the inclosed-drive type of body naturally makes a special appeal.

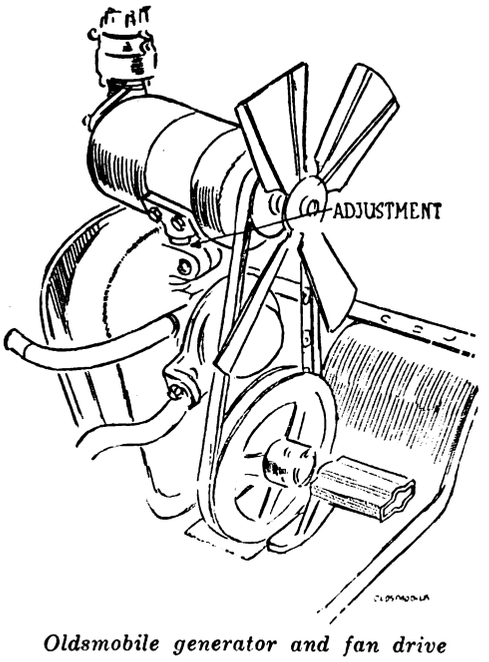
Economy the Keynote

The same object may be discerned in the substitution of oil cups for grease cups on spring shackles and other parts. Filling grease cups is a messy, tedious job, and if the owner has to attend to lubrication himself it is apt to be neglected. With oil cups in these places, of such design that they can be readily opened and closed, much of the drudgery of lubrication is eliminated.

In this connection it is not only the owner caring for his car in his own garage who has to be considered. Owing to the fact that an enormous number of young men have been withdrawn from the industries most garages in the future will have to get along with a reduced force, and the cars stored will only receive such attention as this reduced, and in most cases less experienced, force can give them.

In engine design there is a continued tendency toward separate cylinder heads, one of the latest converts being Cadillac. With such heads the decarbonization of the engine by scraping, which most garage men seem to consider the best all-around method, is greatly facilitated. Probably another factor that favors this construction is that it does away with valve plugs and the placing of spark plugs in them, which is a frequent cause of preignition. With the increasing engine speed and the decreasing cylinder sizes, there is a tendency to use as high compression as possible. The heavier fuels which must now be used having a somewhat lower temperature of ignition, every effort must be made to eliminate hot spots in the combustion chamber wall, and the elimination of valve plugs tends in this direction.

Those firms which have been building aluminum engines during the past year are continuing them, and this type of engine will probably see quite a boom when aluminum prices drop to normal again. The Premier has made an important change in its design, whereby the cast-iron cylinder liner is no longer surrounded by an aluminum shell, but is fitted to the aluminum casting with packings at top and bottom. This results in the cast-iron liner—which is machined all over and therefore of absolutely uniform thickness—being in direct contact with the cooling water on its outside. While with the old style of construction a clearance of 0.009 in. was necessary on the piston skirt, it has now been found possible to reduce this to 0.004 in. The advantage of this is twofold. In the first place it is well known that with aluminum pistons there is a tendency to piston slap when the engine is cold, this being due to the very considerable clearance which must ordinarily be allowed with these pistons. If the clearance can be cut down by more than one half, the cause of piston slap is largely, if not wholly, eliminated.

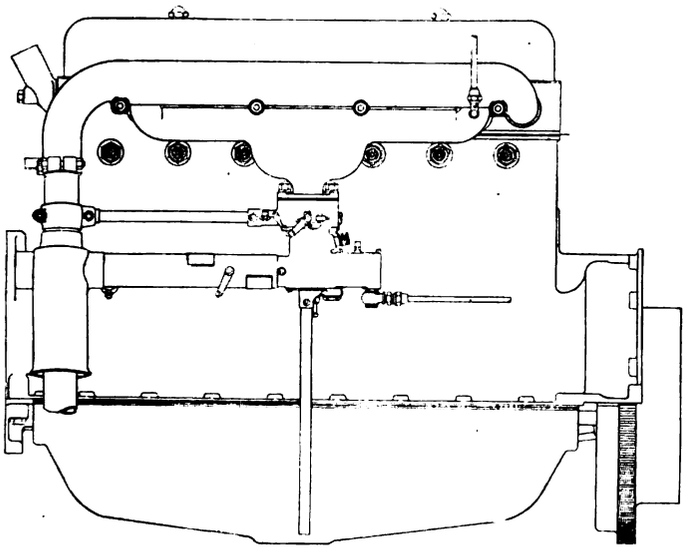


Oldsmobile generator and fan drive

Every user of aluminum pistons has had to content himself with the piston slap difficulty, and a variety of solutions have been arrived at. Probably every reader is familiar with the Packard plan of slightly offsetting the piston pin from the piston axis. Franklin slots its piston skirts lengthwise from the open end to the wrist-pin zone. This permits of a very slight clearance on the skirt, as the slots give the metal in the skirt a chance to expand without increasing the diameter and, therefore, without creating a tendency to bind.

While on the subject of piston slap it may be of interest to relate the argument of one stand attendant why his engines had never been known to develop this defect. He explained that most engines had the spark plug on the side, over the valves, and as the push of the gases started from the plug the force of

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Front exhaust take-down on Nash

explosion came against the piston sideways and created a slap. In his cylinder the plug was in the cylinder head and there was, therefore, a straight down push on the pistons. This argument of the straight push on the pistons due to spark plugs in the cylinder heads has been met with repeatedly recently, probably as a result of the tendency to remove the plugs from directly over the valves to a more central position. It would seem that the scientific principle that within a closed vessel containing gas under pressure the pressure is uniform over the entire interior surface does not command much respect among car salesmen and catalog writers.

Relieving Piston Surfaces

Another tendency in piston design is to relieve the skirts of the pistons on the non-bearing sides as much as possible. This is a new application of a principle long ago established in connection with journal bearings. In the average journal bearing carrying a heavy revolving part the load is carried at the bottom. Owing to the friction the center of the load, of couse, shifts slightly to one side of the line perpendicularly below the axis of the journal. There is no appreciable load on the sides of the bearing at the level of the journal axis and it was found advantageous to relieve the bearing at both sides over a certain area, so that there can be contact between the joural and bearing only at the top and bottom. The reason why this construction gives an easier running bearing is readily explained. If the journal were in contact with the bearing all around, the film of oil which must be sheared as the journal revolves would extend all around. The oil film at the sides does not reduce the unit pressure on the lower part of the bearing and its only effect is to produce a loss due to the shearing. In a piston the conditions are exactly the same. The pressure on the piston walls is greatest along the two lines of intersection of the plane of connecting-rod swing with the cylindrical surface of the piston. From these lines the pressure eases off toward both sides and there is no pressure midway between these lines. If a thin film of oil is allowed to exist between the piston and cylinder wall at these points of no pressure or little pressure, a considerable loss of power is incurred, especially in a high-speed engine and if a rather heavy oil is used. Aluminum cylinders cast in metal molds are generally cast with relieved surfaces, and pistons cast in sand molds are now often formed with similar depressions by turning them eccentrically. Formerly pistons were generally relieved on the wrist-pin belt by being turned down concentrically. This does not give as much relief on the sides as desirable and removes some of the useful bearing surface adjacent to the maximum pressure lines.

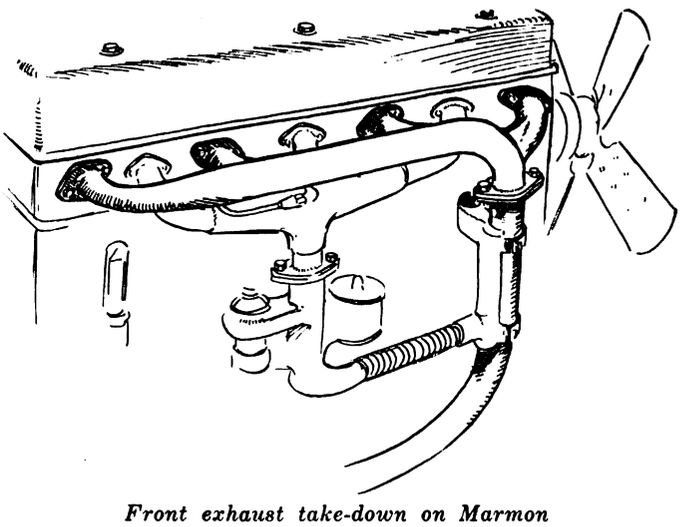
One of the perplexing problems that every designer has to contend with is that of accessory drives. The number of accessories has been constantly increasing and while there is no difficulty in finding a place and arranging a drive for each of them, there has recently been a strong tendency to clean up engines and chassis as well. It is very desirable that one drive be made to serve for two or more accessories, yet the possibility of an accident to one of these accessories interfering with the operation of the other must never be lost sight of.

Fans on Generator Shafts

There seems to be a growing tendency to use the same drive for the generator and the fan. This practice originated with makers of eight-cylinder cars where the generator is placed in the V between the two sets of cylinders and naturally comes at about the right height for the fan shaft. It has now been extended to four and six-cylinder vertical engines. In the Oldsmobile the generator is mounted in front of the engine on a pad with a vertical stem clamped in a bracket on the cam gear housing. This provides adjustment for the belt. Nash uses a similar construction, but in this case there is a sort of base at the rear end of the generator with oblong slots through which pass clamping bolts to the cylinder block. In some instances where the fan is mounted on the generator shaft the drive pulley is in front of the fan. This results in quite a space between the fan and the radiator, which is not conducive to the highest efficiency.

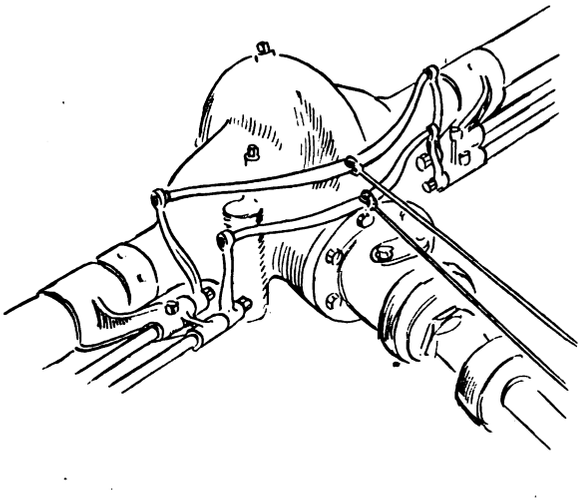
Some years ago there seemed to be a tendency toward two-blade airplane type fans. The capacity of these fans in many cases proved inadequate and only a few of this type are left.

The subject of manifolds really merits an article by itself, as there are few concerns which have not changed their design in this respect during the past year. In a general way it may be stated, however, that the air heater is now not a separate part, but is incorporated in the design. Where in past years we used sheet metal or cast stoves clamped to the exhaust pipe or manifold, which connected to the carbureter air intake by a flexible tube that often ran half way around the engine, the air heater is now formed integral with the exhaust manifold and connects to the carbureter by a short length of either rigid or flexible tubing. The

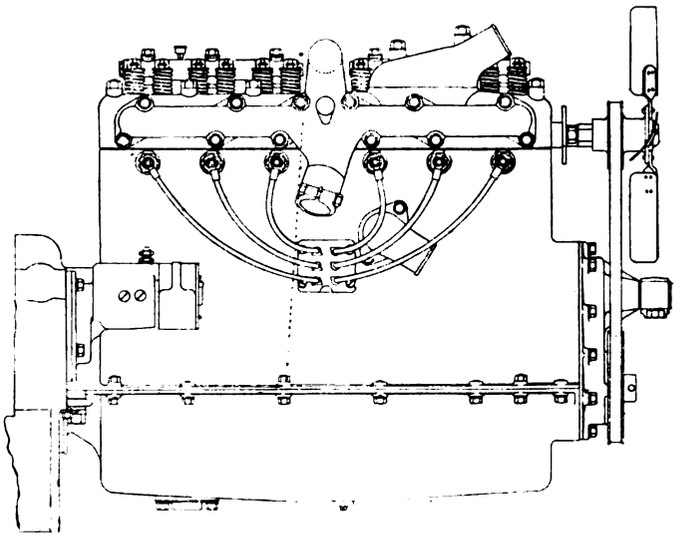


Front exhaust take-down on Marmon

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Neat brake equalizer arrangement on Elcar



Symmetrical arrangement of high-tension cables on Grant

hot-air tube was especially obtrusive where the carbureter was located on the opposite side of the engine from the exhaust pipe. Where this is the case the pipe is now generally carried through the space between the two middle cylinders.

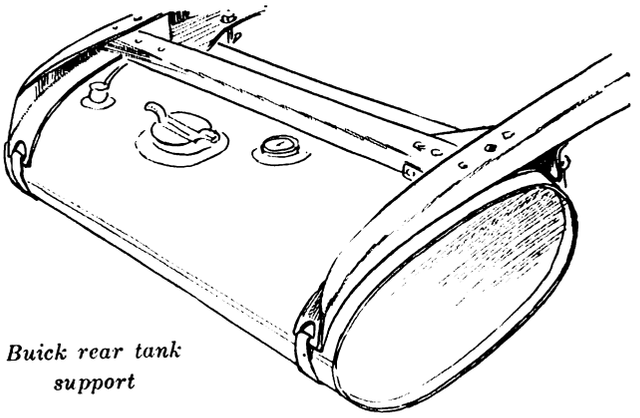
In a few cars the circulation pump and fan are both driven by the same belt. As in the case of generator and fan, the speeds of these two devices are about the same even if driven separately, and the pump combines more readily with the fan, especially in a six-cylinder car, because it occupies less space in a lengthwise direction. Some people, who had experience with early cars in which the pumps were driven off the flywheel, might object to a friction drive for this important part, but there is no comparison as far as reliability is concerned between a modern V belt in an inclosed engine space and a friction drive from an exposed flywheel at about the lowest point of the car. There is one merit in the friction drive for the circulation pump, namely, that if the latter should be allowed to freeze up it cannot be broken in cranking.

Reducing Height of Cars

The tendency toward low-hung construction continues, the incentive seeming to be chiefly a desire for more attractive appearance, though the advantages of greater safety (stability) and steadier riding qualities cannot be disputed. This year the chief change looking toward this end has been a reduction in wheel diameters. Many cars that formerly had 34-in. wheels are now equipped with wheels of 32-in. diameter. This change, of course, also conduces to economy in construction and just in what proportion the economy factor and the appearance factor share in the responsibility for it, it is hard to say. To further reduce the center of gravity of the cars the rear springs, if of the semi-elliptic type, are now generally underslung.

In recent years the unit power plant has been strongly in the ascendency. The first sign that this movement may possibly come to an end may be seen in the new Studebaker chassis. This is probably the first instance in years of a passenger-car manufacturer having adopted an admidships transmission and discarded one differently located. The reasons for this move are not far to seek. Bell housings contain a large amount of metal, which means a heavy expense if aluminum is used and great weight if—as is more customary in low and medium-priced cars at present—cast iron is the material of construction. The inclosure of the flywheel and a dry-disc clutch serves no useful purpose, but the fact that the bell housing holds the bearings of engine and transmission in rigid alignment has been an important consideration in the past. The use of a pair of universal joints between the clutch and the transmission obviates the need for such alignment, but the usual types of joints are rather complicated mechanisms and, moreover, they have a tendency to become noisy with age. Noisiness is a particular fault of the simplified types of joints, such as the Hookham joint, which the designer is tempted to use here on account of the small angularity required. So long as only mechanical joints were available engineers seemed to prefer the bell housing. Now, however, the leather or fabric type of joint has reached a manufacturing stage and seems to fit this service admirably. It is comparatively inexpensive, is noiseless and requires no attention. The advent of this type of joint in commercial form swings the balance of advantages in the direction of the separate transmission, and it may possibly return to popularity.

A little detail of construction noted on the new Studebaker is in connection with the brake pedal. Most brake pedal shanks extend substantially straight up from their hub for a certain distance and then turn forwardly to follow the inclination of the toe board. At the point of the bend a lug is formed on the shank to which the brake rod is connected by a yoke. In the Studebaker (as well as in several other designs) there is a separate arm on the pedal hub for the brake rod to fasten to, and in order that this arm need not be made very heavy it is braced to the shank of the pedal.



Buick rear tank support

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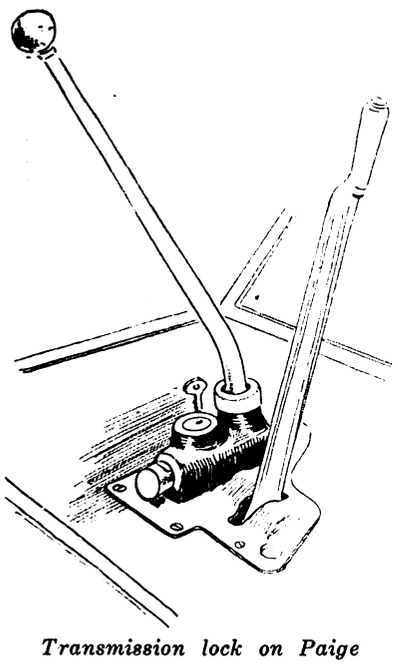
The metal in the brace is almost in direct tension when the brake is applied, and therefore works to the best advantage.

In line with the general tendency to clean up chassis design the ignition wiring in some cars has been rearranged. In some of the lower-priced cars the wires were carried from a distributer at one end of the engine to the different spark plugs across the tops of the cylinders. This involves the use of quite long high-tension cables, with corresponding chances of leakage and of trouble from electro-static effects, especially if the cables lie close together. Probably the chief objection has been, however, the unsightly appearance. This is now being attended to and the accompanying sketches of the Grant and Oakland high-tension wiring show examples of neat arrangements without the use of conduits. By placing the distributer at the middle of the length of the engine, variation in length of the different cables is reduced and a neat effect can be obtained.

Gear Lever Locks

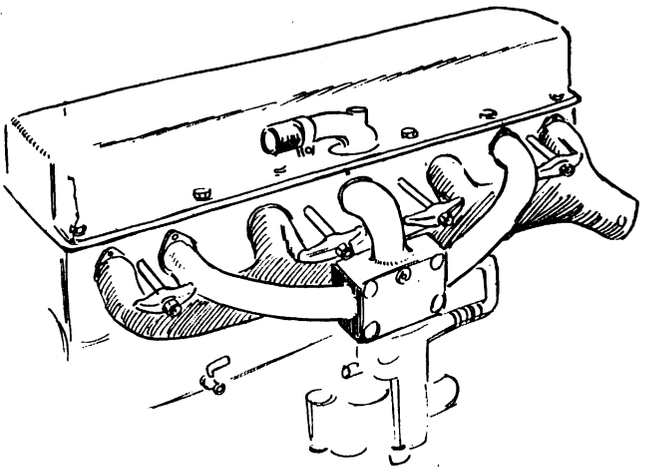
Gear lever locks are gaining. Formerly cars were locked chiefly by switch locks. However, the great prevalence of a few popular makes of magneto and battery ignition systems, and the fact that only one form of key is being used with each ignition system, make this protection rather illusory. Fuel line locks have also been developed and met with a measure of success. An objection to both switch locks and valve locks is that a skilled man can easily make connections to the engine from a separate current source or fuel supply. On the other hand, if the gear lever is locked in the neutral position, apparently the only way to move the car is to tow it.

Rear fuel tanks are becoming more numerous right along and the various methods of supporting them afford quite a study. A particularly neat arrangement is found on the Buick, where the tank is of flat oval shape and is located substantially centrally below the rear cross-member of the frame. The frame side bars extend beyond the rear cross-member and are curved downward to conform to the outline of the tank. The top flange of the side bar is cut off on a bevel beginning at the cross-member, and where it ends the web of the side bar begins to be reduced in a similar way, so that finally only the bottom flange remains. This has a slot cut through it near the end through which the steel band used to support the tank is looped. The other end of the band connects to an eye bolt which passes through a hole in the lower flange of the side bar and is drawn up by a nut. An integral gusset is formed on the side bar where it joins the rear cross-member and this gusset has a flap on it which bends up on the rear side of the cross-member and is riveted to it.

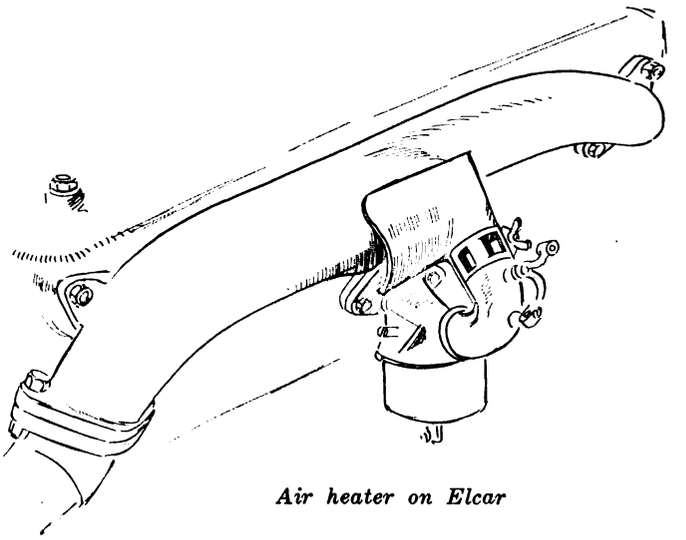


Transmission lock on Paige

It is getting to be quite a common practice to lead the exhaust manifold down at the forward end of the engine. Early instances of this arrangement may be traced back a great many years, but its development into a regular practice is quite recent. When the steering gear and exhaust manifold are located on the same side of the engine there is apt to be interference if the latter is carried down at the rear end, and this probably was the original *raison d'etre* of exhaust manifolds with front take-down. It is quite likely that such a manifold and exhaust pipe arrangement also favorably affect the engine efficiency, as the cylinder exhausts into a long pipe of large volume and excellent cooling facilities. Owen, Marmon and Nash are some examples of engines with a front exhaust take-down.



Hot spot manifold on Scripps-Booth



Air heater on Elcar

In past years one of the most annoying things on automobiles has been the fan belt. Belts will stretch and require frequent adjustment, especially if rather small in size for the work they have to do. This trouble has been partly eliminated by using more liberal belts, still the constantly varying belt tension as the belt stretches with atmospheric conditions, and as a result of wear makes for anything but ideal operation. The Buick company this year has adopted an automatic tensioning device as shown in the sketch.

Probably the most interesting exhibit to visitors of a technical turn of mind was the new Overland small car which is to sell at a popular price. It has often been said, and correctly, that at this late date it is not a difficult thing to design an automobile which shall give excellent service; the difficulty begins when it is required to design the car so that it can be produced at

(*Continued on page* 131)

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Production and Economy Features Characterize New Cars at Show

Valve-in-Head Type Indorsed by Makers Who Are Using Show as Occasion to Announce New Models

By J. Edward Schipper

ANALYZING the new cars at the show, the conclusion cannot but be made that an unqualified indorsement has been placed upon the overhead-valve engine by the industry. There are five cars which have never been shown before using this type of power plant, and two others using the L-head design. One of the latter, the new Overland Four, is not as yet in production, and probably will not be for some months.

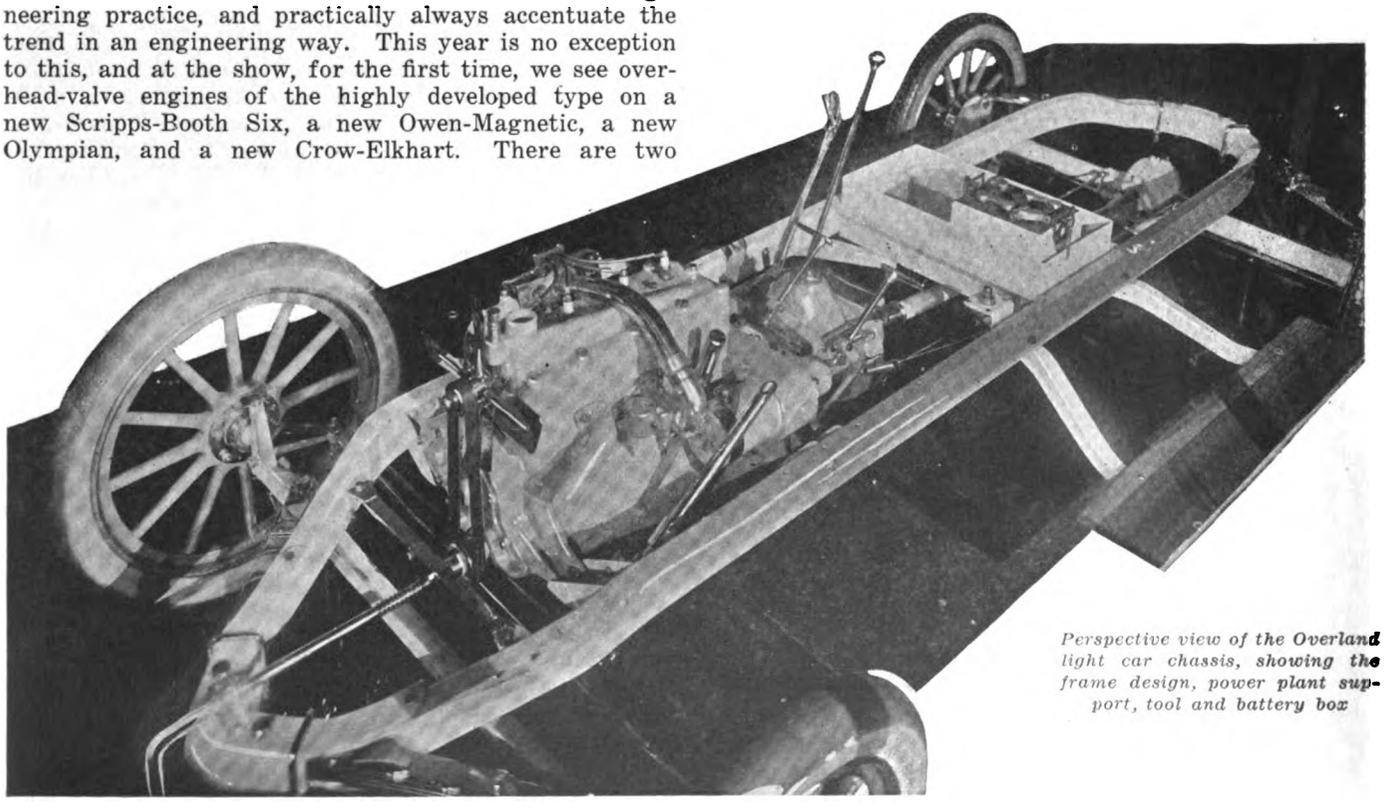
Of the new cars present there is no doubt that the Overland Four takes a prominent position in general interest because this is a car which Willys-Overland is soon to launch in competition with the Ford. Its price has not been fixed, but it is understood that it will be on a competitive basis with the Detroit product. Consequently, it is designed to be made on a highly organized production basis in order to bring the possible selling price down to the lowest limit.

Surprises Not Numerous

While the number of show surprises is not nearly so great as in former years, the new cars have a more significant value. New cars are, in nearly all cases, the results of careful study, particularly as regards the possibilities of placing them on the necessary class-production basis. These cars are also indicative of the latest engineering practice, and practically always accentuate the trend in an engineering way. This year is no exception to this, and at the show, for the first time, we see overhead-valve engines of the highly developed type on a new Scripps-Booth Six, a new Owen-Magnetic, a new Olympian, and a new Crow-Elkhart. There are two L-head engines, both of them on low-priced cars, the new Overland Four, which will probably sell for close to $500, and the Moore 30, at $695.

In addition to the new cars there are always new bodies added to present chassis, and exhibited for the first time. This is particularly true this year, where a surprisingly large number of new bodies has been added as sales stimulation. Hupp is now exhibiting its complete line of closed bodies on its new chassis. Oldsmobile shows a new sportster. Cole exhibits its bevel-edged bodies for the first time. There are a new Liberty limousine, a new Elgin sport model and a convertible sedan. McFarlan has a sportster of rather extreme lines. There are also a great number of special show bodies which are not regular products, but exhibit cars.

Besides the cars which are new throughout, either in chassis or body, there are a great number which incorporate refinements made within the last few weeks. This is the case, for instance, on the Winton, where a new water-jacketed intake manifold is fitted, and on the steam cars, both Stanley and Doble. The Stanley car has a number of important refinements in the piping, and on the Doble the fan is now operated by a small impulse turbine of the velocity type, actuated by exhaust steam. The Peerless cars now have L-head engines in place of the



Perspective view of the Overland light car chassis, showing the frame design, power plant support, tool and battery box

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overhead-valve type, although otherwise the design is quite similar. This is one example where a manufacturer has gone from the valve-in-head to the L-head engine. This change is to a great extent due to the advantages of construction on the V engine.

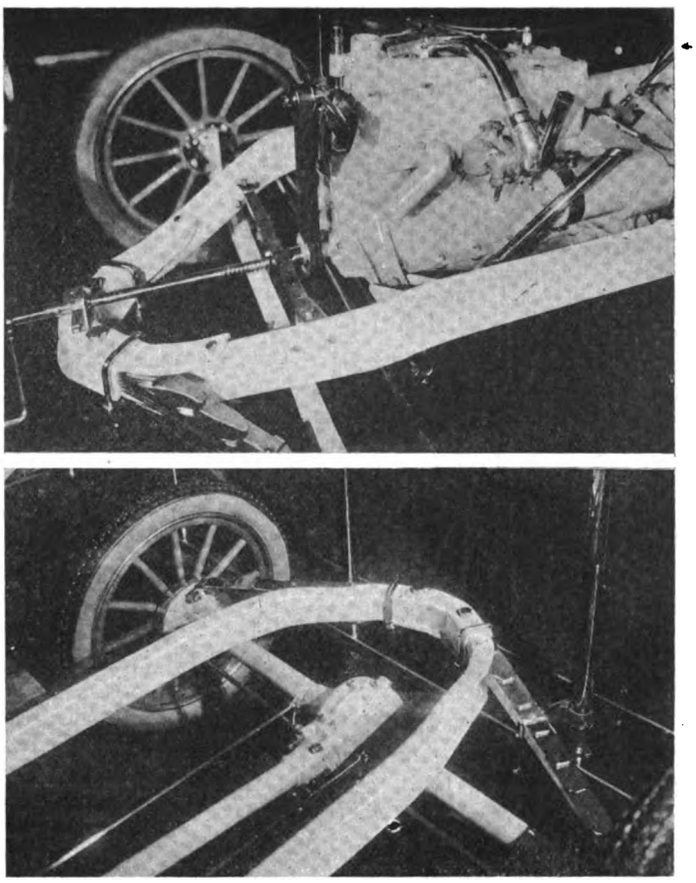
Willys-Overland Exhibits Forerunner of Low-Priced Product

Will Be a Big Production Car with High-Grade Engineering Features

THE Willys-Overland big-production, low-priced Four, shown for the first time three months ago at the Toledo factory in chassis form to a few inside observers, is exhibited as a chassis and an unfinished body. Its predominating feature from a construction standpoint is the skillful use of pressed steel in both chassis and body. Everything possible is made as a pressed part, giving the desired lightness and low cost. Another feature is the extension of the chassis suspension forward of the front axle and behind the rear axle by the means of an overhanging form of spring arrangement.

The result is that the Willys-Overland company has produced a 1500-lb. car on a wheelbase of 100 in. with the equivalent of 130 in. in spring suspension. The frame side members are long pressed steel parts, spaced quite closely, the distance from the inside of the channel side on one side to the inside of the opposite channel being 23 in. The depth of the channel member is 31.2 in. and the width across from the outside of the channel flange on one side to the outside of the channel flange on the other is 26 in. These side members are rounded off front and rear so that the form of the chassis frame is what might be roughly called a flat sided, narrow, continuous ellipse, the ellipse itself being 130 in. from end to end.

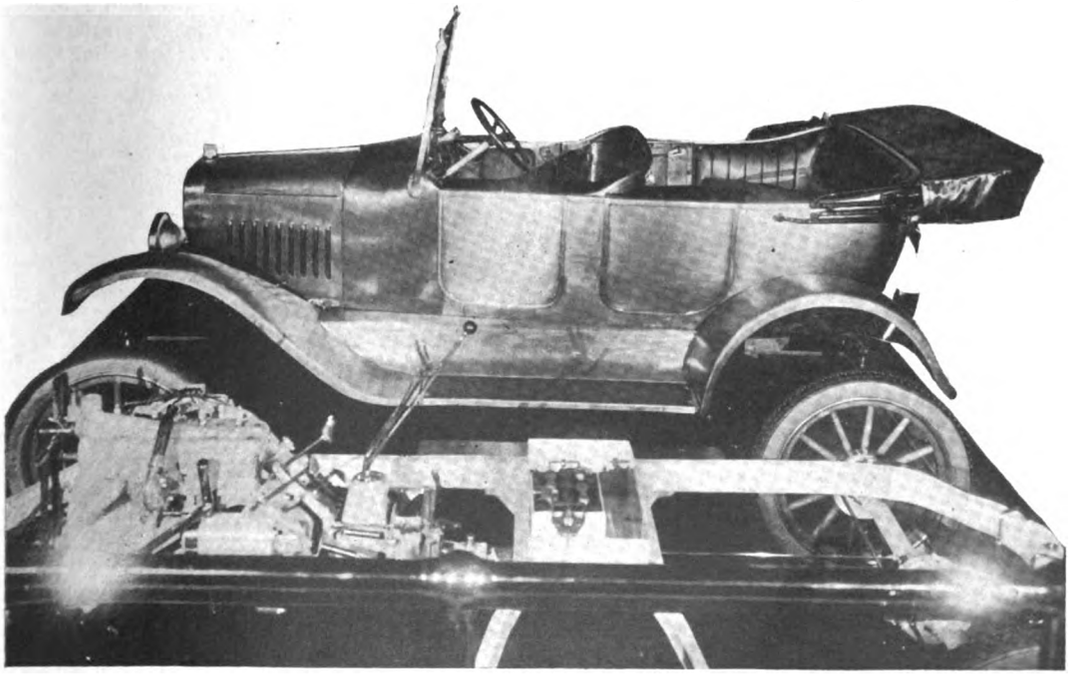
As the wheelbase is 100 in., the front and rear axles are both 15 in. in from the ends of the frame, this amount being represented by the overhang of the chassis. The springs are mounted in such a way as to connect the overhanging ends of the frame to the axle, this being accomplished by a horizontal V-type of suspension at both front and rear. The front springs being fixed at both the frame and axle and the rear springs being shackled on one side and pivoted on the other to take care of the movement of the body, thus the front axle member is relied upon to absorb directly the spring stresses by slight movements of the front axle from the vertical.



Front and rear ends of Overland light car chassis

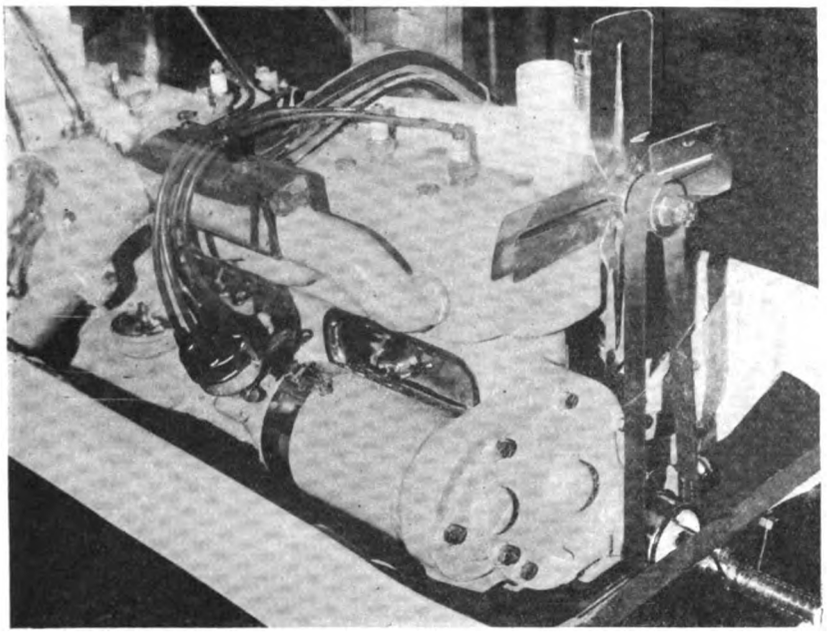
Outside of the radical departure from usual practice in the arrangement of the frame members and suspension, the Willys Four does not depart from standard design in its other features. A conventional type of block L-head four-cylinder engine is used with dimensions of 3¼ by 4 in. The valves are operated from a gear-driven camshaft through mushroom push rods. Cooling is by thermo-syphon and oiling by a pressure-feed system in which the oil is thrown by centrifugal force by the flywheel through an oil strainer and then to a lead to the hollow crankshaft. The hollow shaft also takes care of the lower connecting rod bearings.

The castings for the engine are arranged in accordance



Sheet metal body alongside of chassis of Overland light car. The ensemble is surrounded by a railing to keep the crowds at a distance

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Four-cylinder L-head engine for the new Little Four Overland

with practice in L-head design. The head is removable and the cylinders are cast in unit with the upper half of the crankcase. This casting also carries the motor supporting feet at all four corners, giving a four-point rigid suspension. The water jackets are large, and in connection with a cellular tube radiator with a large tank at the top the cooling system hold a total of 7 gal., which is much larger than that employed in cars of far greater size. In connection with this radiator there is a fan driven by belt from a gear on the end of the crankshaft, and the tension on this belt is constantly maintained by a spring.

A complete electrical system is employed. The units are the Auto-Lite for starting and lighting, and the battery equipment may be either U.S.L., Gould or Willard. The battery capacity is 60 amp.-hr. The motor and generator are mounted separately, the generator being on the right side and driven directly from the timing set, while the starting motor is on the left and is engaged with the flywheel by the Bendix gear.

Unit Powerplant

The clutch and gearbox are mounted with the engine as a unit powerplant. The clutch is an oil disk, having three disks faced with Raybestos. It is housed within the flywheel and secures its oil from the engine, the same oil lubricating the entire unit plant, flowing back also to the gearbox, which is a three-speed, sliding, selective. From the gearbox the drive passes through one universal joint to the propeller shaft and thence to the three-quarter floating rear axle. This axle is a single bearing floating type with a ball bearing pressed over the outside of the axle housing, carrying the wheel, and a roller bearing at the differential end. The wheels are wood, carrying 30 by 3½ tires, non-skid in rear. Propulsion is through a torque tube.

Two sets of brakes are used, the foot brake being mounted on the jackshaft, giving a transmission brake, with the hand brake on at the rear wheels. The control members for operating the brakes and controlling the other functions of the car are placed in the customary manner.

The body is a production job as well as the chassis, being pressed steel throughout. The type shown is a five-passenger job and arranged with an apron-like projection in the front and a rounded off rear to accommodate itself to the overhanging frame suspension. The running boards are supported from the chassis by two inverted pressed steel U-bars riveted to the frames, giving a substantial support to these boards. The color of the body is not fixed, and there are some other details which are also to be settled upon before the car is put into production. For instance, the gear ratio on the model shown is 4.73:1. This may be altered, and the color is not as yet fixed upon. It is expected that a definite move toward production will be made during the coming spring.

Scripps New Six Has Northway Overhead Valve Engine

First Appearance of This Make as a Five-Passenger Touring Car

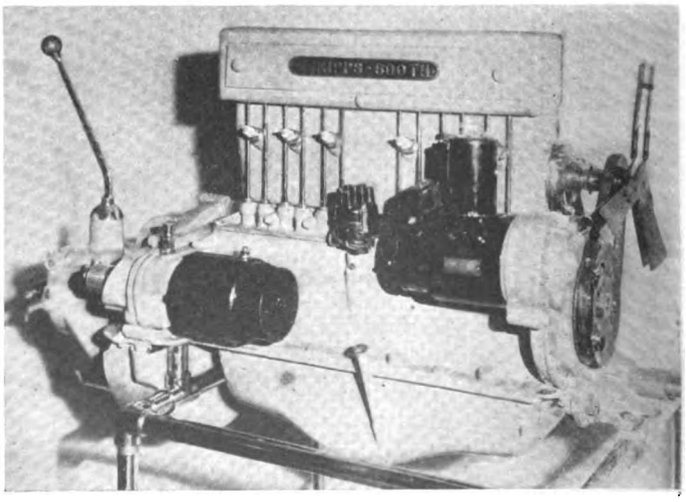
FOR the first time the Scripps-Booth car appears in six-cylinder, five-passenger form. The familiar body lines which have created a name for distinctiveness remain, although they are modified to accommodate them to the new touring model. The new Scripps design is due without doubt to the definite inauguration of this concern as a part of the General Motors Co., and General Motors units displace the parts which were formerly purchased elsewhere. This is particularly true of the engine, which is now the Northway overhead valve six.

The new car which is sold as a five-passenger for $1,195 is mounted on a wheelbase of 112 in. It is equipped with a 2 13/16 by 4¾ unit powerplant, having its six cylinders cast in block, with the valves operated from a single camshaft which actuates a set of exterior side rods and then an overhead rocker arm valve set. The cylinder heads are detachable and are held in place by long studs, and there is in addition a coverplate which incloses the valve action in order to give dust-proof qualities and silence.

The intake manifold on the new engine employs the hot plate principle in order to aid in the evaporation of the mixture. The manifolds are on the right side of the engine, and the exhaust from the two central cylinders is directly against the portion of the manifold around which the intake gases are led. The carbureter is a Marvel, and is provided with a full hot-air intake so that both the primary air and the mixture are subjected to the high exhaust temperatures.

Pump on Fan Shaft

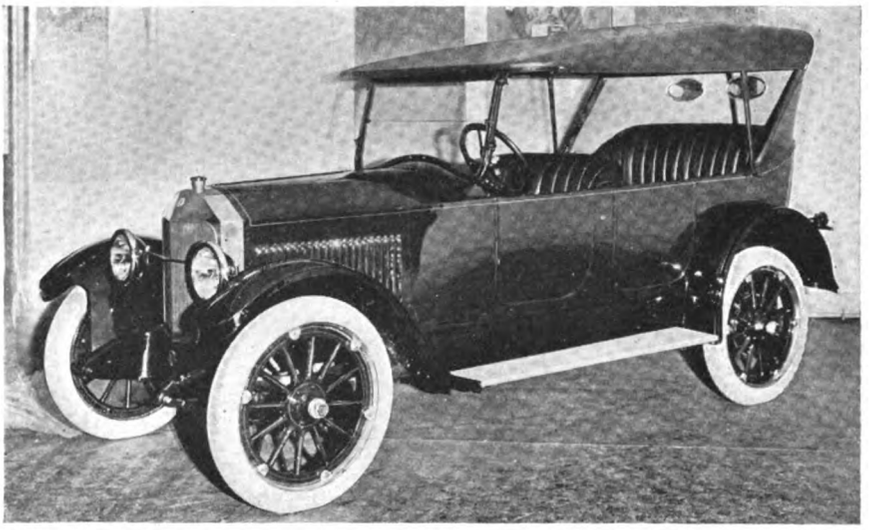
Pump cooling is used, the water pump being driven off the fan belt, as both the fan and pump are on the same shaft. The belt is a notched type to give positive drive. The fan is what is known as the biplane type, being a three-blade unit, with each blade having two parts parallel to each other in the form of a biplane. Starting and lighting and ignition is by the Remy system, and the oil feed is by means of a Stewart vacuum tank in connection with a rear gasoline tank.



Scripps is now using the Northway valve-in-head six-cylinder engine

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Power is transmitted through a clutch faced with leather, having an aluminum cone with spring insert. The gearbox is a Warner-Munsey type, with ball bearings on the main shaft and plain bearings on the lay shaft. The propeller shaft has two universals, and the drive is by the Hotchkiss system in connection with semi-elliptic springs. In addition to the equipment mentioned the list price includes Marshall upholstery springs and a Stewart speedometer.



Five-passenger touring car mounted on the new Scripps six-cylinder chassis

New Olympian Uses Brush Deep Frame Chassis

Has Overhead Valve Engine—Light-Weight Construction Features New Product

THE Olympian Motor Car Co. of Pontiac, Mich., is exhibiting the first of its new cars. This is a new design throughout and incorporates Brush features such as the valve-in-head engine, deep frame construction in which the side members are formed by the splash apron and the running boards are also part of the frame structure, the full circle housing on the rear axle and the related features which go with this type of construction.

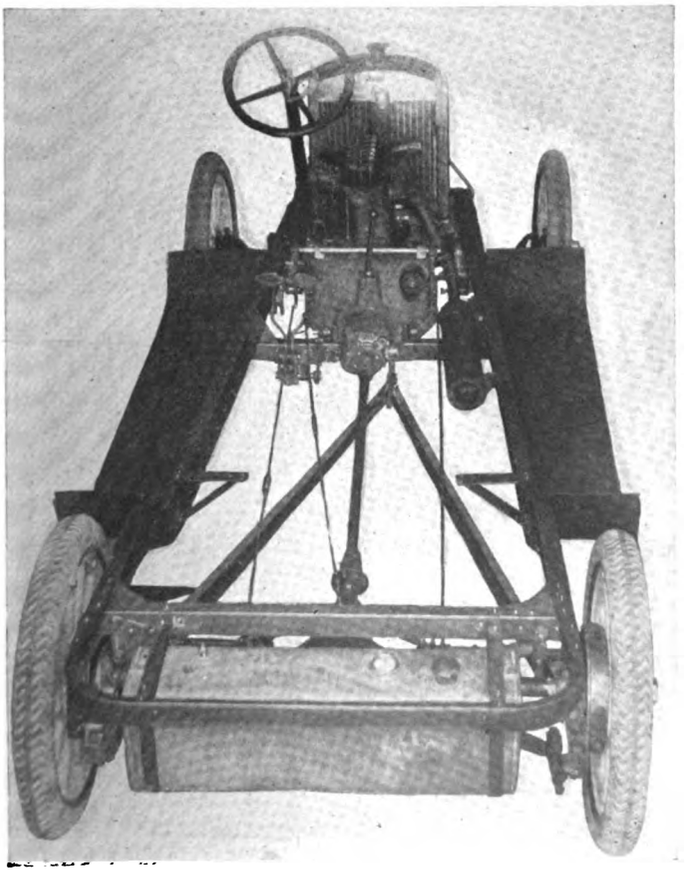
In addition to these features the drive units have been made stiffer by a triangular layout composed of two torque arms coming together at their forward ends, so that an equilateral triangle is formed by the two torque members and rear axle.

Mounted on a wheelbase of 112 in. the body is typical of up-to-date expression in economy of space. The cowl is so arranged that it takes up but little room, and the gearshift lever is brought out from beneath the cowl with a bend which carries it directly to the hand of the operator. In place of the ordinary type of hand brake there is a handle which operates on a pull rod through the dash so that the manipulation of the hand brake is rendered exceptionally easy and accessible. A clear aisle is left across the width of the front seat by this arrangement of levers, so that in spite of the reasonable length of wheelbase there is more than a normal amount of room both front and rear.

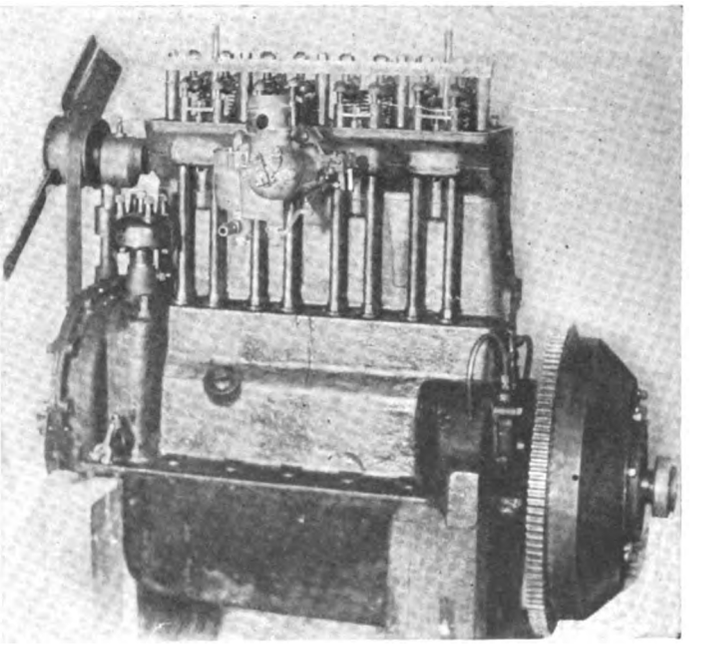
The powerplant is comprised of a four-cylinder engine, Borg & Beck clutch and a three-speed ball-bearing gearset mounted as a unit. The engine is a 3¼ by 4½ block four, with detachable head carrying the Brush overhead valve gear, which is so designed that adjustments on the valve clearance can be made while the engine is running. An improvement has been incorporated in the valve action by using a full generated rocker pivot.

Aluminum alloy pistons, Lynite, are used. These have a length of 3 9/16 in. and a diameter of 3.24 in., with 3 3/16-in. rings. They are fitted with a 1-in. wristpin, which forms the upper bearing for the 8½-in. drop forged connecting rod, which has a crankpin diameter at the bottom end of 2¼ in., with a 1½-in. length.

The 100-lb. flywheel carries an 8-in. diameter Borg & Beck dry plate clutch. The flywheel itself has an exterior diameter

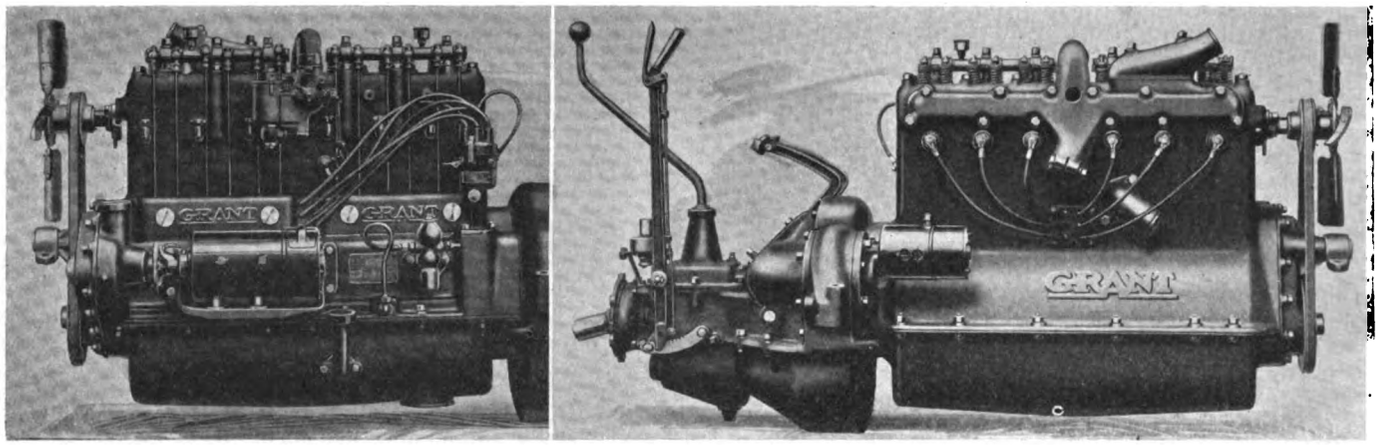


Olympian chassis with deep frame construction. Note continuous frame bumper at rear

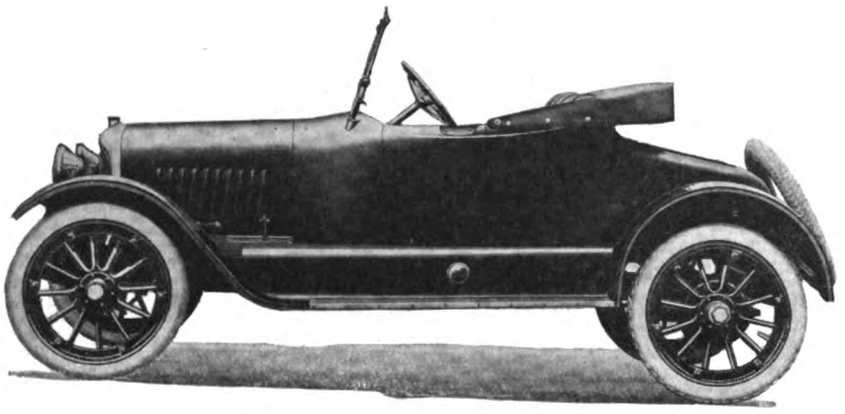


Overhead valve engine adopted for the Olympian car, showing top cover removed

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Both sides of the refined Grant powerplant, which is a typical overhead valve six



New Grant roadster, with sloping windshield and rear deck

of 14 in. From this unit the drive is transmitted through a three-speed gearset unit mounted on S.K.F. ball bearings on the main shaft and plain bearings on the countershaft. Both these shafts are 3½ per cent nickel steel. The gear ratios provided are 3 to 1 on low, 1.89 to 1 on intermediate and 1 to 1 on high—the reverse ratio in the box is 3.62 to 1. For final reductions these are all multiplied at the rear axle by 4¾ to 1.

The propeller shaft has two universals and is relieved of torsional stresses by two pressed steel torque arms previously described. The rear axle is a three-quarter floating mounted on Hyatt bearings with a circular type of differential housing to which the tubular shaft housings are bolted on either side.

The body is a five-passenger double cowl streamline type with slanting wind-shield. It is built in the Olympian shops and follows the somewhat angular line now in wide use. It is equipped with an electric light in the rear right hand door for lighting the tonneau and entrance. There is also a two-passenger design of individual lines. The equipment includes a Boyce Moto-Meter, Stewart-Warner speedometer, bumper and a complete set of tools. The price is $1,085.

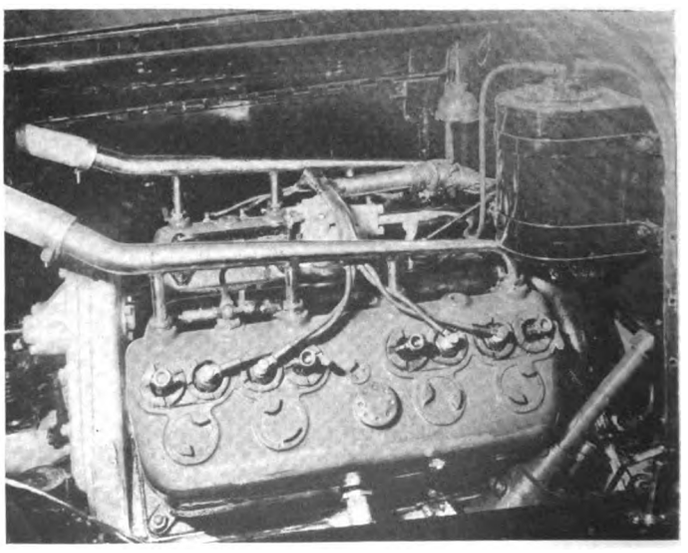
Grant Changes Give Higher Speed Engine

Refinements Made Throughout Body and Chassis Giving Increased Accessibility

IN general design the 1918 model Grant chassis is very much the same sort of machine as its predecessor, but in details there are numerous and important differences. The six-cylinder engine has the same dimensions, 3 in. bore by 4¼ in. stroke (180.3 cu. in.), but changes in design enabling it to run at higher speeds have increased the horsepower. The waterjackets now extend all the way down the cylinders. Filler plates now are placed between the engine crankcase and the frame, thus excluding dust and mud, and to further protect the valve mechanism against excessive wear the valve lifters at the base are covered. The latter are also made lighter than formerly.

A much cleaner appearance of the engine results from the replacement of the old wiring system in which the wires were carried above the cylinders by a new one in which the wires are supported in fiber blocks between the cylinders. This change also reduces the length of the wires and thus improves ignition. The flexible hot air tube formerly used, together with the hot air muff, has been eliminated, the place of these parts being taken by a permanent hot air tube extending from the carbureter over the top of the cylinders directly to a hot air box cast in the exhaust manifold.

Practically all of the bearing surfaces have been increased in size. That portion of the crankcase supporting the bearings has been reinforced, the generator bearing shaft has been increased in length and an oil guard provided to prevent leakage. A V-type fan belt with a simple adjustment is used, and the fan is driven from the crankshaft instead of from the general driveshaft. The lubricating system is entirely new. First the oil pump capacity has been multiplied four times and the oil flow is shown by a gage on the dash instead of by the feed oiler heretofore used. The breather tube and oil filler are now combined and are placed in an



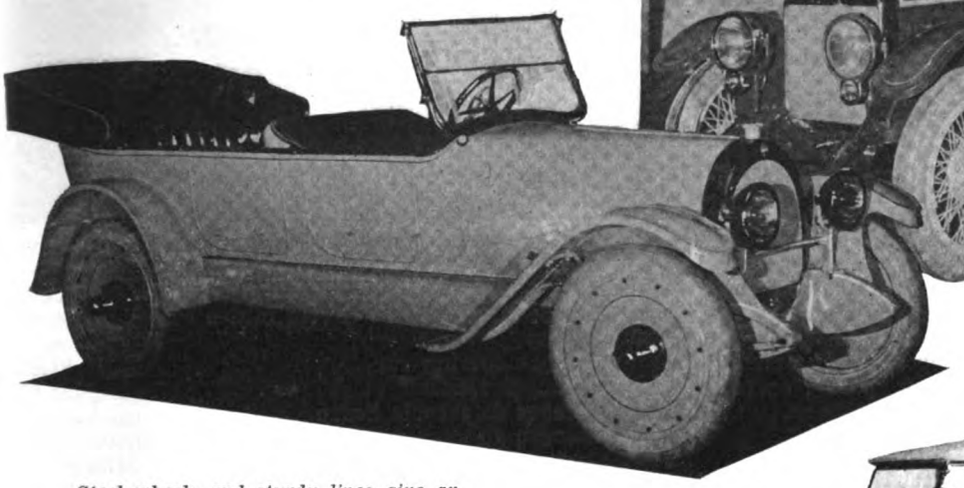
New Peerless L-head engine which takes the place of the former I-head

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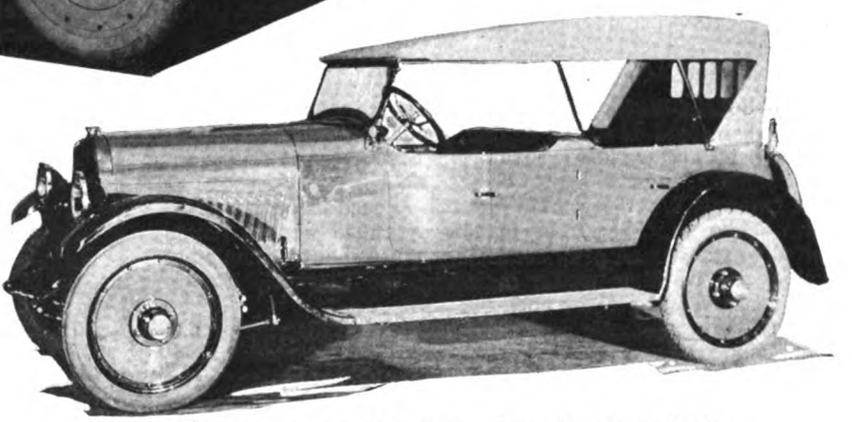
Military Lines Characterize Models at New York Show



Here is a special built-to-order model of the Winton which has a higher radiator than the standard job and straighter lines

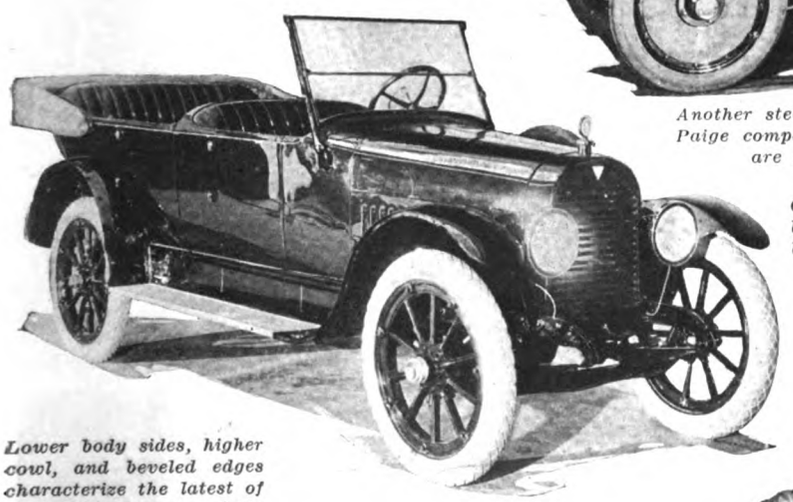


Steel wheels and sturdy lines give an armored-car appearance to the 7-passenger Oldsmobile which is finished in azure blue and sells for $1,700

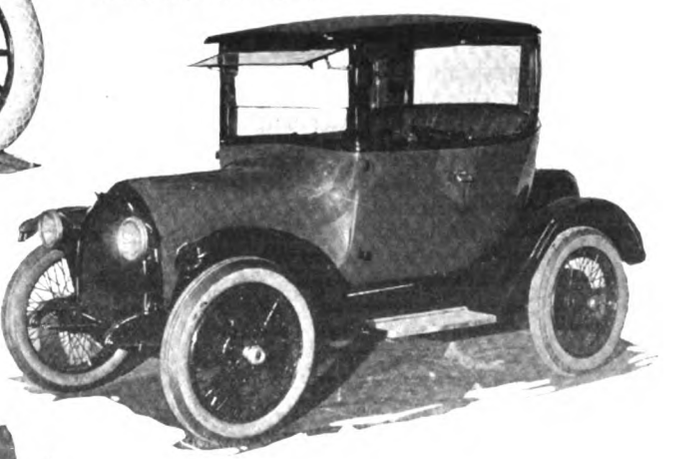


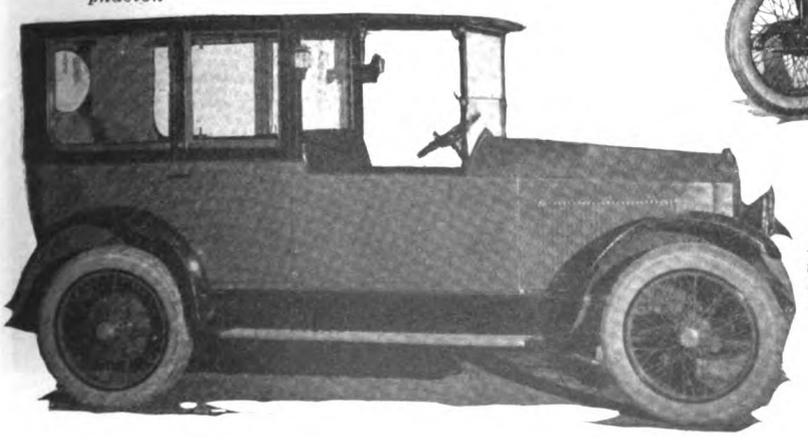
Another steel wheel model at the show was shown by the Paige company. The slanting windshield and one-man top are other up-to-date features of this product

One of the Detroit-Electric broughams is shown below. The body appointments of this line are of the highest grade



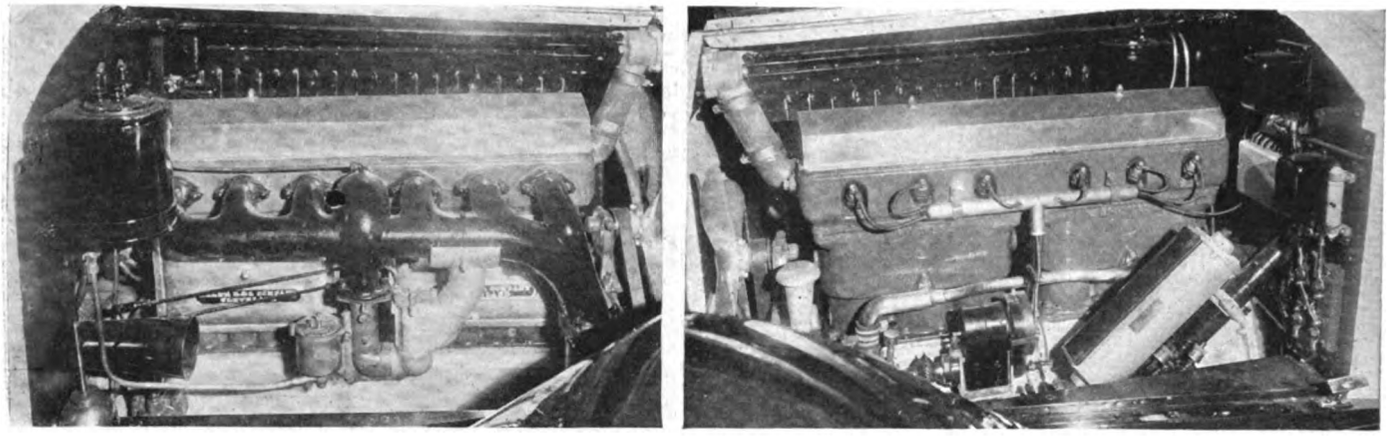
Lower body sides, higher cowl, and beveled edges characterize the latest of the Hudson open body models, known as the phaeton





Milburn electrics are being built this year with speed especially in mind. The limousine at the left is built to go over 25 m.p.h. if desired

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Both sides of the new Owen-Magnetic overhead valve six made in the shops of the Baker R. & L. Co.

accessible position on the gearcase. The oil strainer has been made larger and may be readily removed for cleaning. Internally the distributing system comprises a tube within the crankcase containing a small opening opposite each connecting-rod and in the gearcase, flooding each bearing surface with oil. Unequal lubrication is rendered more difficult by the use of a new oil trough pan.

Vacuum Tank Attached to Dash

The Sparks-Withington vacuum tank is now attached to the dash instead of to the engine, rendering all parts of the motor head accessible. A Stromberg carbureter is still used, with slight changes.

A two-unit Wagner starting system is used in an improved form. The starting motor is now arranged with a flange bolted to the engine arm, rendering it possible to completely inclose all working parts, including the flywheel, Bendix pinion shaft and starter spring.

The Remy automatic advance type ignition distributer has been removed from the vertical drive shaft and placed upon a short shaft, eliminating a large number of parts. The spark control mechanism works independently of the timer and the timer cap, so that the timer as a whole remains stationary. This decreases the possibility of loose wires due to the former constant motion of the timer.

The gearbox and clutch are of the same general design, one important change being the provision of a method of lubricating the clutch throw-out bearing. This now receives oil through a hole in the constant mesh pinion gear.

Semi-Steel Castings for Gearbox

Semi-steel castings replace the heavy drop forge arms formerly supporting the gearbox. These are bolted permanently to the engine and support the gearbox. A pressed steel underpan covers the lower half of the flywheel, effecting complete inclosure. A large hand hole however is provided for inspection and adjustment of the clutch and if necessary this steel underpan may be quickly dropped.

Among the other changes are an increase in the throw of the emergency brake lever, permitting more power and action, though the brake construction remains practically the same. The starting switch is now mounted on the gearbox and so made that it requires but a light pressure for operation. A split nut type Jacox steering gear replaces the worm and gear Jacox formerly used, and the horn button is now carried on the top of the steering wheel.

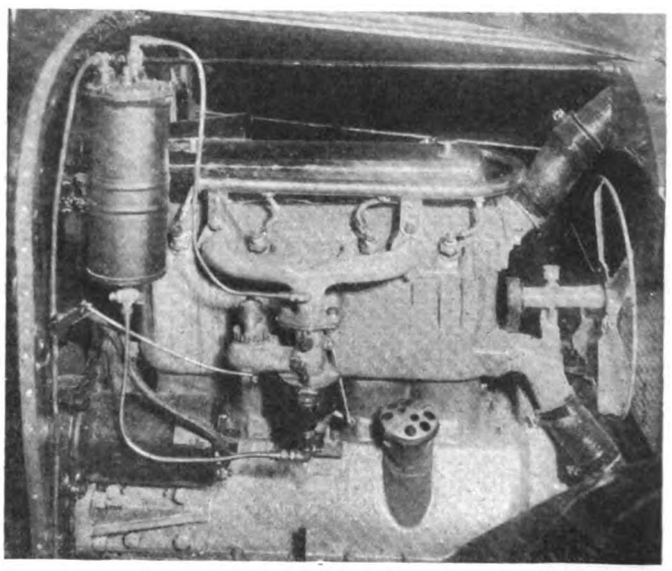
Though the rear axle is similar to the one formerly used the factor of safety is increased by the use of better steel and gears with larger teeth.

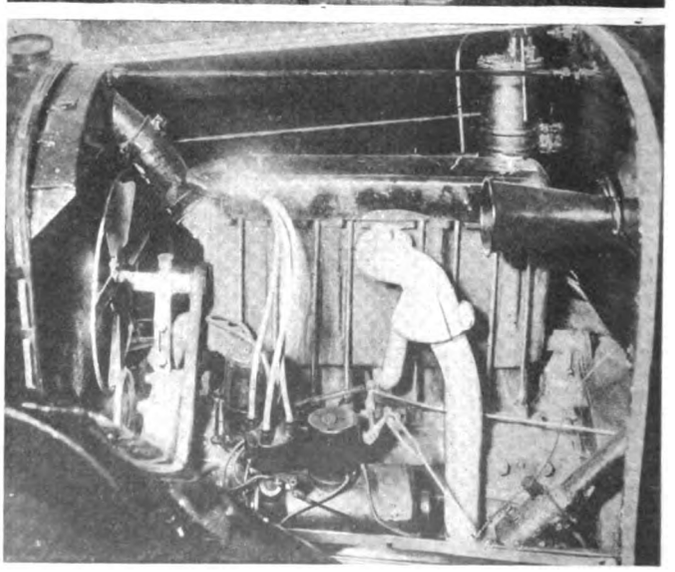
Body Dimensions Increased

An increase in the wheelbase to 114 in. has permitted an increase in the body dimensions. The rear springs are 8 in. longer than formerly. An entirely new design of radiator is used, somewhat higher and narrower than the previous one and of reinforced double shell construction permitting ready removal of the core. It is mounted on trunnions permitting it to adjust itself to any weaving of the car frame. Its cooling capacity has been increased and the shell is nickel plated.

In 1918 the Grant will be offered in five bodies at the following prices:

Five-passenger touring car	$1,055
Three-passenger roadster	1,055
Five-passenger detachable Sedan	1,350
Five-passenger all-weather Sedan (Springfield type)	1,595
Three-passenger standard all-weather coupe (Springfield type)	1,575





Overhead valve engine adopted by the Crow-Elkhart Co. and made in the Crow-Elkhart establishment

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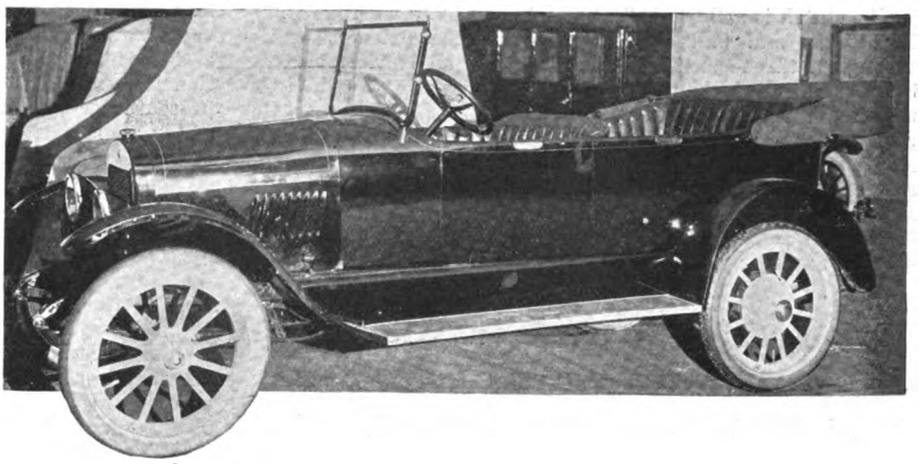
Anderson Has Convertible Sport-Touring

Gives Both Two- and Five-Passenger Bodies

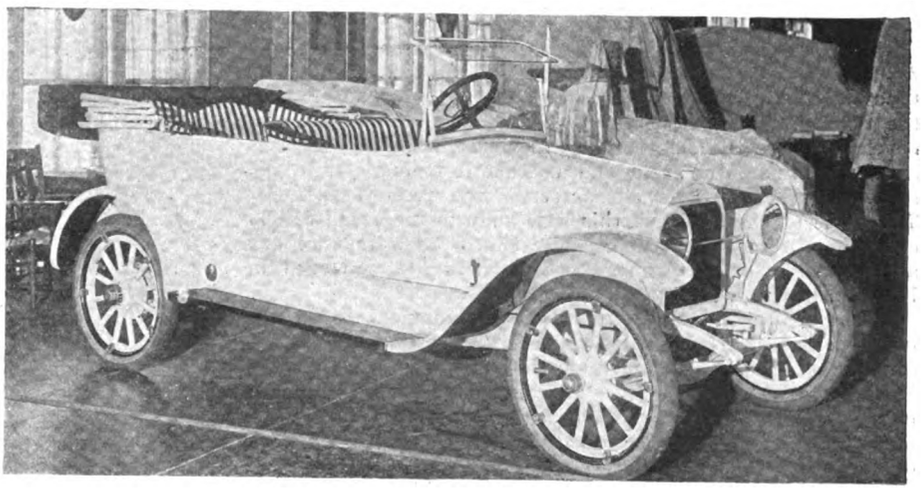
THE Anderson Motor Company of Rock Hill, S. C., has a new car at the show in the shape of a convertible sport model which may be transformed from a roadster to a five-passenger model. The rear compartment can be closed over, thus forming a rear-deck roadster, or when it is opened it uncovers a rear compartment which allows of three additional passengers. This convertible model comes in two styles, one with divided front seats and the other with a solid front seat and entrance to the rear compartment through a door at the rear on the right side of the car. The convertible feature of the car is patented by the Anderson company.

The convertible model with the rear door is a larger type than the one with the divided front seat and is known as the De Luxe. The engine is larger in this model, being the new Continental 9 N, 3½ by 5¼ in., six-cylinder type. The other features of the car are similar to the standard Anderson product. The clutch is a Borg & Beck, the transmission is a three-speed selective and the rear axle a Columbia.

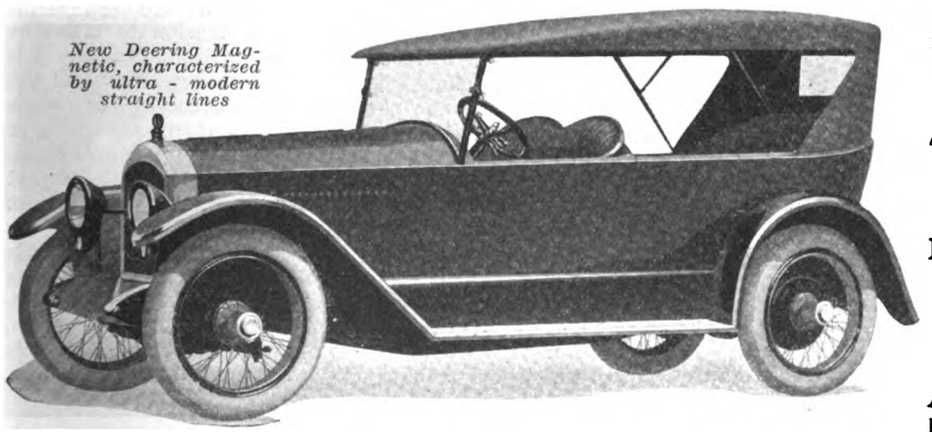
One of the interesting features of the De Luxe convertible is the method of top adjustment for the roadster. There are two pillars which are concealed in the body just behind the front compartment and a curtain top which pulls over the front compartment on a spring roller. The De Luxe convertible sells for $1,925, the convertible sport $1,465, four-passenger $1,465 and the sedan $2,165.



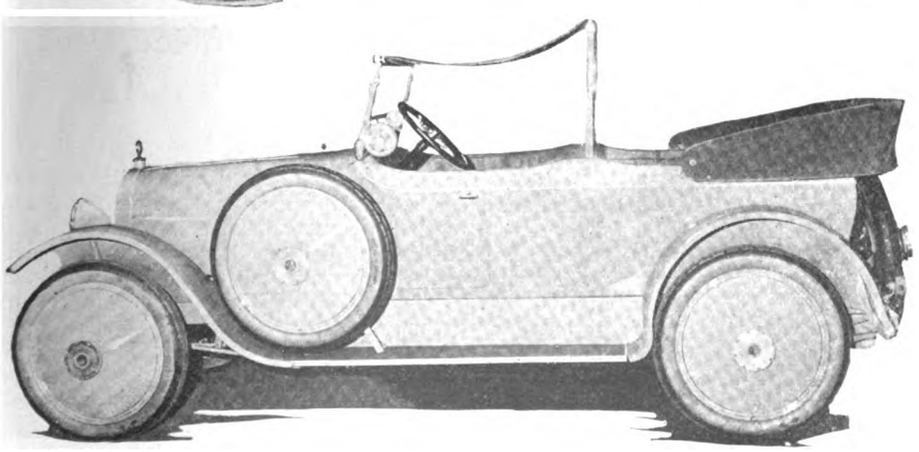
Crow-Elkhart touring car, showing lines of stock product



Moore Thirty, which is one of the new low-priced products at the show



New Deering Magnetic, characterized by ultra - modern straight lines



Anderson is showing a convertible sport model giving both two- and five-passenger capacity

Templar Exhibits Its Product for First Time

Has Four - Cylinder Overhead Valve Unit of 197 Cu. In. Displacement

A NEW car with a new design of overhead valve engine is being exhibited by the Templar Motors Corp., Cleveland. The car is an assembled product with the exception of the engine, which has been designed in the Templar shops and will be built by the company itself. The engine is a four-cylinder product of 197 cu. in. piston displacement and is claimed to develop 43 hp. at 2200 r.p.m.

The powerplant is a detachable head unit with 3⅜ by 5½-in. cylinder dimensions. The valve action is a rocker arm type with the rockers covered by an aluminum housing. The vertical push rods operate in a hollow space which is so arranged that there is a continuous oil vapor from the crankcase surrounding the valve action and keeping the parts lubricated. The valve rocker shaft is part of the pressure oil feed system.

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The clutch is a Borg & Beck single dry plate with multiplying levers and ball bearing release. The drive is taken through a three-speed gearbox operating on New Departure ball bearings to a hollow propeller shaft with two Schwitzer universals and a semi-floating American Ball-Bearing Co. rear axle. The springs are semi-elliptic front and rear, the length being 54 in. in the rear and the bushings are Nigrum oil-less type. The tires are 32 by 4 Goodyear Cord, straight side. The five-passenger and the four-passenger sell for $1,985, the four-passenger for $2,155, and the two-passenger touring-roadster for $2,255.

Owen-Magnetic Refined with New Overhead Valve Engine

Chassis Is 6 In. Longer, Now 142-In. Wheelbase —Improved Body and Better Equipment —Price Raised $1,000

A NEW Owen-Magnetic is on exhibition for the first time. In body work it is probably one of the most distinctive types at the exhibition and carries out to a marked degree the tendency toward the beveled edge. The hood lines are beveled, as are the side rails of the body, and this effect is carried around to the rear end, so that it finishes off in the same angular style as characterizes the rest of the car. The price of the car with this new body is increased $1,000 over the former price, being now $5,475 as a touring car and $6,500 as a limousine. These prices are delivered in New York and include the war tax.

Mechanically the most important development is in the use of a new overhead valve engine. There is also a better control, which more uniformly graduates the intermediate steps in speed control. The new control apparatus also permits of a better braking action by allowing the current of the motor, acting as a generator, to increase the field strength of the electrical driving unit, thereby giving an increased drag on the armature for more severe braking.

Car 6 In. Longer

The new car is now 6 in. longer in wheelbase, being 142 in., as compared with 136 last year. This is made necessary by the rearranged body and larger engine. The new engine is a 4 by 5½ overhead valve six, with the cylinders cast in two blocks of three, the overhead valve construction being carried on a single detachable head which fits both cylinder blocks. The engine is capable of delivering 80 hp. on the brake, according to the claims of the makers, and is manufactured specially for the Owen-Magnetic cars in the Baker R. & L. shop.

Both the upper and lower halves of the crankcase are aluminum castings. The upper half is a ribbed structure stiffened to support the main bearing and to carry the crankshaft load. The latter not only must perform the usual duties but must also support the revolving member of the magnetic clutch, forming a part of the transmission, which acts in place of the conventional flywheel. The pistons are ground and lapped into the cylinder and drive through drop-forged, oval-section connecting rods.

The camshaft and the water pump and magneto shaft are driven from the crankshaft by means of a timing set composed of three helical gears inclosed by the aluminum cover. The valves are tungsten steel, 1⅞ in. in diameter, and are used in connection with the overhead system carried in the detachable cylinder head. They are operated by drop-forged rocker arms and push rods entirely inclosed by cover plates. These rods can be adjusted by removing the single aluminum top cover running the full length of the detachable head.

The exhaust from the engine is led by the manifold to the forward end and the exhaust pipe curves down from that point below the body, thus keeping the heat away from the front compartment. The intake and exhaust manifolds are both on the left side, and the intake passages are arranged so that the single connection to the carbureter is cast integrally with the exhaust manifold and passes through it. This gives a highly preheated mixture and aids in the vaporization of the fuel.

Gasoline is fed by the Stewart vacuum system, and ignition is by a Bosch high-tension magneto. Lubrication is by pressure feed, with the gear pump supplying the lubricant under a head of from 20 to 30 lb. at normal running. The pressure is proportional to the power requirement, and the oil under pressure is taken directly to the camshaft rocker arm bearings and timing gears besides the bearings directly concerned with the operation of the crankshaft. Cooling is by centrifugal pump, the pump being on the same shaft as the magneto. A Sylphon thermostat is located at the upper tank of the radiator, checking the flow of the cooling liquid through the radiator by means of a bypass until the proper running temperature has been reached.

There is no alteration in the electrical system other than in the control unit mentioned. The chassis frame has been strengthened to support the longer wheelbase and is now 8 in. deep, of pressed steel channel section, provided with many stiffening cross-members and gussets. Although the wheelbase is 142 in., the turning radius is but 24 ft. The rear springs are now 61 in. long and are underslung. The standard rim equipment is Firestone straight side, and the tires are 35 by 5 in. cord, with ribbed front and non-skid rear.

Crow-Elkhart Building Own Overhead Valve Engine

Former Type Supplanted by I-Head Engine and Unit Powerplant Replaces Axle Unit

CROW-ELKHART is showing for the first time its revised car employing its own new valve-in-head engine. The engine is a rocker arm type, four-cylinder 3½ by 5, with a counterbalanced crankshaft having the counterweights electrically welded into place. The new car contains several changes in practice as compared with previous Crow-Elkharts. In the former L-head engine a two-bearing crankshaft was used, whereas in the new type there is an additional bearing.

Oiling is now by splash pressure, cooling by thermo-syphon and in place of the three-quarter elliptic springs, semi-elliptics are employed with a frame extension to take the place of the quarter which has been removed. Another big change is the abandonment of the rear axle gearbox and the substitution of the unit powerplant. In place of the clutch formerly made by the Crow-Elkhart company the Borg & Beck dry disk type is being used and in place of a cowl gasoline tank the tank has been moved to the rear and Stewart vacuum feed employed. Other detail changes have also been put into effect such as a sloping windshield in place of the vertical, a curved cowl, lower seats in the front compartment and twelve varieties of color offered as stock. The five-passenger touring car sells for $935, the De Luxe touring at $995, De Luxe roadster, $995, coupe, $1,295 and sedan, $1,395. For $100 extra a complete set of Houk wire wheels is supplied. The upholstery is either in Spanish brown or black long grain leatherette.

Moore Car Is New Assembled Unit

Employs Standard Parts Mounted on a 106-In. Chassis

THE Moore Motor Vehicle Co. of Danville, Ill., has on exhibition a car on a 106-in. wheelbase, selling for $695. It is an assembled product with a Golden-Belknap & Swartz, four-cylinder, L-head engine, disk in oil clutch, Grant-Lees three-speed gearbox, Peru floating rear axle with Hotchkiss drive and 30 by 3½ tires. The car is furnished in either black or brewster green.

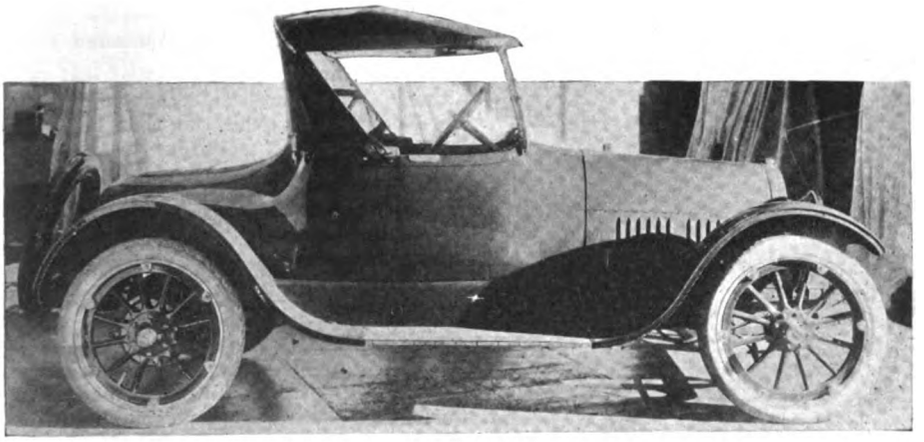
In equipment the Dyneto lighting and starting is furnished in connection with an 80-ampere Willard storage battery. Ignition is provided by Dixie magneto. The car is mounted on cantilever springs.

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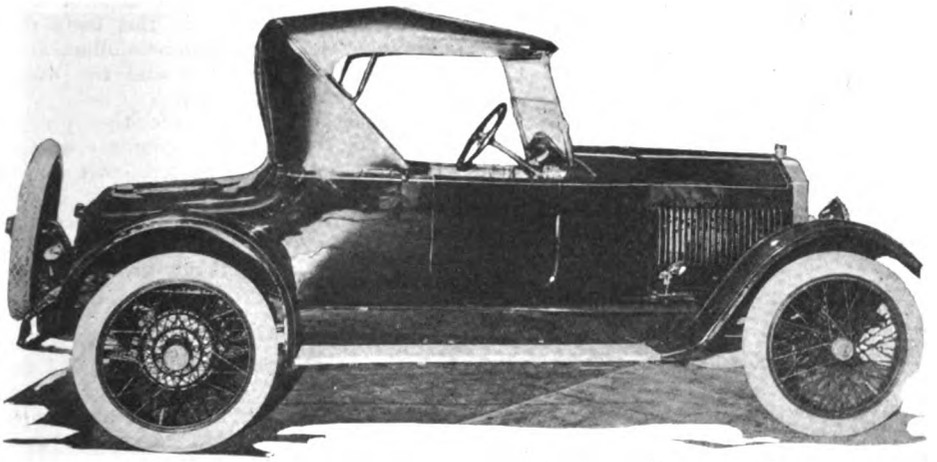
Stock Bodies Uniformly of Good Design

Angular Lines with Flat Sides and Sharp Corners Gracefully Handled—Beveled Edge Type Prominent

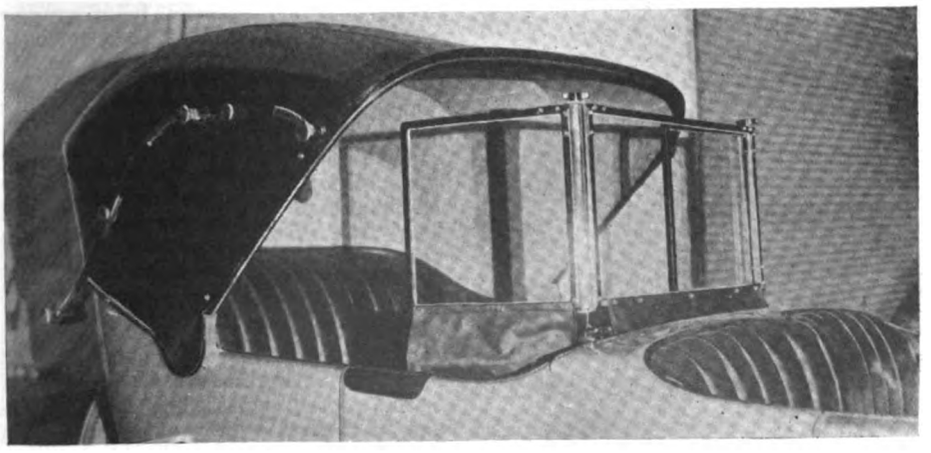
By George J. Mercer



Buick runabout, showing the gypsy quarter



Scripps-Booth runabout, with straight line extending around rear



Mercer, showing victoria top and tonneau windshield

THERE are some real new bodies at the show. These designs are the products of the last few months and represent the latest practice.

Innovations in design are not brought out solely to have something new, but are set in motion generally to meet a real need. Style is arbitrary and carries along until the sameness becomes irksome or is superseded for practical reasons. Not always does the change meet the requirements sought. It is brought into existence to remedy or meet a want, and with different minds working along the objective, different results are obtained until finally the blend of ideas will produce a permanent design that becomes standard.

The opportunity for change is greater in open bodies than in closed, and the runabouts are the most prolific breeders of innovations and consequently they are less standard than other types. These bodies are the most cheaply made and may be experimented with at less financial risk. This is amply borne out by show types, as the following studies will show.

What Drawings Indicate

Figs. 9 and 6 are criticisms of details that mar the design out of proportion to their actual demerit. Fig. 9 is a case of having the radiator too narrow to blend with the body side line. Formerly the radiator was governed solely in size by the requirements of its cooling, but with the flush sided body the body lines converge at this point, and if the width is as narrow as the illustration the converging lines give the appearance of a pencil point, because the middle width of the body is established by the seat room.

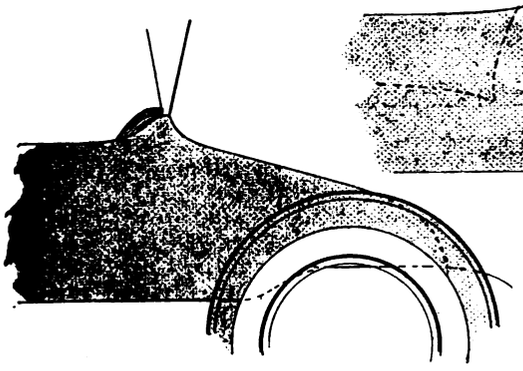
Fig. 6 is another thing that destroys the good general appearance. The guard may be nearly right in every way, but if the space between wheel and guard at rear is more, proportionately, than at the front and top of wheel, it gives a distorted appearance. The guard should circle the wheel about as shown in Fig. 7. It is not absolutely necessary that the lower end curve the reverse as shown, but a guard with this shape certainly looks a better balanced one.

Of the runabouts at the show, the majority were those having a stern or hamper like the photographs of the Buick and others. Usually this hamper

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Good and Bad Points of Body Design

Fig. 1



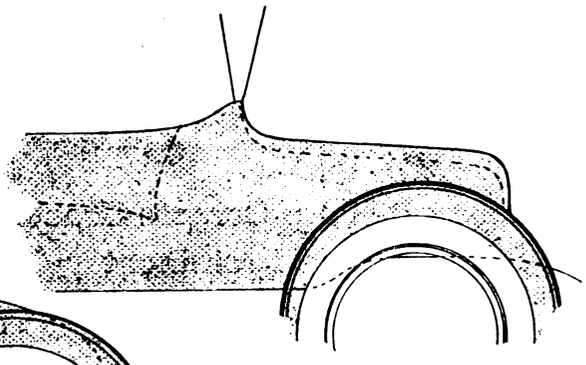


Fig. 2

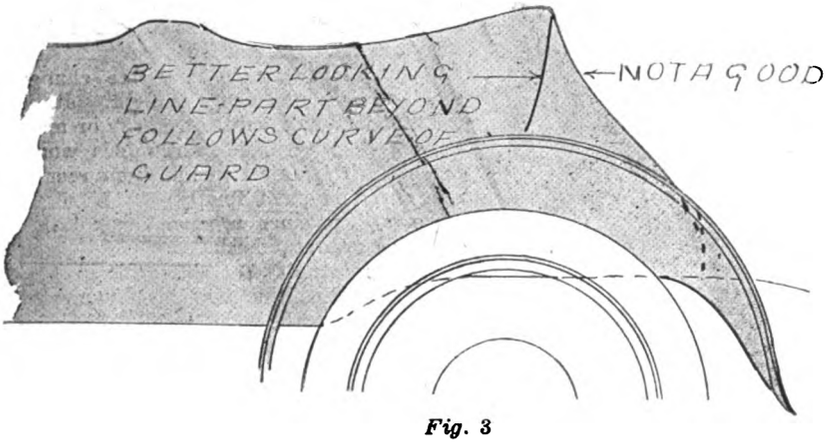


Fig. 3

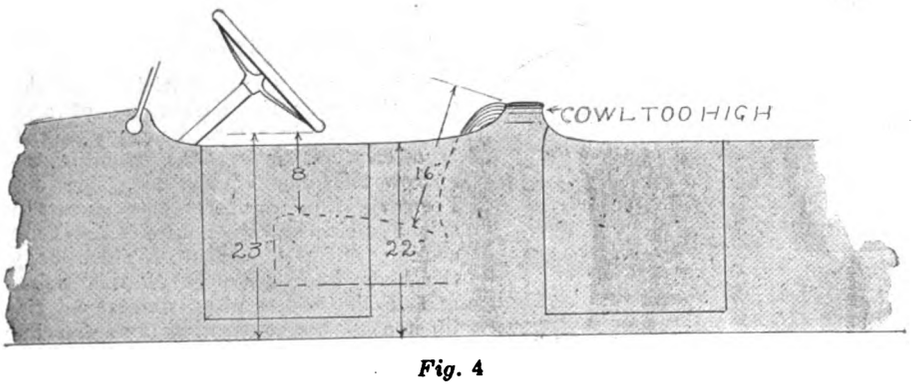


Fig. 4

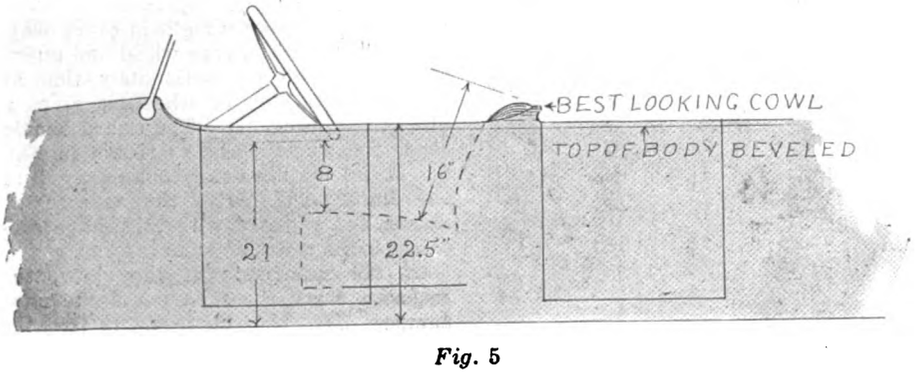


Fig. 5

contains a concealed seat. The making of a good-looking hamper has been a trouble to designers for years. Every possible shape has been tried, and the illustrations, Figs. 1 and 2, show the good and bad of it. The good is when the top deck is nearly horizontal, as in Fig. 2, while the shape as illustrated in Fig. 1 lacks definiteness as well as good lines. The great majority were of the better shape.

Fig. 3 is another illustration in which the good and poor lines are shown together. This hamper is shorter on account of being adapted from a clover leaf runabout. In this, as in the previous illustrations, the poor line is when same has an indefinite character.

Close-Coupled Body in Ascendency

In continuation of the clover leaf runabout, it was noticeable that there were less of these on exhibition than last year. At that time it looked as if this body type had made a permanent place for itself, but in the desire to make them compact, proper space to seat four people was never allowed. The result has been that the sport close-coupled touring body has begun to supersede it. This latter has the advantage of the four doors, it is better looking, the front seats are divided, and it has comfortable seats for four. But on some models the sides are too low and the manufacturers will cripple its coming popularity unless the body sides are high enough to come sensibly above the top of the cushion. Photographs of this body design show the Hudson and Cadillac. One of these shows the low and the other the moderately high side.

A good way to detect the proper height for the side is to compare on the side line the height of the cowl above the body side. If the disparity is excessive according to general practice, the seat cushion must be very close to the floor or the sides will not give adequate protection.

Essentials in Touring Bodies

In connection with the subject of the height of the sides of touring bodies, Figs. 4 and 5 will assist in answering the question that every car owner asks —why a certain recognized body looks better on one chassis than another. What we consider as essential in a touring body is low sides and an inconspicuous top to the driving seat. The second cowl, as shown on Fig. 4, is doomed. In its place has come the combination of the second cowl and the older seat back unified as shown on Fig. 5. To look well it should not come much above the side body line, and the dimensions given on these two illustrations show that in order to end right the starting point or position of the steering wheel is all powerful in getting results.

The second cowl, as shown on Fig. 5, is in most cases the continuation of the bevel edge of the body top. This bevel edge is rapidly superseding the rounded edge, as it gives a lower side appearance and a more distinct line of demarcation; also it makes it possible to continue the

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side line straight through from the hood, when the latter is high enough to start. Several of the photos illustrate this.

Fig. 10 shows how the bevel edge should finish at the hood cowl. Along the body edge the width of the bevel is never less than 1½ in., but if this is continued around it looks too heavy; whereas if lightened, as illustrated, the appearance is wonderfully improved.

While the height of the driving seat back has been minimized to the extreme, the height of the rear seat is retained at 19 in. or over above the cushion top. This high back is always concealed when the top is down, and when it is up the gypsy quarter, which has become increasingly popular this season, will cover all above the body line, which is kept low or nearly horizontal to obtain the straight line through from the front to rear. Several of the photos illustrate these two points.

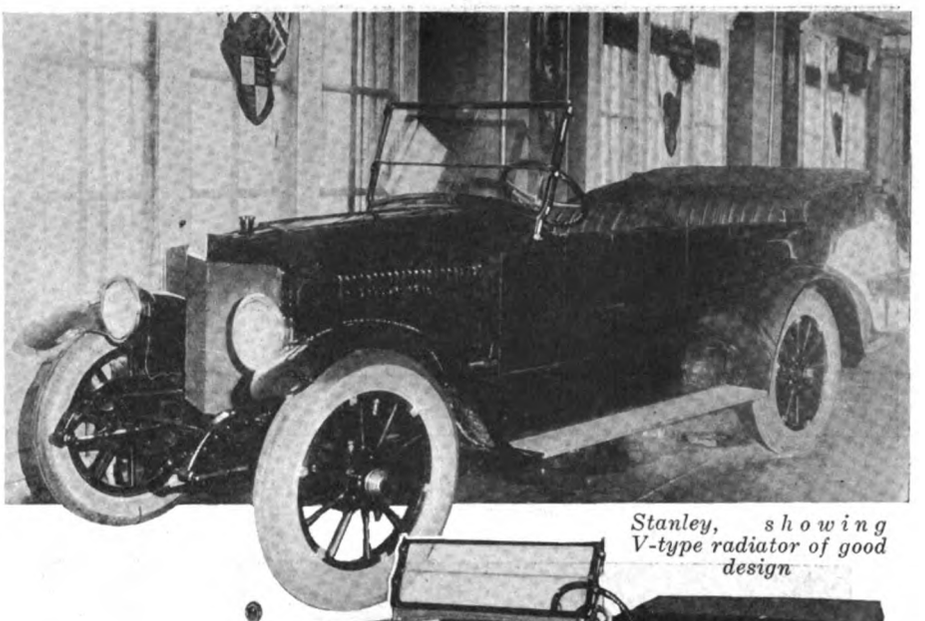
Use of Straight Lines

Fig. 8 illustrates how the straight line can be used even if the hood is slightly low. To continue straight back, this line has from all time been horizontal, but since the custom has obtained of raising the top line of the hood, the hinge line can be raised and still appear horizontal. In fact, on some cars where the frame sets lower than customary at the rear, this hood hinge line has the appearance of dropping toward the rear, and viewed from certain angles seems to carry the impression to the frame and gives the look of a sag at the dash.

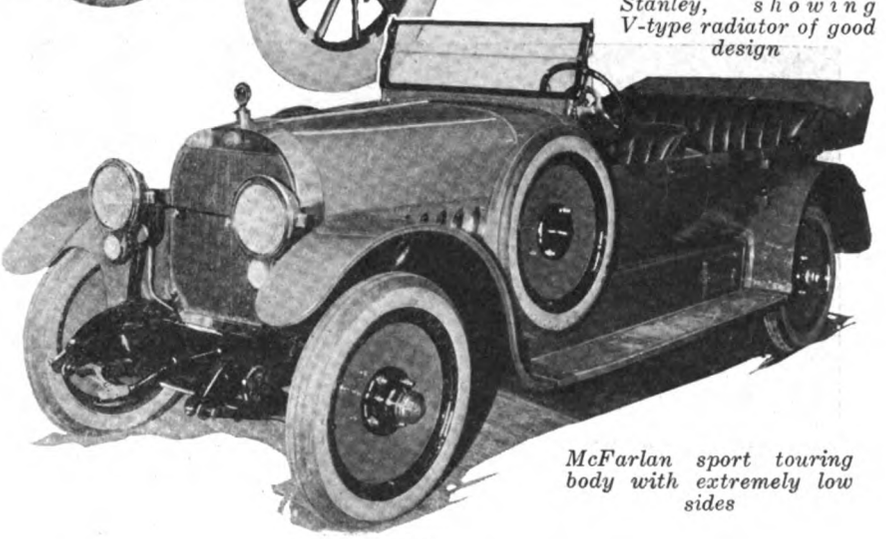
The closed bodies, while not so numerous as formerly, had a better or lighter appearance than at any other show. Figs. 11 and 12 are two illustrations which show how this is accomplished. Each illustration shows the belt molding and the roof. One, that on Fig. 11, shows the roof line straight and the side edges accentuated, the height of the crown being invisible beyond. The part that shows is blackened and the line of the roof center which is invisible from the ground is indicated by a single line. On Fig. 12 the roof is rounded to the center and the total thickness is always apparent. Rounded edges will on certain parts of the body give the impression of lightness, but on a roof it always adds thickness to the looks.

Belt Molding

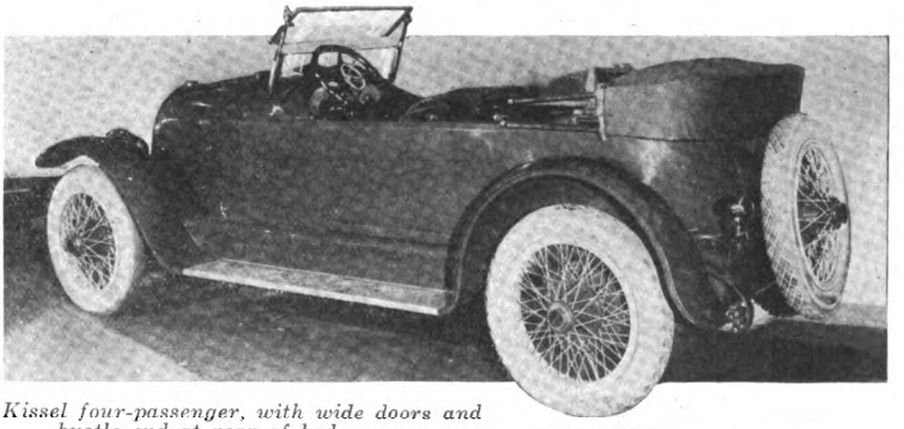
There is another point that is shown in the reverse relation on most of the bodies. The belt molding was shown as Fig. 11, but on a few they were as Fig. 12. The excessively heavy belt is only excusable when a makeshift proposition like a demountable top is put on a touring body. In this case, framing sufficient for the purpose must be added, and without a chance to conceal any of it. But with a properly built closed body there is no reason to show such heavy construction. It serves no useful purpose and detracts from the clean-cut look that might be otherwise obtained as shown in Fig. 11.



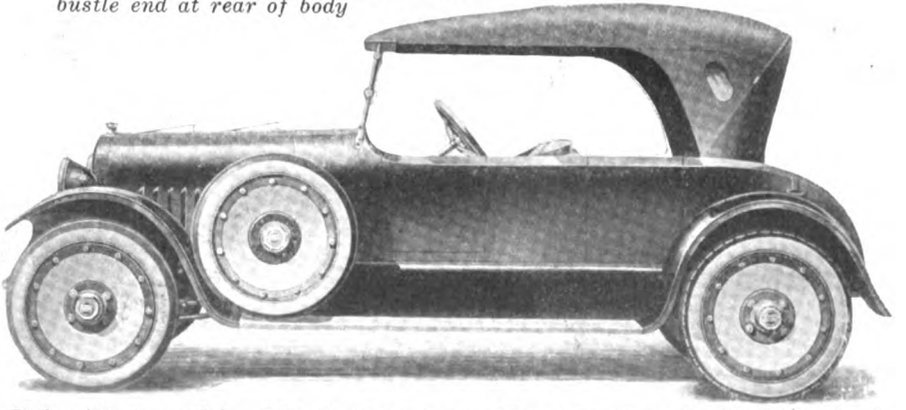
Stanley, showing V-type radiator of good design



McFarlan sport touring body with extremely low sides

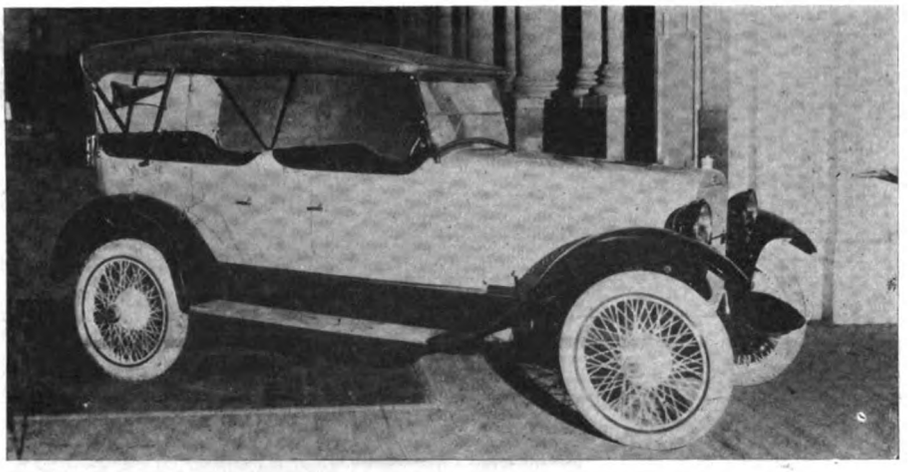


Kissel four-passenger, with wide doors and bustle end at rear of body

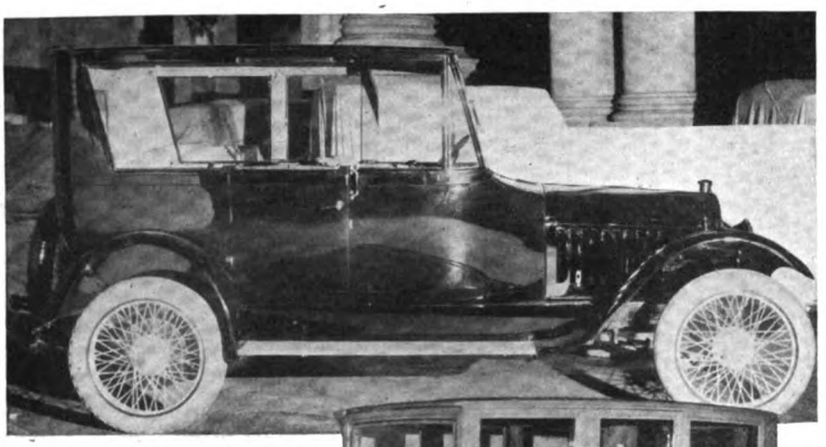


Hal military model, which is given a war-like appearance by its disk wheels

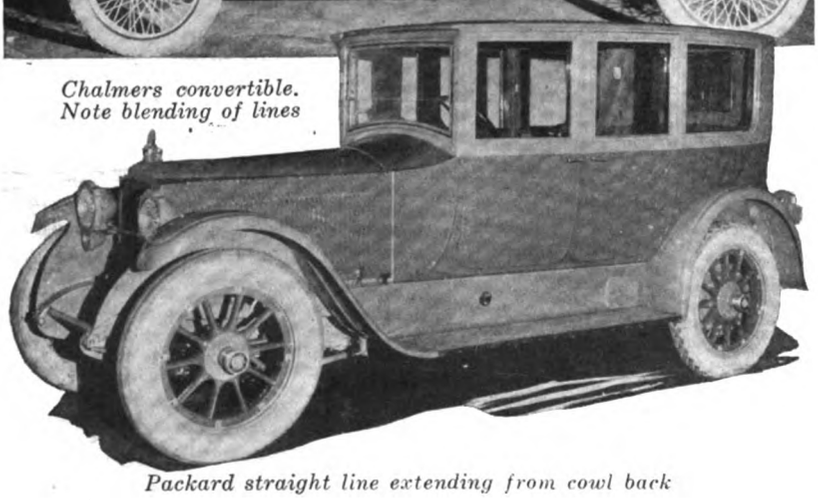
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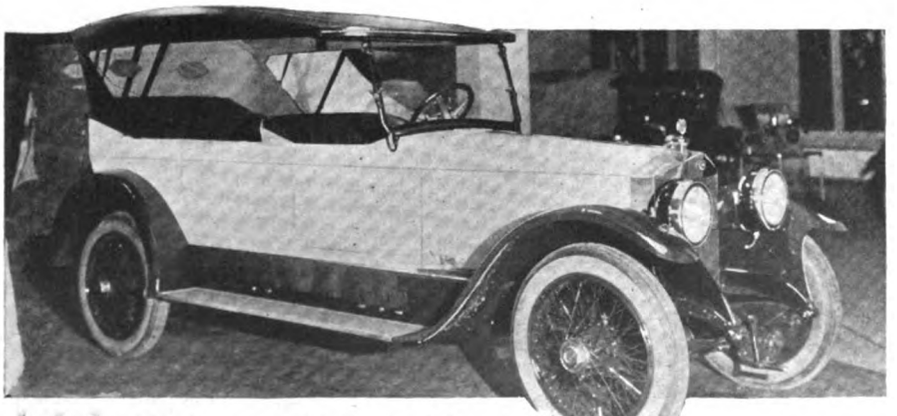
Chandler touring shows outside door handles and wire wheels and narrow long louvres



Chalmers convertible. Note blending of lines



Packard straight line extending from cowl back



Owen-Magnetic, the only cubist body at the show

There were more town car bodies than at any time in the past few years. They were of the brougham-limousine and cabriolet types, and some of the former had square rear corners. In fact, all the town car bodies had the regulation custom-built body appearance.

The windshield height on a town car body varies so much that Fig. 13 is introduced to make clear the needs requisite. The dimensions given are the height for headroom and for vision, and provided these are fairly well proportioned, the top curtain should come as far down as possible so as not to have a tall shield.

The various photographs illustrate as well as the sketches the points accentuated, and in addition some others, like the increased use of the Victoria top. One shows in conjunction with the top a tonneau shield. Good shaped guards are the rule, the moderate crown being the most common. Good guards make a lot toward the appearance of a car; especially is this noticeable when the front guard in addition to being well shaped is of generous length before attaching to the runningboard; also the slight outward curve at the bottom of the rear is an advantage.

The slanting windshield was the rule. There were few cowl lamps. Many of the touring bodies had a sensible bevel top body edge and a moderate height to the back of the driving seat. These bodies were of metal and showed good workmanship. The total absence of molding was another feature, and the doors had either the overlap panel or were flush, and there seems to be a reverse move toward the outside door handles. This is probably due to the trouble of locating the inside handle from the outside, as well as the objection that many have to the leather pad neces-

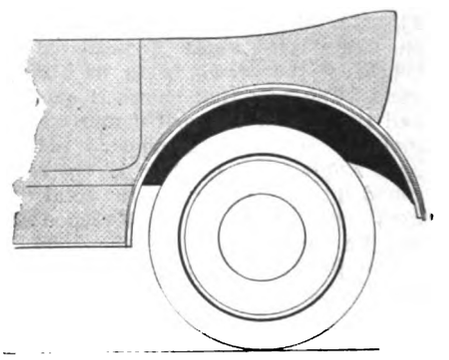


Fig. 6

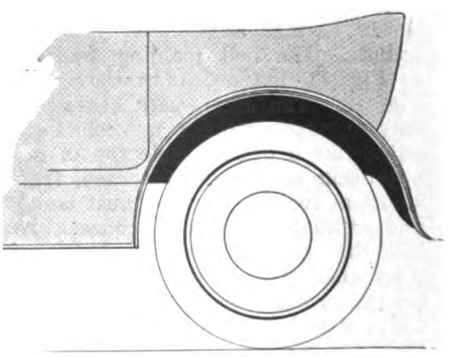


Fig. 7

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sary for closing the door when there is no handle outside.

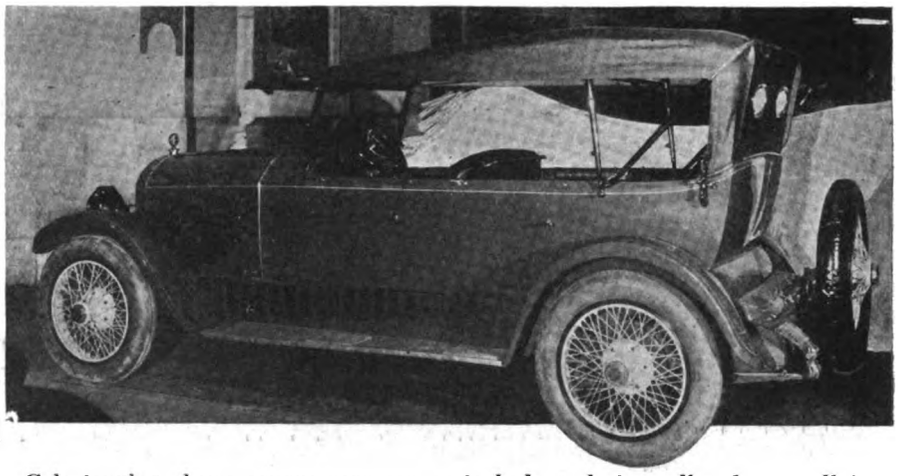
At the Astor salon there were bodies with the handle at the top of the door. Wheels or tires were placed with a very few exceptions at the rear of the car. This is good practice as it adds traction where needed. Both wire and disk wheels were common; wire wheels particularly were used with all the different kinds of bodies.

The trimming design on these touring and runabout bodies was almost exclusively the plain pleat. Leather was used principally. Some had imitation leather and a few had Spanish leather, while a few used a plush cord. The extra seats were of the floor flush type, and a lavish display of paint combinations was to be seen. Some were not good by reason of the shade or the combinations. The blue that looked almost green in the electric light was a good color, especially when relieved with white or yellow wire wheels. The bronze green, with red wheels, was good, as were many of the grays, coffee color and brown and yellow. Many of the light shades looked sickly because of the combination. The stripe line around the body below the top was a failure in most all cases. A double yellow line on a green body and a red line on a bronze green were the best illustrations. Some had the line too heavy, and altogether it seems that the putting on of this stripe is a delicate task.

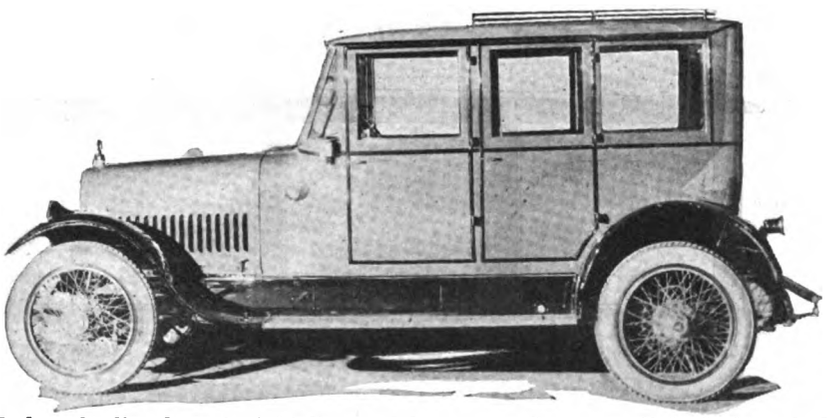
The closed bodies were equal with the open in presenting color schemes, with this advantage, that the combinations were more uniformly successful. There were the usual number of black bodies, but colors were plentifully sprinkled about. The trimming design on closed bodies was generally the plain pleat. Some had the plain design, and there were others that had the plain effect divided. The material was more somber in design than formerly. The medium light cloths were most popular. These were used without marking for the body of the job and the headlining and a striped design for the seat and back.

In some cases the plain cloth was used throughout, and also the figured material was used for the lower part up to the waist line.

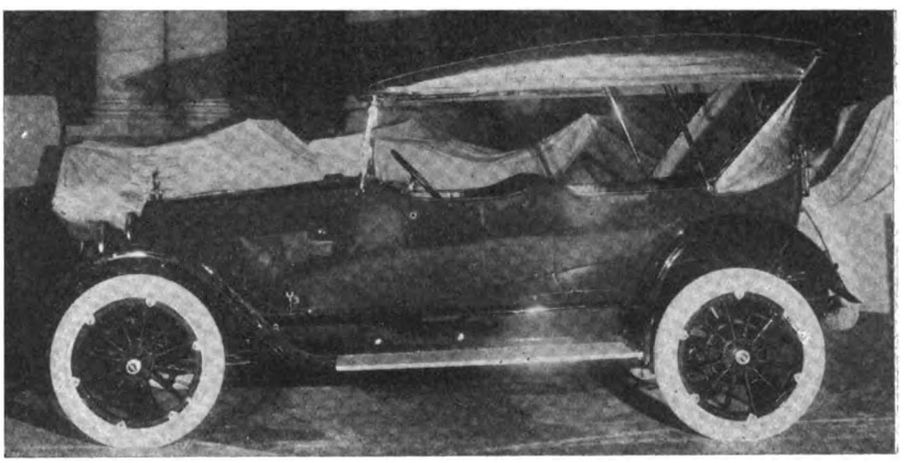
The appointments were gun metal or gold or dull silver. The toilet cases were elaborate in design. There was a



Cole touring shows square rear corner to body and streamline from radiator



Hudson berline has straight line and luggage rail on top, light looking body



Chevrolet shows tires at rear

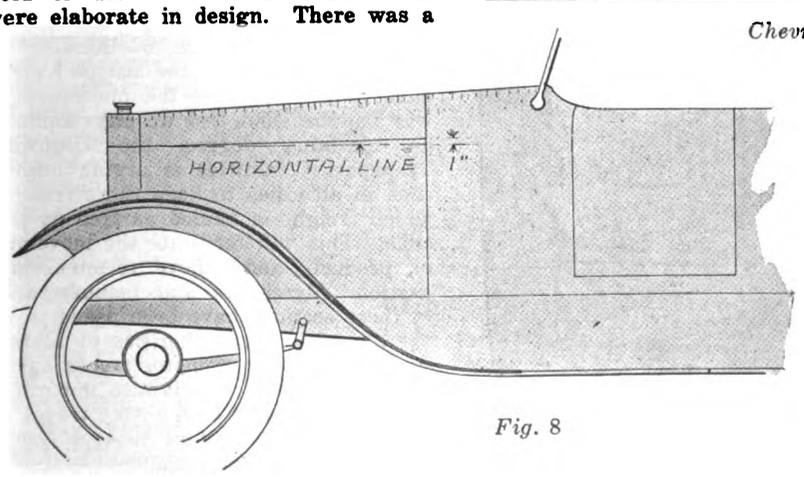


Fig. 8

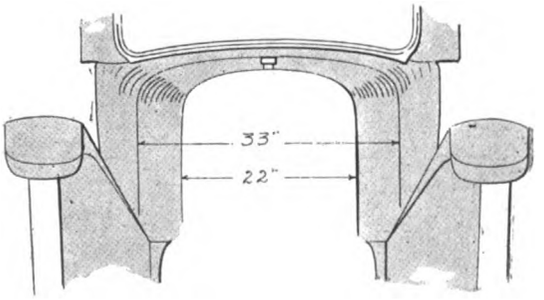


Fig. 9

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Modern Body Lines Analyzed

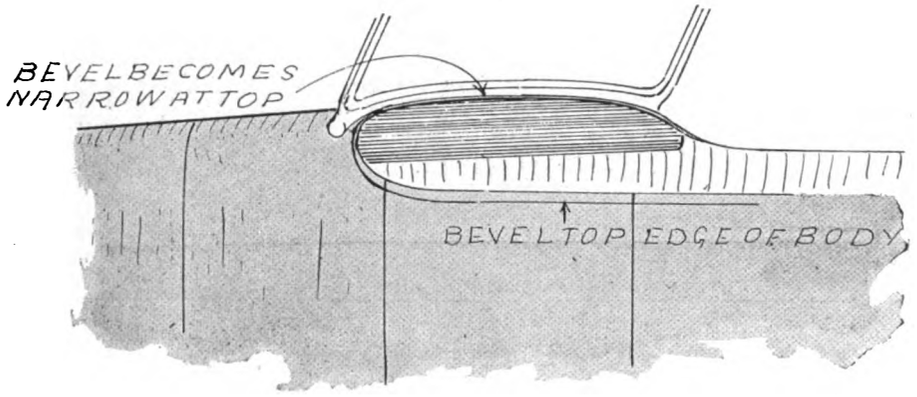
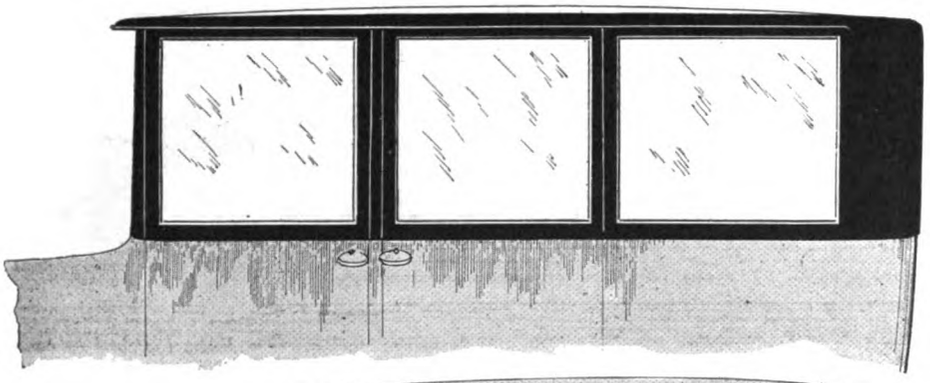
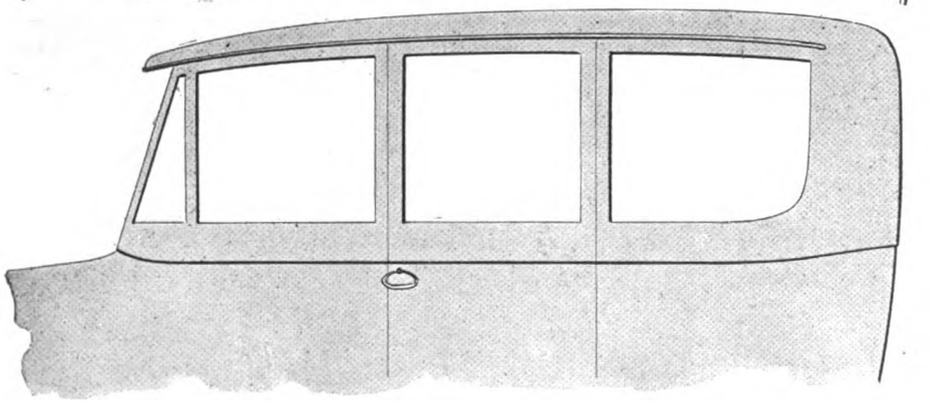


Fig. 10





Above—Fig. 11. *Below—Fig.* 12

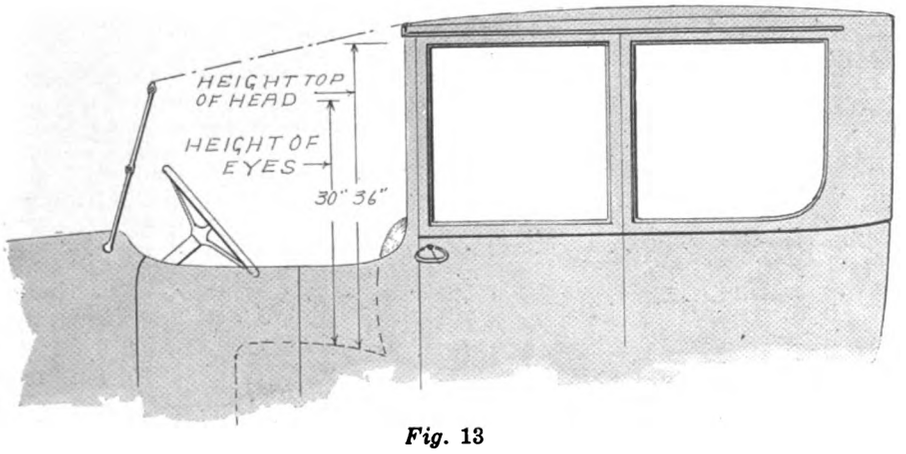


Fig. 13

total absence of interior inlaid woodwork, and there were several bodies without dome lights, the corner reading lamps set in flush but not concealed being the only light to be obtained. There were both the telephone and dictograph used and the pull-to handles were of good size, of metal and sensible for use.

As before stated, the closed bodies had a lighter look than in former years; there was a total absence of the large round roofed cumbersome bodies formerly so common. The berlines were of the divided sedan order. Sedans seem to be the popular body and the convertible with the flapper door were similar to those of last year.

Altogether the exhibit looked good because it was good. Designers of bodies that did not possess the merit that they should, had a splendid chance to see their mistakes, because there were good body designs of every type that were well worth using for models.

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Texas Has 194,740 Registered Vehicles

AUSTIN, TEX., Jan. 5—During the first five and one-half months, up to Jan. 1, 1918, that the State Highway Commission was in existence there were registered a total of 194,740 motor vehicles, including automobiles and motor trucks, and 3579 motorcycles. The number of dealers in the State is 3094. Licenses were issued to 12,696 chauffeurs, of whom about 25 per cent are in San Antonio. In the registration of motor vehicles there is no separation of automobiles and motor trucks. Included in the motor trucks are those owned and operated by the United States Army and other departments of the Federal Government, but no registration fee is charged for these. It is difficult to give anything like a reliable estimate of the total number of motor trucks in the State but there are probably ten thousand or more in operation. It is known that many automobiles and other motor vehicles have escaped the registration law. It is believed that if all were registered the total number would be close to 225,000. According to unofficial reports made by the county clerks of the different counties several months ago there were at that time more than 225,000 automobiles in Texas.

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Asks Cities to Eliminate Snow Troubles

WASHINGTON, Jan. 6—Because the severe snowstorms of the last two weeks have greatly affected the movement of war supplies and tied up city traffic to an alarming degree, the Highways Transport Committee is urging authorities in all cities to keep the streets on which freight is hauled as free as possible. This will facilitate the movement of products and relieve terminal congestion. Merchants and manufacturers in these sections have been asked to cooperate with city authorities by loaning men and wagons or motor trucks during such emergencies. It is also imperative that main arteries of highway travel between industrial centers be kept free of snow so as to permit traffic.

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British Aviation Engine Inspection

Part I

1—Chart scheme of complete system in use

2—Best methods of employing women in work

3—Routine for rejection by government men

4—Plan of using approved firms is favored

5—Advantages of inspection to companies

By Lieut.-Col. R. K. Bagnall-Wild

EDITOR'S NOTE—*The British Government is reputed to have the most rigid inspection of any. Lieut.-Col. R. K. Bagnall-Wild, who has charge of the inspection of British aeronautical engines, is also president of the British Institution of Automobile Engineers for* 1918. *In his opening address to that body he analyzed the reasons for and methods employed in government inspection. While the system may be criticised, it is thorough and worthy of study.*

IN considering inspection we have first to ask the question, Why inspect? An inspecting staff is expensive and is usually classified as non-productive labor; therefore, it is obvious that the greatest possible care must be exercised in restraining those responsible for inspection from unduly inflating their staff beyond the minimum requirement.

It will, perhaps, help to realize why inspection is necessary if the various classes of men employed in production are compared. Omitting laborers, there are in average engineering works a majority of workers, both male and female, who, although graded as mechanics, are practically repetition workers. It is not necessary for them to have the training and the brain knowledge of the higher grade engineer. The further we progress with the introduction of automatic machines and a general system of repetition work, the more shall we be able to use less highly skilled labor. A certain proportion of the employees in an engineering firm must necessarily have skilled knowledge in tool setting, gauge making and the like, but they will not necessarily have general engineering knowledge. Even the more highly skilled men, who are employed as foremen over these various classes of labor, only require knowledge in their particular branch, from a production point of view. But from an educational point of view, all these grades, from the lowest to the highest, must naturally, if they wish to progress, obtain the knowledge necessary for promotion, and it is our duty to see that they do progress. This institution is in a position to grant unique facilities for improvement and advancement.

Start on Drawing

There is yet another branch which must be considered before the necessity for inspection can be clearly realized, and that is the design and drawing room. The engineer puts forward a design, the drawing room works it out in detail. Those drawings should be reproduced as shop drawings, showing the various processes for each part and clearly laying down the limits which are to be worked to and the material from which the parts are to be made. Starting with materials—it cannot be expected that the producer, *i.e.*, the mechanic, should have the knowledge required to determine whether that material is in accordance with the specification or not, and further, it is impossible for him, should the material be slightly above or below the limits of the specification, to determine whether it is safe to employ that material for the purpose for which it is intended.

The designer may justly be entitled to expect that a finished article is in accordance with his wishes, otherwise he could hardly be responsible for its correct functioning. Some department must, therefore, exist to take this responsibility, and an inspection branch for this purpose is essential. It is obvious that if incorrect material is allowed to go into the machine shop it will result in either scrap in the machine shop, or scrap when the finished article is put on test, or subsequent early failure. Undue scrapping in the machine shop upsets the steady flow of production—failure on test is excessively costly; the failure of one part may often lead to the scrapping of a considerable portion of the whole. For example, steel bar must be inspected to see that it is in accordance with the specification. Say it is nickel chrome steel bar, it might not be economical to machine it in its final hard heat-treated condition; it must, therefore, be received in the normalized state. Inspection alone will determine whether the heat treatment given for the finished article will produce the physical properties required by the designer. The bar must also be tested to show that when heat-treated the desired physical properties can be obtained.

Machine-Shop Inspection

Looking at inspection from the machine shop point of view, the workman desires output, because it gives him more money; the foreman desires output, for therein lies his chance of promotion; the production manager is obviously, if I may say so, the enemy of the designer, it is only human nature that this should be so. The directors and shareholders of a company must, therefore, protect themselves from bad workmanship, the reputation of the firm must be upheld and the finished article must be as good as is possible, having due regard to prime cost. Inspection alone will insure this. This need only be selective inspection in many cases, the main point being that a check must be kept on shop gages, tool setting (especially with automatics), etc., and any departure from drawings at once located, checked and nipped in the bud. If, for example, errors are allowed to creep in in the earlier processes, when there are ten or twelve operations, perhaps, in making one piece, it is quite clear that the cost and time of the remaining processes will be saved if the error

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is checked in the earlier stages; consequently inspection is needed between each operation.

I could give a whole number of cases where I have found firms completing ten or twelve operations, and then having to scrap the part because the first operation was wrong, simply because the firm had no process of inspection of its own.

Spare Parts

Again, inspection of a finished part is absolutely essential prior to assembly of all the parts into the whole. A well-organized shop with a proper system of inspection results in a saving of time and money in erection. In many cases where the viewing of the output of the machine shop is slack, or is lacking, erection practically becomes "hand-fitting," interchangeability is entirely lost and spare parts impossible to fit. In other words, no two articles are alike. An organization, therefore, is required on the following lines: A small inspection staff to deal with all goods in the receiving or inward store (nothing being allowed to go into the machine shop unless bearing the stamp of that Inspection branch), and a complete system of process inspection in the machine shop and a view room between the machine shop and what may be called the erection or main store, so that nothing can go out of the main store to the erection shop unless it has been checked, stamped and certified as reasonably likely to be capable of being built into the whole without undue fitting and, also, to be able to correctly fulfil its functions.

Another small inspection staff is desirable in the despatch store to see that packing cases are adequate and correctly built to design, if any, and also to see that bright parts and so on are properly greased and every care taken that the goods are packed in such a manner as to be likely to arrive safely at their destination.

Turning now to the purchaser. The average purchaser is content to take a firm's name as a guarantee that the goods supplied are in accordance with the order. The purchaser usually protects himself by seeing that the articles are externally correct and function reasonably in accordance with his requirements.

Government departments go a great deal further than this. In the first place they are responsible for public funds and have to insure that value is obtained for money expended. In many cases the requirements may be of a special naval or military nature of which the contractor has little or no knowledge, and it is not to be expected that he can have other than a mere passing acquaintance with the working of a machine or parts under service conditions.

Inspection, from this point of view, may be divided into two main classes, namely, final inspection and detail process inspection. The former is possible in many cases, such as, for example, in the purchase of a lathe. Detail inspection is essential where the nature of the material is of vital importance in the functioning of the whole, as occurs where the factor of safety is low.

Inspecting Material

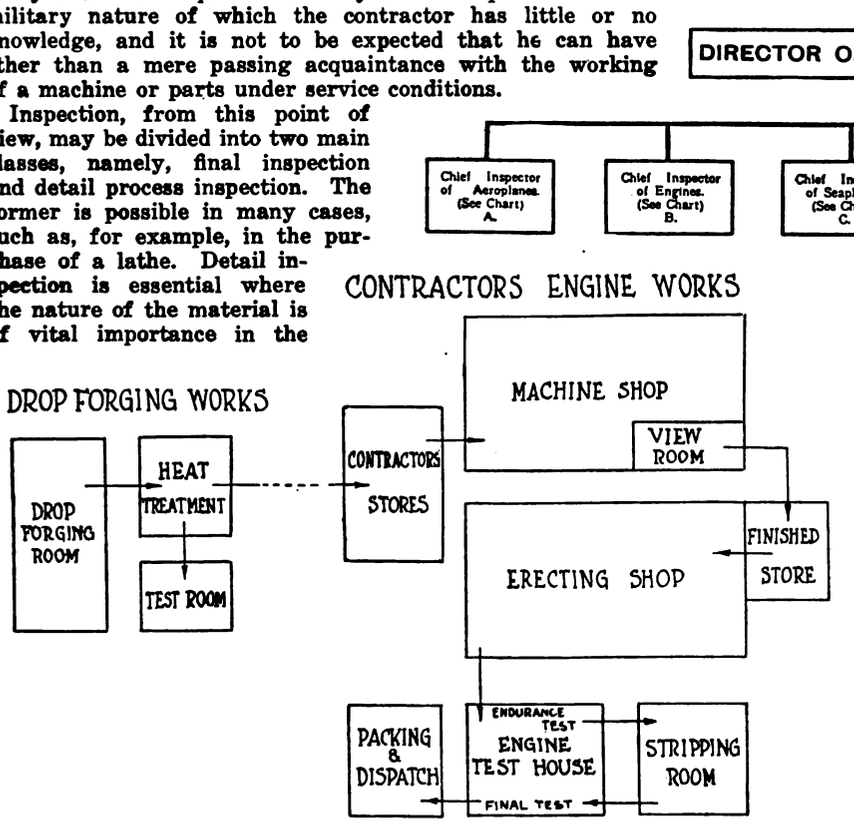
Detailed inspection during manufacture should not be necessary where a firm has a good view room of its own. In this case material must be inspected on or before entering the plant: steel should be inspected where it is made, namely, at the steelmakers' works or at the rolling mills. Any faulty material is then at once thrown out, or should be, and the steelmaker has an opportunity of tracing the trouble to its source. Freight to and from the steelmakers' and contractors' works is saved; in fact a double journey is obviated, as faulty material would probably be returned to the maker by the contractor. The inspector should exercise general supervision to insure that no parts are made from material which has not been so passed in the plant.

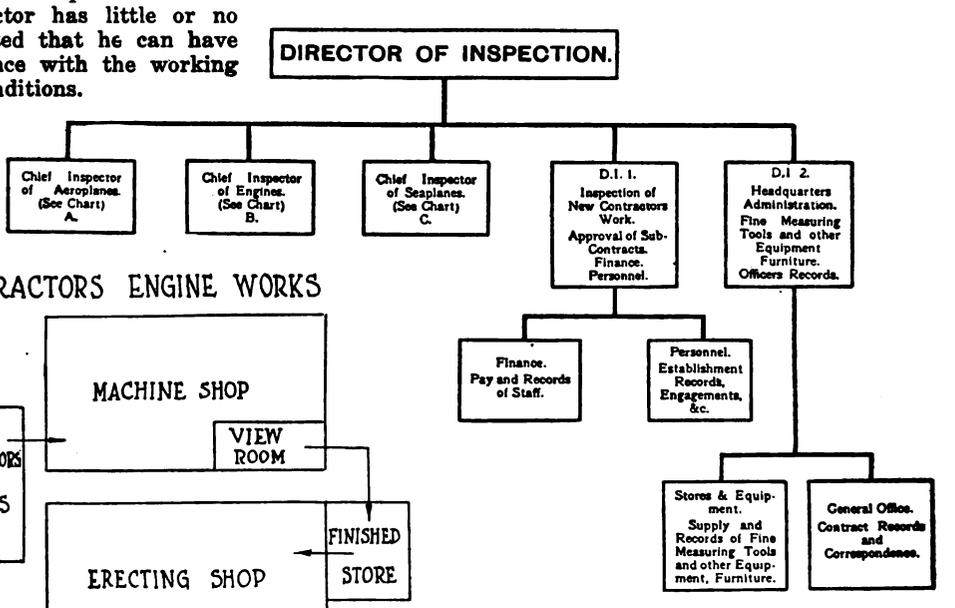
The next place where the inspection department picks up the thread is where parts have left the machine shop, and here again the amount of inspection necessary entirely depends upon the firm. As a typical example we may take the case of a good manufacturer who is, say, erecting 80 per cent of his products into finished machines and sending away the remaining 20 per cent as spares; it would probably only be necessary for the government inspector to inspect the spares, the machine itself being inspected after erection. If a running test is involved, this is carried out under the supervision of an inspector and careful examination is made upon conclusion to see that no parts are unduly worn or fail in their action.

Fig. 1 is a diagrammatic representation of an ideal inspection arrangement in connection with the production of crankshafts.

Departmental Co-operation

In considering the question as a whole, I must emphasize the necessity for a dovetailing of, and co-operation between, the various departments. In the first place the drawing room and inspection branch must come to a mutual agreement before the issue of drawings to the shops. Experience has shown that drawings as produced are very seldom clear or suited for commercial production. In some cases they even lack limits entirely and, where limits are included, there is a tendency in most drawing rooms to unduly tighten down





LEFT—*Fig.* 1. ABOVE—*Fig.* 2

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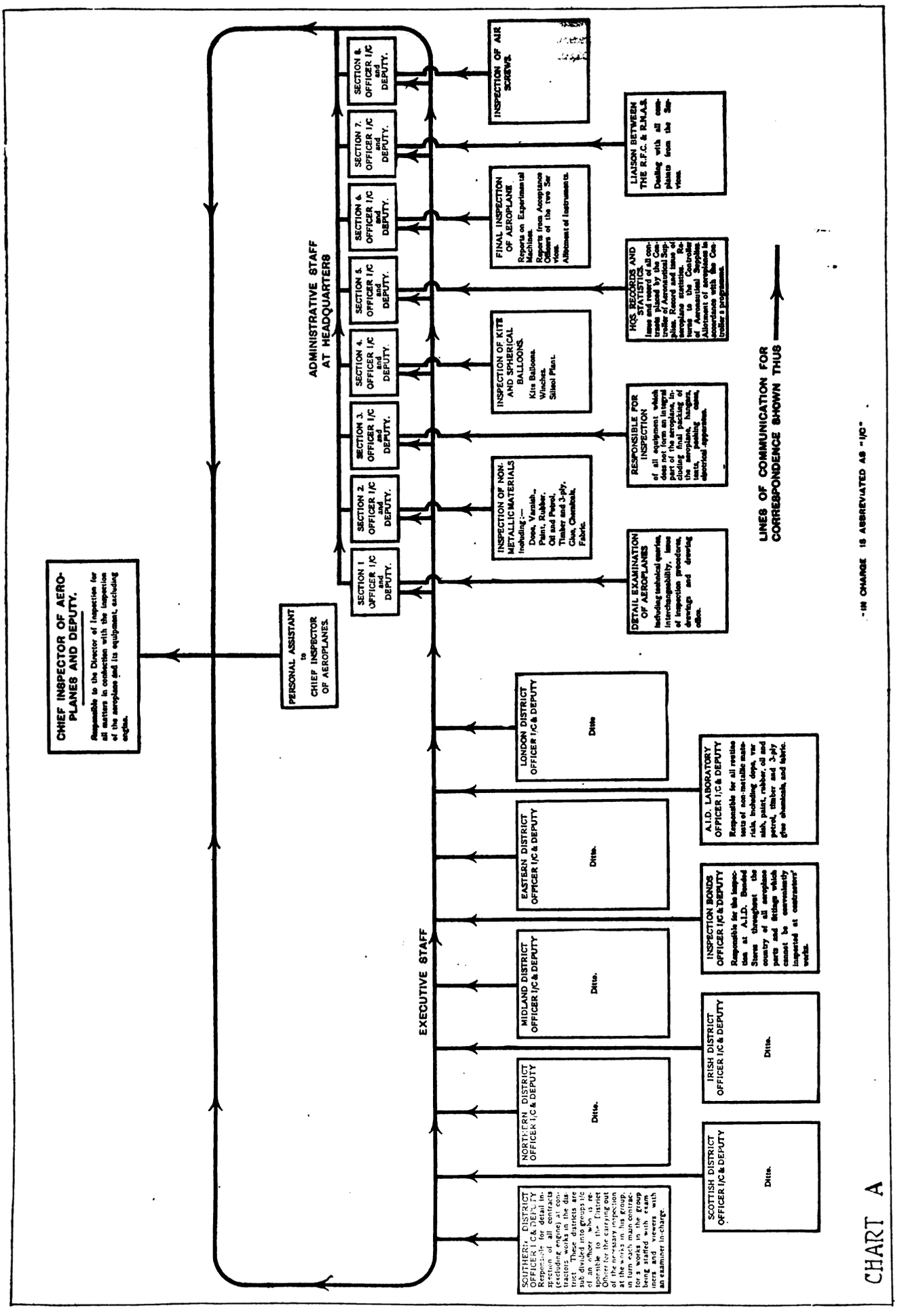


CHART A

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to an entirely unnecessary degree. Fine limits are required for interchangeability in some cases, but apart from erection considerations are not, as a rule, essential. For example, if two parts are to be bolted together it is, as often as not, quite unnecessary to make the bolts a push fit with something like half a thousandth limit on them. So long as there are two locating points, which may be either locating pins or push fit bolts, the remaining bolt holes may have even a thirty-second clearance on small diameter.

It is extraordinary how long it takes for drawings to reach their final form. The first 50 or 100 are completed, but modifications continue to flow in. It is only by close co-operation from the start that production can reach a proper basis at the earliest date.

Well-Organized Inspection Service Necessary

A great deal has been said about the discretionary powers of the inspector. Government inspectors, formerly, were well known as rigid adherents to drawings. They extracted the last pound without any reference to the effect on production and without using any common sense. This is true in some cases, where the inspector has the necessary knowledge, but not the initiative, to take the responsibility, probably from lack of encouragement. The most dangerous man, on the other hand, is the man who thinks he knows everything and takes too great a burden on his own shoulders. There must, necessarily, in a well organized inspection department, be a head with subordinates under him to control the action of inspectors, and it is but logical that first of all the men who actually visit the works should be given a certain amount of power, those controlling them should be given more and, finally, the head of the department should have full powers.

Fig. 2 and its accompanying charts A, B and C illustrate the organization of a well-known inspection department. It is divided into three main headings, and each of these is again sub-divided into sections, each section being given a different class of work. It is impossible to expect one man to know every branch of engineering; by sub-dividing in this manner it is possible to employ specialists in each particular branch.

I should like to touch on the possibility of employing women on inspection. I have had some very considerable experience of their work and I find they are quick to learn elementary details, *i.e.*, they can be taught to use micrometers intelligently, and naturally easily manage the "go" and "no go" gage. The woman with such a training cannot, however, be given discretionary powers to any extent.

The most economical way to employ women is to place an inspector with discretionary powers over a gang; all cases of doubt are put to him and the rejections carefully scrutinized by him, in order to ascertain why they are necessary. Where the amount of work is large and numbers of girls are employed the rejections should be gone over by a specially appointed inspector, as many of the parts rejected by the women viewers can be made use of for production purposes, either by alteration or by selective assembly.

With reference to women employed on, what may be called, routine work inspection, it is found that some show greater aptitude and greater intelligence than others, and these certainly make excellent inspectors. I can say, however, that with one or two exceptions, I have not yet found them to approach a man who has done his 5 years in the shops and been through a technical college training. It can hardly be expected that this should be otherwise, but it would not be surprising if at no very distant date we shall find women competing in engineering.

Handling Rejections

It is very necessary to arrange a proper system for dealing with rejections. When government inspection is in force I consider that the following procedure should be adopted:

The junior government inspector rejects. This is confirmed by a senior member of the staff, who then labels the part to show the cause of rejection, and he should also express an opinion as to whether the part could be returned to the shops for rectification. The part should then be passed back to maker's viewers, who, if they are in agreement with the government inspector, will take action accordingly; if they are not in agreement the part should then be put on what I term a "pending table" and a higher authority called in for consultation. In a large inspection organization this is arranged for by the appointment of district and traveling officers.

The main object in instituting such procedure is that the reason for rejections may be known at the earliest possible moment to the producer, so that the cause may be removed.

Occasional rejects are not, of course, nearly of such importance as, what I would like to term, bulk rejections. Tools or jigs may become worn and parts may start coming through outside the possible limits. In these cases the earliest possible action is obviously required, to avoid a hold-up.

I recently had an opportunity of studying the French government system of inspection, and it is interesting to note that it is almost exactly on similar lines to that adopted by me. It is not astonishing to note that the number of the inspection staff is in some cases rather less than that found necessary by me in England, as this is readily accounted for by the fact that labor is not diluted to anything like the extent it is in England.

The following brief résumé of the inspection system in this particular industry in France is, therefore, of interest:

The fundamental principles of inspection adopted by the French are almost identical with our own, but their method of applying these principles differs in many details.

The labor is almost entirely undiluted and of a very high average skill. At the works visited very few jigs and labor-saving devices were employed, the individual skill of the workmen being trusted to, with apparent success, as they do excellent work without nearly so much assistance as we give our labor in England.

Ease of production seems to have been most carefully considered by the designers. Details would appear to be designed, primarily, from a manufacturing point of view. It was particularly noticeable that the woodwork was often more elaborate than in English designs, while the metal work was cut down to the minimum.

The number of employees relative to the size of the works appeared to be much higher than in England.

Officer in Each Plant

An officer, with a certain number of subordinates, is stationed at the plant of each main contractor. It is his duty to see that only approved material is used and that each detail part, when finished, is viewed and stamped if approved. Components are again viewed, in many cases several times at various stages, to see that the workmanship is satisfactory and that approved details only have been used. Finally, the assembly of components into a complete machine is inspected at several stages, before the machine is passed, as we do in England.

Material is supplied by approved firms only, at most of whose plants there are resident inspectors, more particularly where high tensile steel or tubing is produced. The majority of the mild steel and practically all timber are inspected on arrival at the main contractors' plants. Finished details and accessories, where sub-contracted for, are supplied only by approved firms and inspected by either resident or visiting examiners.

The practice of returning to a sub-contractor any material which had not been approved before despatch to the main contractor is always strictly adhered to, except in cases of extreme urgency. Timber is usually inspected at the main contractor's plant, but frequently test pieces are taken and sent to headquarters for physical tests. These are, however, considered more in the light of educative information for the timber examiner than as a part of the acceptance procedure.

The process inspection of the various components and the final inspection of the machine appear to be excellent.

With regard to design it would appear that far less sub-contracting is done in France and, therefore, the question of parts made by a sub-contractor fitting a part made by a main contractor hardly arises, and a big saving in jigs and gages results.

The practice of employing only "approved" firms, each of whom has been proved to be capable of making certain parts

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AERONAUTICAL INSPECTION DIREOTORATE.

ORGANIZATION OF ENGINE BRANCH.

CHIEF INSPECTOR OF ENGINES AND TWO INSPECTORS.

Responsible to Director of Inspection for the supervision and control of Inspection on Aeroplane Engines.

TECHNICAL AND ADMINISTRATIVE STAFF HEADQUARTERS.

ENGINE SECTION 1. O.I/C & DEPUTY.
TECHNICAL QUERIES ON ENGINES.

- Inspection.
- Defects, Improvements.
- Ease of production.
- Manufacture, viz., drawings.
- Limits, gauges, Interchangeability
- Material specifications.
- Methods of inspection, bench testing
- Maintenance and correction of drawings throughout Inspection Staff

ENGINE SECTION 2. O.I/C & DEPUTY.
MATERIALS (METALS).

- Technical queries on material inspection.
- Defects, Improvements, ease of production
- Manufacture from raw materials, viz.:— Forging, stamping, casting, swaging, &c.
- Methods of inspection, physical tests, analyses, micro-photography, and investigation of failures.
- Inspection of machine tools and electrical plant.
- Control of two inspection groups as a District Officer

ENGINE SECTION 3. O.I/C & DEPUTY.
RECORDS, ALLOTMENT & CERTIFICATION

- Allotment of Engines, Engine output returns, and progress reports.
- Certification of issue vouchers and % payments for Engines on Test.
- Maintenance of Log-books and Engine Records.

ENGINE SECTION 4. O.I/C & DEPUTY.
LIAISON (MILITARY).

- Functioning of Engines in Aeroplanes.
- Liaison with R.F.C. Acceptance Branch and A.I.D. Districts to maintain efficiency.
- Technical queries on Engine Installations in Aeroplanes.
- Liaison with R.F.C. Testing Squadron and all R.F.C. units as required

ENGINE SECTION 5. O.I/C & DEPUTY.
LIAISON (NAVAL).

- Liaison duties similar to those of Engines Section 4 with R.N.A.S.
- Adviser to Chief Inspector on previous procedure.
- Administrative questions concerning attached Naval Staff.
- Responsible executive officer for an inspection group and a main contractor on similar lines to a district officer

ENGINE SECTION 6. O.I/C & DEPUTY.
PERSONNEL.

- All questions relating to appointments, rates of pay, increases, promotion, transfer, and release of Engine Branch Personnel.
- Administrative questions of a general nature affecting the Branch.

EXECUTIVE STAFF — DISTRICTS.

DISTRICT 1	DISTRICT 2	DISTRICT 3	DISTRICT 4	DISTRICT 5	DISTRICT 6

OFFICER-IN-CHARGE AND DEPUTY FOR EACH DISTRICT.

Responsible for inspection of all Aeronautical Supplies Contracts for Engines and Materials (Metals) at contractors and sub-contractors in the District.
Inspection is divided into two heads, Resident and Visiting.
A resident staff is maintained at the large main contractors; visiting staff or "floaters" being responsible for the inspection at smaller contractors and sub-contractors.

CHART B

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correctly before being placed on the "approved" list, and can therefore be trusted to repeat correctly such parts, would seem to have had most excellent results and to be worthy of early adoption to a much greater degree in this country. I cannot emphasize that too strongly.

It is obvious that to obtain increased output we must develop and expand the works of existing contractors. The conditions in this country will, therefore, approximate more and more closely to the conditions in France, in that we shall have to rely upon the contractor for detail examination and concentrate our examiners on process inspection of components and on assembly. It is, therefore, urged that this expansion of the main contractors be very closely coupled with a strict control of the sub-contractor. The sub-contractors who have successfully turned out certain details with a low percentage of rejections should concentrate on these details and be expanded as necessary, new firms only being approved when all other sources of supply fail, and firms with large percentage of rejections removed altogether from the list. It is thought that much more might be done in this country to educate firms who waste material by their high percentage of scrap, for instance, 60 to 70 per cent of rejects on such things as nuts, or failing that to shut them down and make greater use elsewhere of the labor thus released.

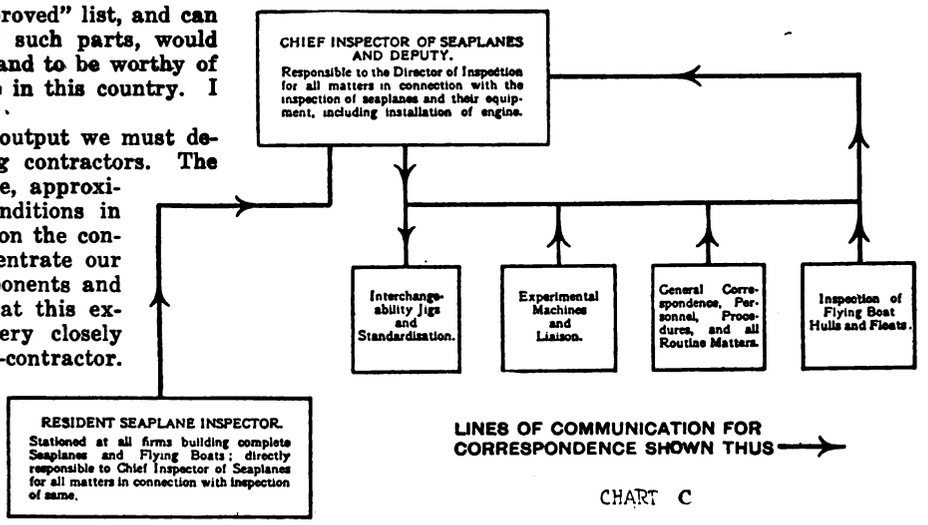


CHART C

Inspection is essential to obtain efficient output. It is the only method whereby the directors of a company can ascertain the quality of the firm's output; it is their only safeguard that money, time and material are not being wasted in the production of scrap; it is a check on their purchasing department; it is a check on their design and drawing office, and it is even a check on their chief engineer, to whom the inspection branch is responsible. Facts will always speak, and the inspection department can at any moment produce figures showing rejections at any stage from the purchased raw material to the completed and finished article.

I do not consider that nearly enough attention has been given by managing directors and managers to the valuable data available in the inspection department.

It has been suggested to me that a full government system of inspection is but a duplication of work. For a long time I have had available a record showing rejections by the firms and rejections by me. These figures, of course, also give the percentage rejections on the total output, and they must, surely, be of vital importance, not only from the output point of view, but financially. A little more money spent on inspection, not only increases dividends, but brings in more orders. The better the article, having due regard to cost, the greater its popularity with the purchaser.

In talking of selective inspection it must be remembered that if we assume 10 per cent as a fair figure for rejections on a certain class of article, if the firm's view-room is adequate, some 9 per cent of that total of 10 per cent should be rejected by the firm, and something like 1 per cent—less preferably—should be rejected by the government inspector. In that case selective inspection may be safe. But many firms have asked to apply selective inspection where they are getting some 20 per cent scrap and where nearly 19 per cent of that is rejected by me and not by the firm. The whole object I have before me is to encourage the firm's view-room, but very often because they know a government inspector is going through everything, they do not care. They think they have no interest in the job at all, and therefore it is up to us to encourage the firm's view-room to have an interest in the work. I think the best way is to adopt selective inspection purely on facts, *i.e.*, according to the percentage rejected by the firm compared with that rejected by the government inspector, and in that way a good view-room will result.

The inspector, as a rule, is nobody's friend. This is not always his fault, it is a fault of the whole system, he should be encouraged to be human. He must not be on unduly intimate social terms with the production staff, but he must be capable of dealing with them with tact and cordiality.

I am certain that if more attention were paid and more encouragement given to the class of man employed by firms for this purpose, much better results would be obtained.

So far as I, personally, am concerned, I invite criticism and co-operation and am at all times willing to listen to suggestions which will further output.

[*Part II to be published next week*]

Ideal Road Illumination

DISCUSSING the automobile headlighting problem in *Electrical Review*, Evan J. Edwards, manager of the engineering department of the National Lamp Works, has the following to say regarding an ideal system: "The machine must be equipped so that in passing other machines it is capable of giving good road illumination up to 75 ft. ahead of the car and of a width sufficient to cover the roadway, say 15 or 20 ft. The light from the upward angles should be reduced to the absolute practicable limit. The upper limit of the high-intensity beam should be depressed about two degrees below the horizontal as a factor of safety to insure no-glare under practically all conditions of road curvature and loading of the machine. It would give good road illumination nearby which is essential to safety in passing. It would eliminate glare by the elimination of the light in the angles where might be found the eyes of the approaching driver. There can hardly be a question that such a system would be satisfactory insofar as the passing of other vehicles is concerned.

"Such a system, however, if fixed in position and the only one to be provided, would be very unsatisfactory from certain other standpoints. It would not have sufficient throw to permit of speeds that are often desirable. It would not give warning at a distance to the approaching driver on a cross-road. It would not give pedestrians warning of the approach of the vehicle. It would not give the sense of security and pleasure in night driving that is obtained by the illumination of distant objects in the upward angles. It would not allow a satisfactory range of vision when approaching the foot of a hill. All of these disadvantages are important and some of them are materially concerned in the question of safety. All of them are disadvantages common to all systems where the upward light is reduced or eliminated, and are serious to a degree inversely in proportion to their effectiveness from the standpoint of elimination of glare. None of these disadvantages appear in the standard paraboloid headlights; therefore, it would seem that the ideal system would be one capable of more than one kind of distribution. The points involved are of sufficient importance to bring the conclusion that a satisfactory automobile headlighting system for both country and city driving can never be obtained with one fixed distribution of the light."

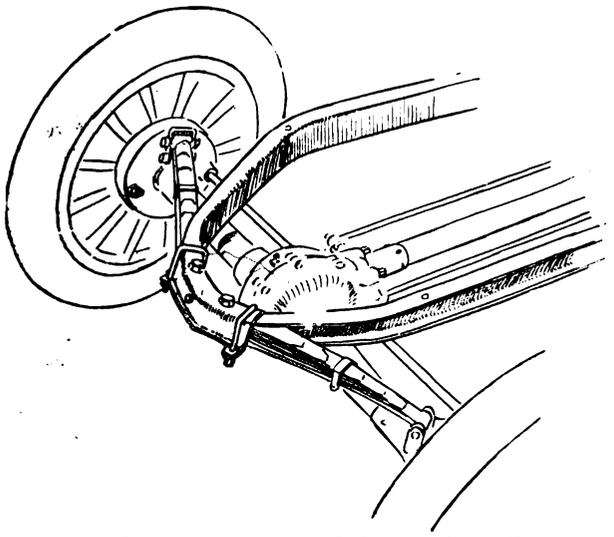
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Mechanical Features Revealed by the Show

(*Continued from page* 109)

a lower cost than other cars giving similar service. The Overland company has been producing small, low-priced cars for years, but the present model is avowedly an attempt to beat its best previous achievements and to create a machine for which there will be an enormous market.

The feature which strikes one most upon an inspection of the chassis is the running gear construction.



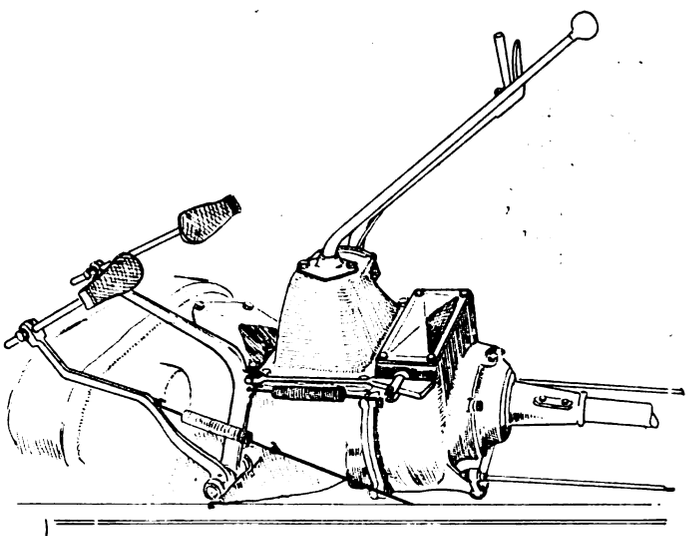
Rear construction of Overland small car

The frame is made of channel steel, with the open side of the channel turned to the outside. The frame members are joined at the ends in such a way as to give a tapering front and rear. This frame is supported on the axles by four quarter-elliptic springs extending underneath the tapering portions. By thus inclining the springs it is possible to have them act as thrust members or radius rods and at the same time bring the load close to the wheels so that the load on the axles is greatly reduced. The front springs are entirely in front of the axle and the latter is pulled by them.

Has Standard Type Engine

It has already been stated in these columns that the four-cylinder engine has 3 x 4-in. cylinders. It is of what has come to be regarded the standard type of engine for low-priced cars, with the cylinders and crankcase in one casting, the cylinder heads a separate casting and the oil base a pressing. Four-point support is used, there being four feet on the power unit which rest upon comparatively long brackets secured to the frame. An interesting feature is the service brake which is inclosed with the transmission. It is operated by means of a wedge which passes through a slot in a bar, operating against a roller in same. This wedge and its pull rod are in a single piece of the outline of a rifle, which connects directly to the brake pedal. Such simplification of the control linkage is especially valuable in a low-priced car where not much work can be spent on the joints and where a large number of joints is sure to result in noisy operation at an early stage in the car's life.

In the higher-priced class engineering considerations must sometimes give way to whims of the buying public or to their idea of the fitness of things. Thus we understand that the Packard control box on the steering post had to be discarded because the buying public did not fancy its appearance. From an operating standpoint it seemed to be a thoroughly sound construction in that it brought all of the controls in a very convenient position for the operator. From an artistic

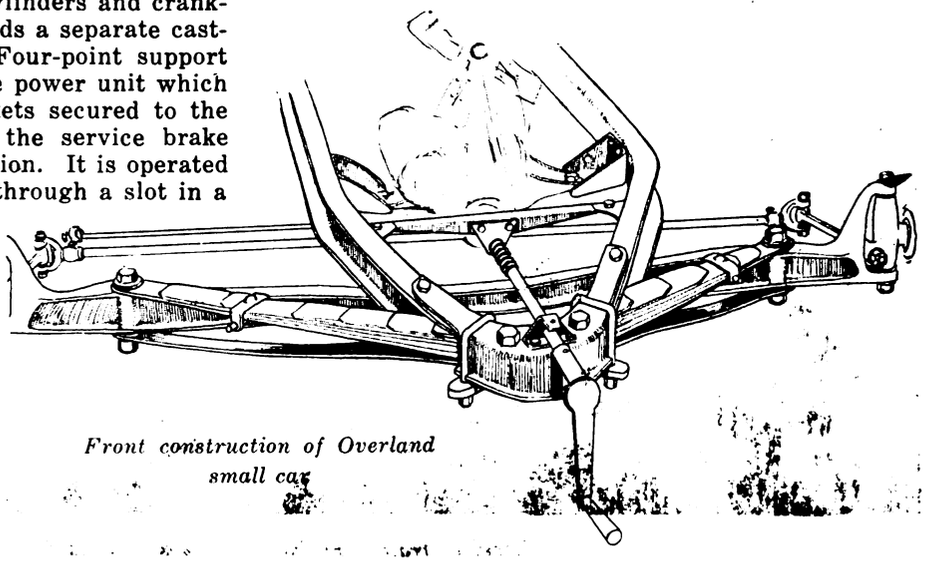


Simple inclosed service brake on Overland small car

standpoint it was certainly not a very happy conception and inasmuch as most of this class of cars are driven by chauffeurs, attractive appearance makes more of an impression with the people who control the purchase than does operating convenience with which they have little or no concern.

Thermostatic Temperature Regulation Increases

Temperature regulation, chiefly automatic by means of thermostats, is becoming a more important factor. The most usual arrangement is to have the thermostat control a by-pass on the cooling water circuit, but in some instances it acts on shutters on the radiator. In fact, heat control is one of the livest subjects in automobile engineering at the present time, and the future is sure to bring further developments.



Front construction of Overland small car

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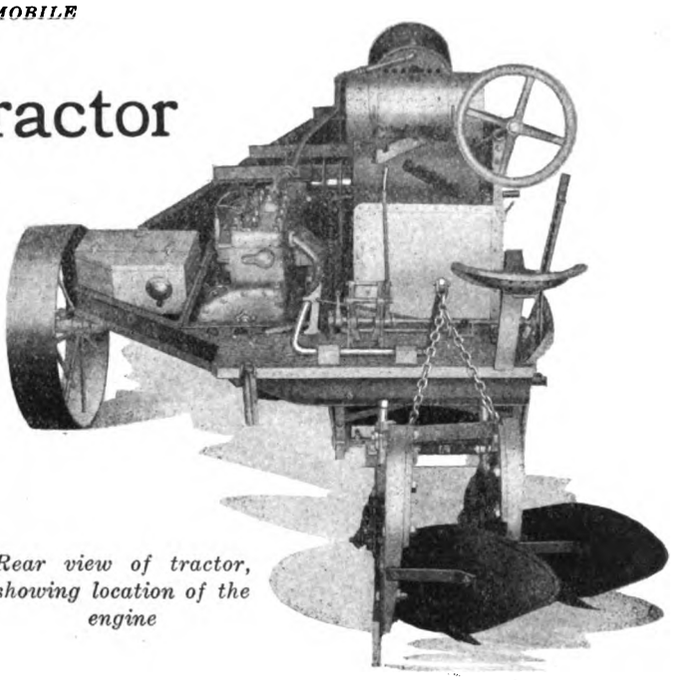
The Hoosier Farm Tractor

A Boiler-Plate Drum With Driving Lugs Serves as Drive Wheel—Also Has Two Non-Driving Wheels

A SMALL tractor suitable for farms of from 100 to 300 acres is manufactured by the Leo Rumely Tractor Co., La Porte, Ind. It is an assembled proposition and at present is built on a small scale only.

The engine is a Waukesha tractor engine and sets on the frame directly over the driving axle, next to the single drum type driving wheel. The tractor is of the three-wheeled type, having a single driving wheel at the rear, a swiveled steering wheel at the front and a guide wheel at the side. The engine is of 3¾ in. bore and 5¼ in. stroke and is rated by the manufacturers at 28 hp., but the Rumely company's rating of the tractor is only 18 hp. at the belt and 8 hp. at the draw bar. The engine is of the regular Waukesha type as built for truck and tractor work, and it is not necessary to go into a detailed description of it here. It is provided with a centrifugal governor which maintains its speed within well defined limits. A Kingston carbureter is fitted and is provided with a Bennett air cleaner so that the engine is protected from dust and grit. Ignition is effected by an Eisemann high-tension magneto of the waterproof type. Batteries are not needed for starting. No attempt is made to use kerosene, as the fuel consumption is comparatively low and it is figured that there will be less trouble with the engine with gasoline. For cooling the engine a large tubular radiator is provided and carried at the front of the tractor frame. This has a capacity of 26 gal. and has an 18 in., high speed, ball bearing fan mounted back of it.

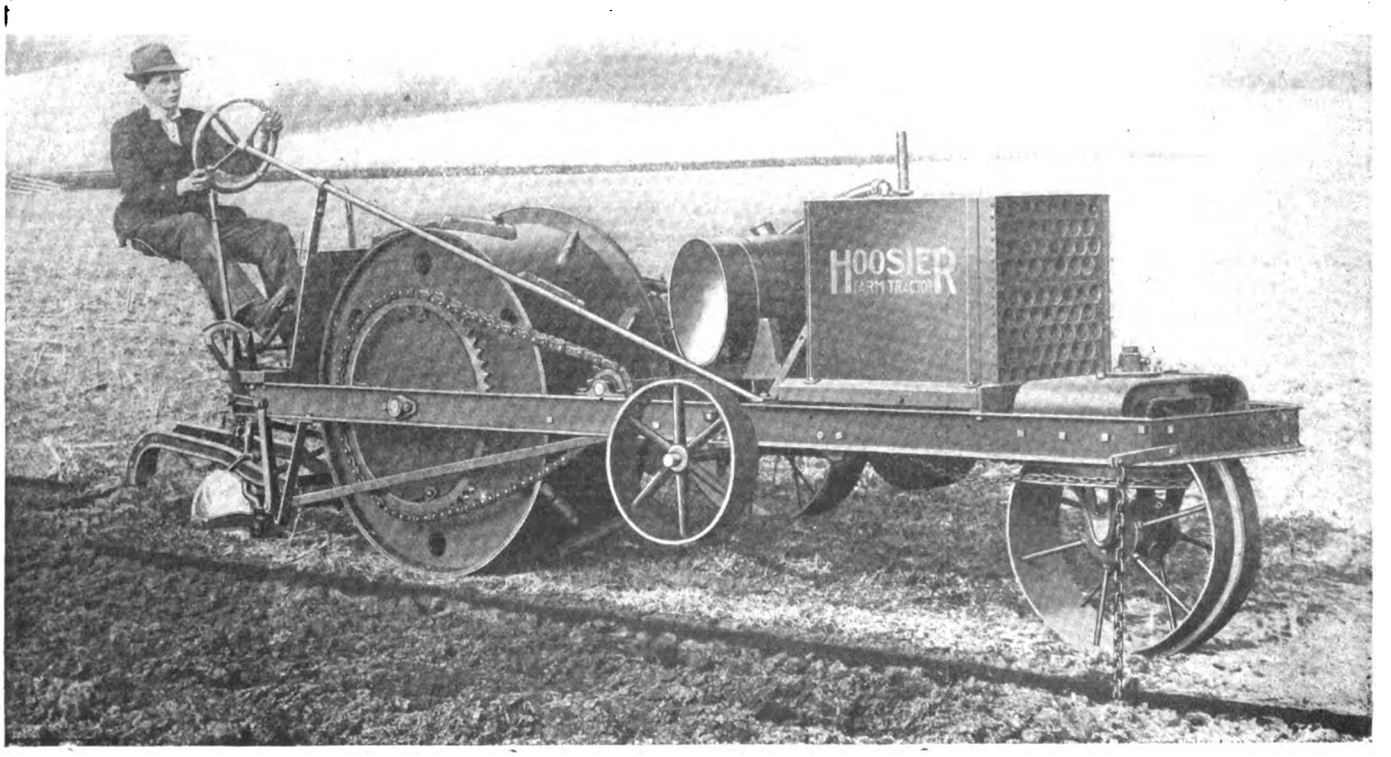
The power is transmitted from the engine through a Borg & Beck dry disk clutch, inclosed in the engine flywheel. The transmission affords only one forward speed and one reverse, the maximum speed being 2½ m.p.h., and this can be cut down by means of a throttle to 1¾ m.p.h. The gears are made of chrome nickel steel, have cut teeth, are hardened and run in a bath of oil. They are inclosed in a cast iron case. The transmission gears are mounted on double row ball bearings and the case is provided with a cover plate which gives ready access to the gears. The final drive from the transmission to the driving wheel is by a 1¾ in. roller chain which runs over hardened, cut steel sprockets. The driving wheel is 54 in. in diameter and has a 24 in. face. It is provided with detachable driving lugs. The axle is mounted in roller bearings 9 in. long. Of the two non-driving wheels the front one has a diameter of 30 in. and a 10 in. face and the one on the side a diameter of 40 in. and an 8 in. face.



Rear view of tractor, showing location of the engine

All of the wheels of the Hoosier tractor run on firm ground when the machine is used for plowing, none of them running in the furrow.

The draft on this tractor is unusual. The draw bars are hinged to the frame quite a distance in front of the rear axle



Hoosier tractor hauling two-bottom Grand Detour plow

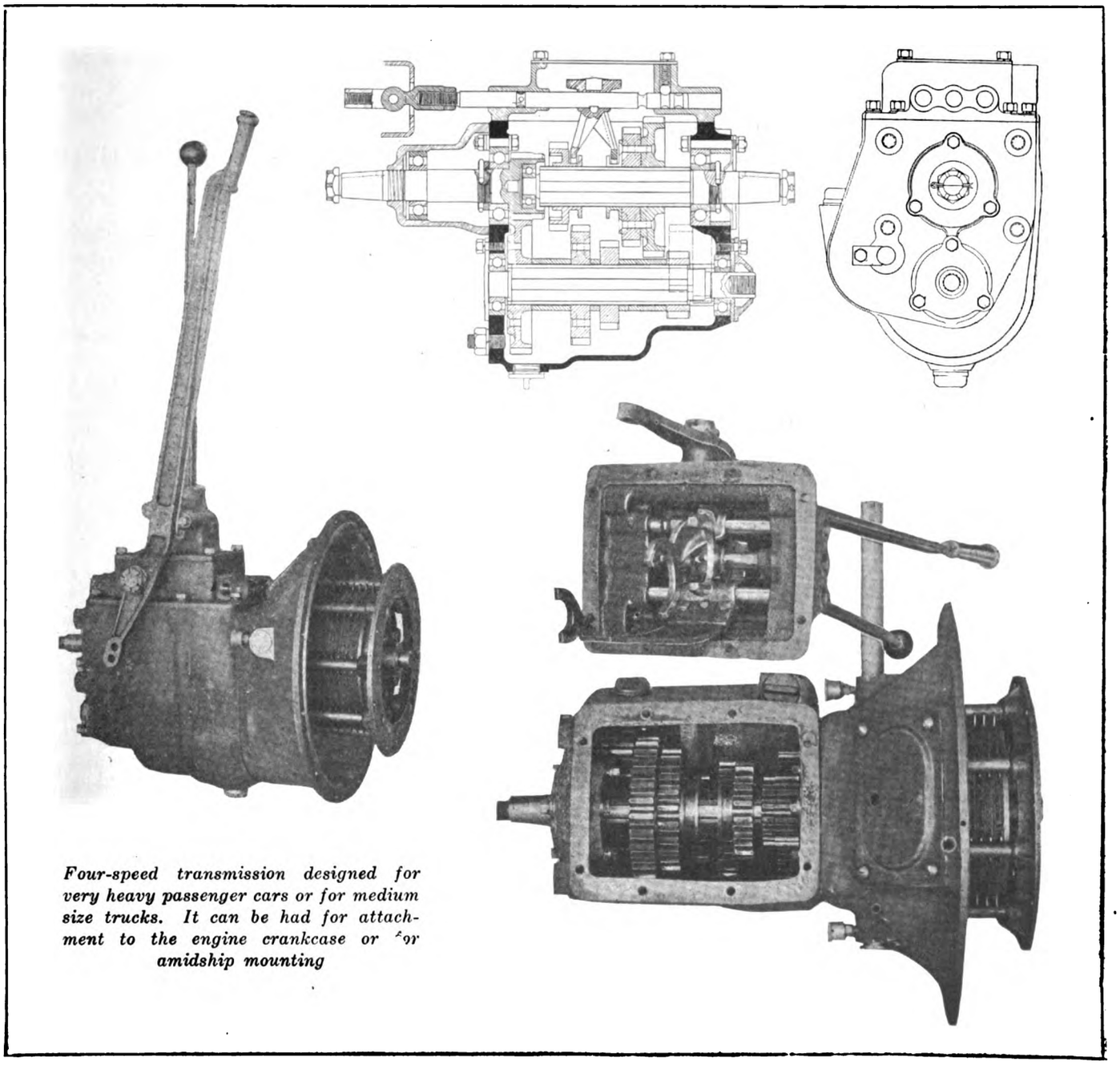
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and are inclined downward. By means of a lever convenient to the driver the height of the rear end of the draw bar can be adjusted within wide limits. In this way it is possible to adjust the depth of plowing from the driver's seat on the tractor. A special Grand Detour plow is used with this tractor, the plow beam being hitched directly to the draw bar. A plow lifting device of new design has recently been worked out, which is not shown in the illustrations. It is a power-operated device, a chain from the driving mechanism running over a chain pulley close to the driver's foot. Adjacent to this pulley there is a pawl and ratchet mechanism, the pawls of which are ordinarily held out of engagement by means of a trip. By operating this trip the driver can engage the pawls and cause the plows to be lifted out of the ground by means of power from the motor. This device makes it possible to make short turns and the plow may be backed into fence corners.

In addition to plowing, the Hoosier tractor is adapted for all sorts of belt work. It is fitted with a 20 in. pulley having an 8 in. face, and the pulley is located conveniently at the side so that the belt can be easily slipped on and off. The frame of the tractor is made of 5 in. channel steel. The weight of the whole tractor is 3900 lb.

New Fuller Gearset

THE great majority of passenger cars and practically all of the smaller trucks are fitted with three-speed gearsets, but there is a certain demand for four-speed transmissions for heavy trucks and passenger vehicles. To meet this demand Fuller & Sons Mfg. Co., Kalamazoo, Mich., have developed the transmission illustrated herewith. It is of the selective type, mounted on ball bearings throughout and has splined primary and secondary shafts. Gear and brake levers may be mounted directly on the cover plate, as shown in some of the illustrations, though if the chassis layout requires this, the gears may be shifted through pullrods, as also illustrated.



Four-speed transmission designed for very heavy passenger cars or for medium size trucks. It can be had for attachment to the engine crankcase or for amidship mounting

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

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Engineering Progress in War Time

IF the history of automobile development since the beginning of regular manufacture were divided into a considerable number of equal periods and the advance in design made in each determined as nearly as possible, it would be found that the periods of greatest progress corresponded to those of low commercial activity. When market conditions are good; when the production of cars runs behind the demand, there is little incentive to make extensive changes in design, as these always occasion heavy outlay for new tool equipment and interfere with production. Besides, what is the use of making improvements when the cars already are so good that the buying public cannot get enough of them? But when trade slackens off and when purchasers no longer are glad to get any car in reasonable time but are most exacting in their demands the manufacturer feels the need of having his product up to date in every respect. There is the further consideration that improvements or new models can be introduced with much less trouble at a period of slackness than when a factory is working to its limit.

While the war lasts the demand for passenger cars will undoubtedly remain below normal and competition will be quite keen. It will be difficult to sell cars which do not conform to the requirements of the times. During the early stages of the war there has been a tendency to drift along, largely due to the unsettled conditions that obtained, but now that it is fairly plain what we are in for we may expect renewed activity in development work, as it will be every manufacturer's aim not only to fortify himself for the somewhat trying times immediately ahead but also to place himself in position to take full advantage of the boom that is sure to set in with the return of peace. New models and changes of a radical character should be given a long try-out before being put in regular production; therefore, makers should not delay shaping their plans. Although nobody can tell what the future holds and how far the end of hostilities is still off, in view of the fact that most British manufacturers already have their post-war models ready it is not too early for our own manufacturers to begin preparing for business under the somewhat changed conditions upon the return of peace.

Motor Plows vs. All-Purpose Tractors

HORSES on the farm are what might be called multiple purpose machines. They draw all of the different implements used for preparing the soil, seeding, cultivating and harvesting; they draw the wagons in which produce is carried to market and farm requisites home, and they operate various types of stationary machines through so-called horse powers. One of the fundamental problems of power farming is whether it is the best policy to design a machine that is capable of doing every kind of work that the horse usually does on the farm, or whether special machines should be developed, at least for the more important classes of work, such as plowing, road hauling, etc.

An all-purpose machine must naturally be a compromise and cannot be as efficient in any particular service as a machine specially designed for that service. In the manufacturing industries this is the age of the special machine. Large boring mills and drill presses, for instance, are designed to work on only one particular machine part, and the advantages of this method are so overwhelming that no one would think of using stock lathes and drill presses—the all-purpose machine tools—where many thousands of parts of the same kind are wanted.

However, in farming the conditions are entirely different from those in manufacturing. If plowing could be done from the beginning of the year to the end it would certainly be best to design machines to do nothing else. As a matter of fact the time occupied in plowing on the average farm is only 20 to 30 days per year. Therefore, a motor plow would be idle more than 90 per cent of the time. It is true enough that a piece of machinery when not in use does not require to be fed, as does a horse, yet it

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occasions expense, because there is money invested in it and this money has interest-bearing power.

It is certainly a highly desirable thing to have machinery operate as efficiently as possible, but where expensive machinery is involved it is equally, and perhaps even more important, that it be kept at work as nearly continuously as possible. This phase of the subject may not have received much attention in farming because there seems to be little possibility of changing the rather rigid routine of the farm year. On the other hand, managers of electric central stations make every effort to "flatten out" their load curve, which means doing the greatest amount of business with the least equipment. The advantage is that the interest charge per unit of electric energy sold is reduced.

This same principle holds equally well with respect to farm machinery. It does not matter whether the farmer uses his own capital or borrows money for purchasing the implements, the capital tied up might bear interest, and if the equipment is not used the interest charge is a loss. The fact must also not be lost sight of that farm machinery during periods of nonuse frequently does not receive proper treatment and in consequence depreciates rapidly.

In view of the above facts there is every likelihood that the development of agricultural power machinery will be along the line of the all-purpose tractor, because a fair degree of efficiency can be obtained with such a machine in the different lines of work for which it is adapted and the farmer does not need to make heavy investments in a variety of machines for which he has no work the greater part of the year.

War Time and Shows

THE show is a success. True, there are not the choked aisles and the surging crowds of past years. There are not the groups of youthful catalog collectors nor the fancy dress parades. On the other hand, there is an intelligent attendance of potential buyers and business people. As a show of the products of a great industry the Palace is a veritable mart of trade for those within the industry itself. The manufacturer, the jobber and the dealer are naturally all there in large numbers and this year has witnessed no great cessation in their activity.

The public itself is amazed at the show. It has been fed on stories of what the war has done to the automobile industry and expected to see this year marked effects of the war upon the exhibition. Instead visitors see a show that is just as great as, if not greater than, any of its predecessors. Here are better products, more efficient vehicles to help in transporting busy Americans from place to place. The great essential of individual transportation, the automobile, is here more highly developed, more artistically dressed than ever before.

A noticeable fact is that the opening day had the least attendance. The throngs were conspicuous by their absence. Since that opening day the attendance is gradually building up and becoming larger. More business is being done and the prediction that the opening of the show season would witness a restoration of confidence is being borne out.

War time, instead of being a bad time to hold the show, is the real time in which its merit becomes evident. "Speed up the industries!" is the battle cry that will lead the nation to victory, and anything which has a stimulating influence will tend to speed them up.

Strong-hearted industries, capable of working at more than normal pace, capable of supplying first government needs and then their own without a let-up in efficiency and capable of not only handling all the work of the war, but the work of peace besides, are the ones that are going to help most. The show is a stimulant and its success has proved its strength.

Demountable Wheels for Motorcycles

NOW that motorcycle wheels have been completely standardized, with the exception of the hubs, there is some chance of demountable wheels coming into use the same as on automobiles. It is hardly to be expected that a spare wheel will ever be carried on a motorcycle, as it could not be stored conveniently, but wherever motorcycles are used in considerable numbers and subjected to severe service, demountable wheels would simplify the repair problem. The advantages of demountable wheels would no doubt stand out most strongly in military service in which wheels fail frequently. Following automobile precedent, there would probably be two hubs, an outer hub forming a permanent part of the wire wheel and an inner hub containing the bearings and carrying the driving means. To this inner hub the outer hub would be secured. Only one type of outer hub would be used. The inner hubs would be different for front, rear and side car wheels, but each type of inner hub would have its outer contour designed to accommodate the standard design of outer hub. One of the most important problems in connection with such demountable wheels is that of the driving connection between the two hubs or between the chain wheel and the outer hub of the rear wheel. The parts must go readily together, yet there must be no slack in the connection.

The chief advantage in a demountable wheel for motorcycles in large services is that it obviates extensive loss of use of the machine due to failure of wheels. If a wheel breaks it is simply removed from the inner hub and another one is substituted, which is the work of a few minutes, whereupon the machine can be replaced in service. The old wheel can then be repaired if this is thought worth while, or else junked. Where ordinary wheels are used not only must three different sets of repair wheels be kept, but each wheel, since it contains the rather expensive bearing hub, ball bearings, etc., represents a greater investment than a demountable wheel. Nowhere is there such a need for demountable wheels as in war operations and the subject will undoubtedly receive full consideration in the design of the army motorcycle.

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Standards Committee in Busy Session

Action Taken on an Unprecedented Number of Subjects — Aeronautic, Motorcycle, Roller Chain, Data Sheet, Miscellaneous and Tractor Divisions Get Reports Adopted — Lack of Quorum at a Late Hour Prevents Adoption of Marine and Tire and Rim Division Reports

ONE of the busiest sessions ever held by the S. A. E. Standards Committee was that at the New York headquarters on Wednesday. More than one half of the session was occupied by reading, discussing and voting on the voluminous report of the Aeronautical Division which contained no less than twenty-three proposed standards. The word standards, however, is not quite to the point in this connection.

It is realized that aircraft engineering is as yet in a state of rapid development and what may seem best to-day may be greatly improved upon within a year. Therefore it has been decided to refer to all of the completed work of the Aeronautic Division as "Recommended Practice" and not standards.

Upon the opening of the meeting by Standards Committee Chairman Utz, Standards Manager Hanks read his report. It reviewed the work done by the Standards Committee in co-operation with the Government, toward the development of the Liberty truck and in the standardization of certain features of motorcycles.

After a certain amount of work had been done along each of these lines the Government took complete charge and selected committees of designing engineers who continued the work of design at Washington.

Need for Speed Was Urgent

Taking up the subject of aeronautic standards Mr. Hanks said:

The aeronautic war standards were required to be turned over to the Government in the shortest possible time. It was not practical to ask the Government to wait 6 months for the S. A. E. to pass the standards through the usual routine. A short cut was authorized by the council, permitting results arrived at at any division meeting to be released immediately to the Government Bureaus needing the standard.

The Government representatives were always present at these meetings, so they were in the closest touch with all conditions from both engineering and manufacturing standpoints. On all these recommendations which went to the Government by short route, a notation was entered at the bottom of each, reading:

> This practice has been recommended by the Aeronautic Division of the S. A. E. in co-operation with representatives of the U. S. War Dept. (or other departments co-operating.)
>
> If, for any reason, your requirements cannot be brought into harmony with this practice, please notify promptly the Society of Automotive Engineers, 29 West Thirty-ninth Street, New York City, returning this sheet with comments thereon.
>
> This practice recommended represents the consensus of opinion of the advising engineers as of (date on which the recommendation was made).

In order that these recommendations might be of the greatest value and be available when wanted, they were printed or mimeographed on standard letter-size paper and placed in loose leaf binders with the S. A. E. emblem on the cover, and sent to those in charge of the various Government bureaus.

In much of the standardization work heretofore attempted, a careful review of American practice with American engineers was all that was necessary. This procedure did not fully meet the requirements in the aeronautic field, as our airplanes are going abroad and the experience of both the foreign builders and ourselves must be co-ordinated. The I. A. S. B., composed of engineering representatives from the United States, Canada, England, France and Italy has been the medium for this co-ordination, and many S. A. E. members are on this board.

The Aeronautic Division has held a total of 24 meetings during the year 1917, including sub-committee meetings. The largest number of meetings held by any Division in previous years was by the Engine and Transmission Division, who had 7 in 1916.

The amount of business transacted by the Standards Division is illustrated by their offering for your consideration to-day a list of some 65 recommendations. In 1916 a total of 38 standards were passed and 45 meetings held. In 1917 there were 109 meetings, and the total number of standards passed for final action was 122.

Aeronautic Division Report

First the report of the Aeronautic Division was taken up, C. M. Manly, chairman of this division, presenting it. In several sections of this report, references were made to government departments in the capacity of purchasers, and it was decided that it would be better to make the recommended practice of general application and to this end substitute the word "customer" for the Signal Corps or other department of the Government.

In the cellulose nitrate report the wording "according to the standard method of the Bureau of Ordnance" is to be replaced by "the Standard Government Method of the Abel Stability Test." The Signal Corps absolutely objects to the use of tetrachlorethane and an item was therefore inserted to the effect that dopes containing tetrachlorethane will not be acceptable. With these amendments the report was adopted.

Specifications Not Ideal But Practical

Dr. Smith of the Bureau of Standards said that the specifications were not ideal but they were practical. The Signal Corps was drawing up specifications for its own use which were being based on the report of the Division. It was hoped to incorporate in these specifications a test for durability, but the work in connection with this test had not yet been completed. Later on, it was the intention to also draw up specifications for a non-inflammable nitrate dope on which tests are now being made.

Dr. Percy Walker of the Bureau of Standards presented the report on spar varnish specifications. One objection was the great latitude allowed in the temperature range in drying the varnish for the bending test. It was decided by the subcommittee to limit the range to 21-24 deg. C. instead of from 21-32 deg. C. as originally proposed. It was stated that Mr. Hanks had sent out a circular to different varnish makers asking for criticism of the proposed change and that the comment made had on the whole been favorable. Mr. Walker, however, pointed out that there was no lack of criticism of the work of the sub-committee and that the hot water test proposed had met with particularly strong objections. Mr.

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Costello, representing the Signal Corps, said that there was quite a possibility that they would omit the hot water test from their specifications. Grover Farnsworth, an aircraft engineer, on the other hand, agreed with Dr. Walker regarding the utility of this test. The report was adopted without further amendments.

Requirements of Good Glue

Presenting the report of the sub-committee on glue specifications, Mr. Manly said that he expected more opposition to this report than to any other. One change that was suggested and accepted without opposition was that wherever the term "the government" or the name of any department of the government appeared, it should be replaced by "the customer."

The report as presented specified that "the glue must be a high grade hide glue," but it was brought out that hide glue is at present practically unobtainable in this country. Glue is manufactured from hoofs, bones and other parts of the animal and it seemed to be the opinion among glue manufacturers that the part from which the glue is made is not such an important factor as the process of manufacture. To get around this it was suggested that the word "hide" be replaced by the word "animal".

Another point to which objection was raised, was the requirement that the strength test of the glue be made by means of two pieces of maple or birch having a shearing strength of at least 2400 lb. per square inch. It was pointed out that if the longitudinal shearing strength was meant, this seldom exceeds 1500 to 1600 lb. per square inch and that woods of this kind showing 2400 lb. shearing strength were absolutely unobtainable.

Mr. Manly said that there had been some discussion regarding this figure, which had been based on information furnished by the National Forest Products Laboratory. Another suggestion made was that the second illustration in the report, showing a double shear test block, be omitted. This suggestion came from Mr. Manly who said that he had had very poor results from test blocks of this kind, as the blocks would invariably spread and the glue not fail under shear but rather under tensile stress. It was finally decided to refer this report back to the committee with instructions to gather information as to what shearing strength could reasonably be specified for the test pieces of maple or birch.

Specifications for Steel Wire

In connection with the specifications of round high-strength steel wire, objection was raised to the torsion test. According to the specifications, a sample of the wire not less than 10 in. long and gripped by two vises 8 in. apart, must be capable of being twisted a number of times equal to the constant 2.7 divided by the wire diameter in inches. It was asserted that it was absolutely impossible to get large diameter wire which would meet with this requirement.

It was therefore agreed that the number of turns which the sample must be able to stand should be equal to a constant factor to be agreed upon between the customer and the manufacturer, to be divided by the wire diameter in inches. The adoption of this amendment also made it necessary to eliminate the third column in a table accompanying the report. With these changes the report was adopted.

Next the subject of non-flexible steel wire cable was taken up and quite a spirited discussion ensued regarding the best method of rust-proofing the wire. The report as presented required that the cable be uniformly coated with pure tin. Mr. Manly stated that the U. S. Government preferred galvanized cable and that his firm used such cable at the present time. The International Aircraft Standardization Board, on the other hand, favors tin covered cable. Mr. Erickson of the Canadian Aircraft Board, who represented the I. A. S. B. at the meeting, said that tinning the cable not only insures greater strength as compared with galvanizing, but also facilitates soldering. He stated that differences in strength of as great as 8 per cent in favor of the tin cable had been shown.

Mr. Manly said that he had been discussing the matter with Mr. Horn of the Roebling Steel & Wire Co. who favored the galvanized cable, while other makers seemed to favor the tin cable. The Roeblings were willing to make either kind, but were very anxious that one of the two be decided upon so that it would not be necessary to maintain equipment for both tinning and galvanizing. Mr. Birdsall stated that experience had shown that galvanizing—he referred to hot galvanizing—always weakened a wire cable or a chain cable. Mr. Erickson said that the chief reason why the I. A. S. B. favored tinning was that the tin formed a better base for solder. It was moved that the word galvanized be substituted for the phrase "coated with pure tin" and also that a footnote be inserted to the effect that the method of galvanizing (if used) be specified by the customer. This amendment was adopted.

A further amendment was in regard to the torsion test which was amended to correspond to the torsion test for the round high-strength steel wire, it being left to the customer and manufacturer to agree upon the number of turns which the test specimen must be capable of withstanding. The report with these amendments was adopted.

American Cable Proves Best

Reports on flexible 6 x 7 and 7 x 7 steel wire cable were adopted without change. In connection with the report on extra flexible 7 x 19 steel wire cable, Mr. Erickson pointed out that the Roebling cable of this denomination was made up of strands containing each three wires of different size. This resulted in extra strength, and the Roebling cable was considerably stronger than British cable of the same denomination having strands made up of equal wires. It was therefore decided to amend that part of the report relating to this matter to read as follows: "It is to be understood that the strand composing this cable must not necessarily be composed of wires all of the same diameter. With this change the report was adopted.

Mr. Birdsall asked whether it was not necessary to provide an elongation test of flexible cable. To this Mr. Manly replied that such a test was unnecessary as every cable before being put in place on an airplane was stretched to 50 per cent of its tensile strength.

There was no comment on the recommendation for cable reels, which consisted of a dimension diagram and a table. This was adopted.

Next the tachometer drive specification was taken up. It was pointed out that the design of this drive was one of the difficult problems of aircraft engine design. The report as it stood had been revised a number of times and represented much work. Major Vincent, in reply to a question, stated that as far as he knew the Signal Corps was satisfied with the design. It was pointed out that the members of the subcommittee had given the subject very careful attention and that it would be safe to pass the specification as submitted, which was done.

Rubber Hose for Gasoline

Next the specifications for rubber hose for gasoline were taken up. Mr. Tuttle of the Bureau of Standards, who read the report as printed, suggested a number of changes. Under the heading "Chemical Properties" it was specified in the original draft that "no organic matter other than para or plantation rubber shall be used in the preparation of this hose."

Considerable objection to this requirement developed, and he made an amendment that the passage be changed to read as follows: "If organic matter other than para or plantation rubber is used in the preparation of this hose, the amount and identity of such material shall be stated." Mr. Hale of the Goodyear Tire & Rubber Co. said that the rubber manufacturers asked that the first paragraph be eliminated. Concerning Mr. Tuttle's modification he said that the rubber companies would decline to give the ingredients of their product. He thought that the physical tests were very rigid and entirely protected the purchaser. Also, it was not within the province of the S. A. E. to require manufacturers to disclose what might be trade secrets with them. Mr. Tuttle replied that all of the physical tests described were made on new hose and did not bring out the durability of the prod-

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uct. Mr. Hale said that in his opinion the physical tests were absolutely adequate. The specifications were based upon the practice of the Royal Aircraft Board of Great Britain and that board did not require the composition to be stated. All sorts of hose, including air hose, water hose and fire hose, were being sold on the strength of physical tests alone.

Another change suggested by Mr. Tuttle, based on recommendations made by manufacturers, was that the percentage of rubber in the hose be not less than 25, instead of 32 as called for in the original specifications. Mr. Crane suggested that the specifications of tubes of larger internal diameter than ¾-in. which "may be made from rubber sheet, in which case they must consist of at least two complete turns" were not sufficiently explicit, and, at his suggestion, the following was added to this paragraph: "And be formed into a complete tube in the further process of manufacture." With these changes the complete report was adopted.

The above was followed in the report by specifications of plain hexagon nuts, ball hexagon nuts, castle hexagon nuts, ball hexagon head bolts and plain hexagon head bolts. Mr. Ehrman, criticizing the manner in which the data regarding these parts were presented, recommended that the basic or nominal size be expressed in decimals of four figures and that all decimals in the tables which represented common fractions of an inch have the fraction added thereto in parenthesis.

Consider Threads of No. 12 Nuts

In connection with this subject, a rather warm discussion arose regarding the number of threads specified in No. 12 nuts. Grover Farnsworth of the Navy Aircraft Department wanted to know why 32 pitch was specified for these nuts, claiming that it was impossible to get dies and taps for this pitch. It appears that the former standard pitch for this size was 28. Mr. Ehrman denied that it was impossible to get the necessary tools for cutting these threads. He asserted that it was impossible to get quick delivery on gages for any of the common size screw threads. If better delivery could be obtained on gages for 12-28 threads it was due to the fact that this thread was in very little use and there was a comparatively small demand for gages of that size. According to Mr. Manly the subject was first taken up with the Signal Corps about a year ago.

The Curtiss Airplane Company at that time was using 12-32 screws in its JN model, and inasmuch as the government wanted quick production of this model, it was decided that no change should be made in the size of the thread used. Mr. Manly said that inasmuch as the 12-32 screw had already been adopted by the Society there remained nothing for them to do but to decide upon nuts that would fit these screws.

Mr. Hanks said that a committee should be appointed to confer with representatives of the Army and Navy and with the I. A. S. B. to clear up any little discrepancies which might arise. According to Mr. Erickson of the I. A. S. B., such a meeting is to be held at Washington on Friday at the new headquarters of the Board.

In the printed report were given tables and illustrations of turnbuckles, shackles, clip ends and clevis pins, and it was explained that these were put in merely for the purpose of giving the committee a chance to check them up for any typographical or similar errors, and that it was not necessary to take any official action on them. Specifications for airplane engine tests were adopted without change, as were the aeronautic engine testing form and the engine weight specification form.

Urge Longer Plug Threads

There was some opposition to the passage of the spark plug shell specification in the form presented. A letter had been received by the committee in which it was claimed that the length of thread was not sufficient to carry off the heat effectively. It was pointed out, however, that spark plugs with ⅝-in. length below the hexagon had now been the standard in automobile practice for two years, and more and more engineers were coming to use it. In further reply to the objection in the written communication it was stated that the heat dispersing capacity was much more a matter of thread fit than of thread length. Mr. Ehrman moved that the angle of the chamfer, which in the report was given as 35 deg. for the lower end and 30 deg. for the upper end, be made 35 deg. for both ends.

Mr. Birdsall advocated the use of a longer thread in view of the fact that spark plugs are now generally screwed into the cylinder wall instead of into the valve caps as formerly. If the spark plug has a long thread the water can be brought close to it, which is not the case if the thread is short. He related an experience where the shell of the plug had become discolored from the heat.

Mr. Manly said that there were not many 200 hp. engines in which the metal of the plug did not change in color when working under full load. This did not matter, as the ability of the plug to withstand high temperatures depended mainly upon the porcelain. The report was accepted with no other amendment than that regarding an equal chamfer of 35 deg. on both ends.

Next on the program was a table of bevel washers. Mr. Manly explained that these bevel washers had always been a source of considerable expense, as they generally involved a milling operation in their production. To reduce this expense it was decided to make them of rolled stock. It is not very practical to punch round washers from this rolled stock, and so Mr. Manly suggested that a series of square washers be added to the round washers, which could be readily produced from the rolled stock by sawing.

These bevel washers are to be made with angles of 6, 12, 24, and 36 deg., and by combining washers, a compound washer can be obtained approaching any desired angle within 3 deg. Besides being cheaper to make, the square washer permits of more accurate alignment of the bevel surface and the bolt. The adoption of this report without change concluded the work of the aeronautic section.

Motorcycle Division Report

William S. Harley, chairman of the Motorcycle Division, made the report of that division, which embodied recommendations regarding sixteen different items. The recommendations regarding the following subjects were adopted without change: Spark control, throttle control, kick starters, clutch pedal, brake pedal, chains, oil and grease cups, cylinder displacement, gearshift, carrying capacity, tires, headlamp mounting lugs and supporting prongs, spokes and nipple.

The recommendation regarding tires is that tires on military motorcycles, rear and side cars shall be of a clincher type, 28 x 3 in. Mr. Wolfe of the Goodyear Tire & Rubber Co. suggested that this be amended to read: "Of the clincher type and fitting a 28 x 3-in. rim." This would take care of over-sized tires, 29 x 3½ in. in dimensions, which are now being used to quite an extent on military motorcycles. Mr. Harley, however, said that these tires were entirely unsuited to motorcycles as now built owing to the fact that there was not sufficient clearance for the tires in the frame, and the division had gone on record as favoring the 28 x 3 in. size. No change was made in the recommendation.

Change Magneto Dimensions

In connection with the magneto dimensions specifications, Mr. Libby of the Splitdorf Electrical Co. recommended that the length of magneto space (from large end of shaft taper) be made 6⅜ instead of 6⅛ in. as recommended, and the width of the magneto space 3¾ instead of 3⅛ in. If the space allowed were smaller than that, it would not accommodate the Splitdorf magneto. This suggestion was accepted and the specifications were then adopted.

Mr. Ehrman pointed out a number of errors in the drawing of the fuel and lubrication pipe fittings and he also recommended that in addition to the dimensions given on the drawing, the root diameter limits of both the male and female threads be inserted. An amendment to this effect was carried and the recommendation was then adopted. It was found that the nipple head depression in the wheel rim as specified was covered by a patent, and inasmuch as it is the invariable rule of the S. A. E. not to standardize any patented article,

(*Continued on page* 140)

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Westinghouse Cam Regulated Generator

Designed Specially for Truck Work—Voltage Regulated by a Vibrator Cutting Field Resistance In and Out—Vibrator Is Under Both Magnetic and Mechanical Influences

A CAM-REGULATED generator has been brought out by the Westinghouse Electric & Mfg. Co. for use particularly on army trucks and high-grade commercial vehicles. It is designed to meet all the requirements of the government's specifications for army truck equipment as approved by the Quartermaster General in May, 1917. The generator is being produced at the Shadyside Works of the Pittsburgh concern.

The machines are ordinarily adjusted at the factory to give a voltage not greater than 8 volts at 1 amp. output at speeds up to 2000 r.p.m., and with a load of 15 amp. to give a voltage not less than 7 volts up to 2000 r.p.m. The generator is capable of giving a continuous output of 12 amp. at 7.5 volts, and the range of possible adjustment of the regulator makes it also applicable to some of the higher class passenger or general utility vehicles as well as military trucks.

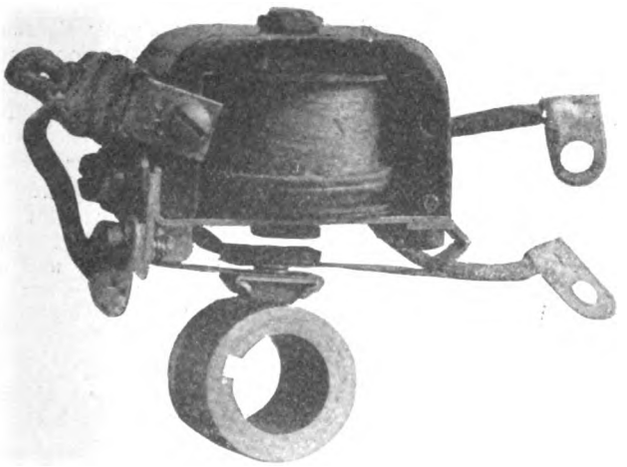


Fig. 1—Regulator unit of the Westinghouse cam-regulated generator

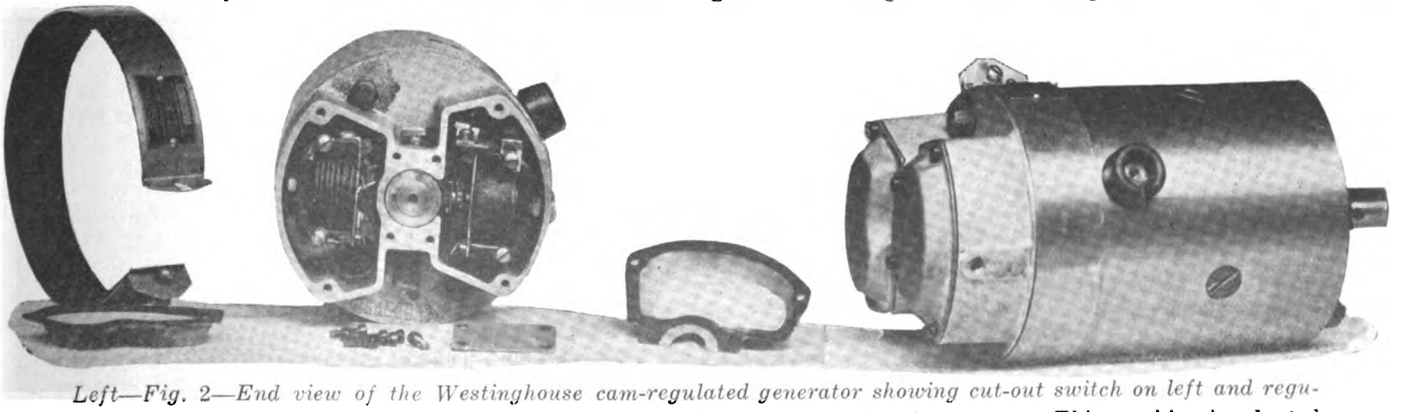
In appearance the generator is similar to other machines of Westinghouse manufacture, with the frame made from steel pipe having a circular section that lends itself to cradle mounting on the engine. The end brackets may be extended to form flanges for end mounting, in which case the cradle brackets are not required. The construction of the armature shaft and regulated generator parts is along conventional lines. Ball bearings are used for the coupled type, while, where the generators are mounted on the gear cases by supporting flanges, large bronze sleeve bearings are employed. These latter are lubricated by a constant stream of oil. The windings are mechanically and electrically strengthened by a double impregnating treatment, making them oil and water proof. Four brushes are supplied on the generator in place of the customary two, and the field coils are securely located on poles and highly insulated from ground. It requires but one wire to connect the generator to the car's wiring system.

It is in the cut-out switch and voltage regulator that the instrument differs from other types. The cut-out and regulating units are mounted within the bracket on the commutator end, and removable covers provide access to both. The cut-out is adjusted to close the circuit to the battery when the speed of the generator has reached such a point as to give 6.5 volts at the generator terminals; it opens with a reverse current of 1 amp. and at a speed below the cut-in speed to avoid any tendency to chatter when the generator is running near the cut-in speed. The cut-in speed varies from 5 to 10 m.p.h., depending on the gear ratio and wheel diameter used on the car.

Regulator Specially Developed

The regulator has been especially developed for truck work. Movement of one of the contacts of the regulator is caused by a cam on the generator shaft so that this operation is positive and contacts are either in intimate contact or entirely open. A slight wiping motion keeps the contact surfaces clean. Regulation is effected by opening and closing of the regulator contacts, thus cutting in and out a resistance connected across these contacts and in series with the field winding of the generator; the time the contacts are closed varies with the speed. The generator will maintain a proper voltage and current output even if the battery becomes disconnected. An opening in the end bracket affords access to the regulator adjusting screw.

The action of the regulator is explained in Fig. 1. The contact affixed to the armature moves back and forth with the latter to and from the end of the armature core as the amount of flux through this core varies. Since this flux varies with the voltage of the generator, the position of the surface of the top contact is at all times determined by the generator voltage. If this voltage tends to rise, the top



Left—Fig. 2—End view of the Westinghouse cam-regulated generator showing cut-out switch on left and regulator on right. Right—Fig. 3—Exterior of the Westinghouse cam-regulated generator. This machine is adapted to cradle mounting

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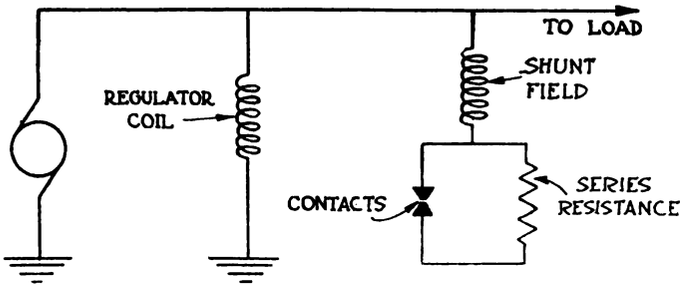


Fig. 4—Approximate wiring diagram of the Westinghouse cam-regulated generator

contact will then be withdrawn from the lower contact.

Since the lower contact is always moving up and down under the influence of the cam, the duration of contact in each revolution will be proportional to the position of the top contact, which in turn is proportional to the voltage. Thus, if the voltage tends to increase the top contact will be withdrawn from its mean position, while if the voltage tends to decrease, due perhaps to lower speed or increased load upon the generator, the upper contact will approach the lower and thus make the duration of contact longer in each revolution. Since the two contacts short-circuit a resistance in series with the shunt field of the generator, the operation is identically that of the familiar Tirrell regulator used in power plants.

Adjustment is made by bending the brass piece at the outer end of the steel frame. By straightening out the crooks in it the armature is moved farther away from the core, and this increases the regulated voltage. By squeezing up the brass piece the armature is allowed to move up nearer the core. This gives the core a greater influence on it and tends to take it away from the contact, thus increasing the length of time during each revolution in which the fields regulating resistance is left in the circuit.

Standards Committee in Busy Session

(*Continued from page* 138)

it was decided to eliminate the dimensions .216" R and 0.180" which overcame the difficulty. On the suggestion of Mr. Wolfe, the minus tolerance of the circumference of the rim was changed from 11/64 to 9/64 in., this change having been decided upon by the Clincher Tire Manufacturers Association. With these changes the wheel and rim specifications were adopted.

Mr. Harley stated that the division had also decided upon an 18 mm. spark plug, having been given to understand that this was the size of plug to be used in the Liberty motor truck engines. As the motorcycles will be used largely in conjunction with the trucks, it was considered advantageous to have the same size of plugs in use on both types of vehicles. Since that time, however, it was learned that the ⅞-18 plug would be used on the truck and the action regarding the use of the millimeter plug on motorcycles was rescinded.

The newly appointed roller chain division made its first report, containing recommendations regarding the nomenclature of roller chain parts and a table of roller chain dimensions. The chain sizes recommended were selected from the most generally used existing series, with the addition of a 2½-in. pitch for heavier duty. This series was chosen in order to provide the best practice during the existing war conditions. Other series will be worked out for light duty at high speeds, and heavy duty at slow speeds, and will be influenced more or less by the introduction of alloy steels in future chain manufacture. The chain size numbers indicate the number of quarter inches in the pitch. The report was adopted.

Tractor Division Report

Chairman Parrett of the Tractor Division read the report of that division as formulated at a meeting on the previous day. It was accepted as presented. In the report of the data sheet division it was stated that a new comprehensive index to the data sheets had been prepared and sent out to the members. Suggestions were made that a number of obsolete sheets be eliminated and that several other sheets be revised. This report was adopted.

Miscellaneous Division Report

In the printed report presented to members of the meeting were given complete tables of yoke and eye rod ends, plain rod ends and eye rod ends. Only the two largest sizes in each of these tables, ⅞ in. and 1 in., were new, and the addition of these sizes to the existing standards was decided upon. The subject of bumpers and mounting had been given consideration by the miscellaneous division in co-operation with the Bumper Manufacturers Association and after a careful review of the proper height for both front and rear bumpers, for various conditions of loading, fender clearance and collision, the following heights and dimensions were recommended. The committee also believes that there is a chance for further work along the line of methods of attaching the bumpers.

Table of Standard Bumper Heights and Dimensions

	Front	Rear
Height from center of face to ground	21	22
Over-all length	Between 59 and 60	Between 59 and 60
Bumper face	Flat	Flat
Vertical depth bumper bar min.....	2	2½

Dimensions in inches.

The final item in the report of the miscellaneous division was a table of S. A. E. screw threads, containing both the regular S. A. E. and the new S. A. E. fine thread. A diagram showing the pitches corresponding to various diameters of the new fine thread was given in the report of the recent standards committee Washington meeting in AUTOMOTIVE INDUSTRIES. All of the items in the miscellaneous division of report were tables to pass upon.

Marine Division Report

The Marine division presented reports on steel engine couplings, steel reverse couplings, cast iron reverse couplings, shaft couplings and propeller mounts. These were in the form of tables with dimension drawings. The steel couplings called for taper fittings and determined opposition was made to the adoption of this form of fitting by a manufacturer of flexible couplings, who said that the adoption of this sort of fitting as standard would be detrimental to his business, as his coupling could not be fitted to a tapered shaft end.

There was considerable discussion on this point, but inasmuch as it was getting late and there were only a few members of the Standards Committee left in the room, it was found that there was no quorum present, and that no action could be taken on the report. A vote was taken and showed it to be the sense of the committee that with a number of corrections of typographical errors, the report should be adopted as presented. Mr. Smith, who objected to the adoption of a standard for couplings with tapered fittings, will be given a chance to present his views to the Marine Engine Division at one of its next meetings.

There will be a general marine engineering meeting under S. A. E. auspices in this city on Jan. 25, and it is possible that the Marine Division of the Standards Committee will have a meeting at that time. All of the subjects on the program having been passed upon, the meeting adjourned.

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Standards Division Meeting

A MEETING of the Tractor Division was held at S. A. E. headquarters on Tuesday. Of the members of the Division, Chairman Dent Parrett and Joseph Van Blerck were in attendance, and Standards Manager M. W. Hanks and P. M. Heldt of *Automotive Industries* were also present. The recommendations formulated at the Minneapolis meeting were gone over in detail. In regard to the suggestion that tractor rims be cut in lengths of 12, 14, 16, 18, 20, 22 and 24 ft., it was pointed out that this resulted in rather large steps (about 7¾ in.) between diameters of successive sizes of wheels. It was decided to compose a letter explaining that it is not the intention of the Standards Committee that tractor manufacturers should change the wheels on their existing models, but that, whenever they are developing a new model they should aim to adopt one of the suggested dimensions. The letter is to be sent to all manufacturers of tractors, who will be asked to criticise the recommendations and to make suggestions in case they cannot adopt them in their practice.

Slight Change in Wording of Specification Blank

A slight change in the wording of the short specification blank, already adopted by the Division, was decided upon, this being to the effect that the speed which is normally used in plowing is to be indicated by a check mark, the word "normally" not being used in the original recommendation.

In connection with the recommendation that a pad of magnetic insulating material at least ½-in. thick be placed under magnetos when mounted on cast iron brackets, a letter had been received by Chairman Dent Parrett from a magneto manufacturer protesting against this recommendation. The manufacturer in question asserted that with many makes of magnetos this pad was unnecessary, and the requirement would be a hardship on tractor manufacturers. Chairman Parrett reported that he had replied to this letter by stating that the recommendation was adopted at a meeting of the tractor division held in Chicago, which was attended by representatives of practically all the magneto manufacturers, and there was no opposition to it. It was decided to report the substance of the letter and of Mr. Parrett's reply to the Standards Committee.

The recommendation regarding tube size for gasoline and oil leads was ratified, though there was a feeling among the members present that an additional, larger size would be necessary for the heavier tractors.

Drawbar Connections

Considerable discussion developed in regard to the proposed draw bar connections. Under this heading specifications are given of the size of stock from which the coupling is to be made, the width of the space for the draw bar, the size of hole for the draw bar pin, and the position of this hole. A drawing accompanies this specification, which contains full dimensions for the coupling. Mr. Van Blerck urged that no dimensions should be given except the width of the space for the drawbar, the size of the hole and the location of same, so as to afford manufacturers and designers a chance of working out the details of the coupling according to their own best judgment. Other members present felt, however, that the design shown in the sketch would be suggestive to engineers, and after a full discussion of the subject it was decided to caption the cut "Suggested Design of Drawbar Coupling."

Electric Vehicle Report

A meeting was also held by the Electric Vehicle Division and the following recommendations were made:

It is recommended that the matter be laid before the different members of the Committee as to whether it is the consensus of opinion that an attempt be made to standardize a specification for .motor rating. Mr. Queeney stated that there already is a specification for railway motor practice, and that a specification along similar lines would be helpful. He promised to procure a copy of the railway motor specification and send it to Mr. Hanks, so that all the members of the Division might be supplied with a copy. This railway motor specification will serve as a model for a type of specification for electric vehicle motors.

This Division was requested to standardize the focal length of headlamp bulbs for electric vehicles along the same lines as already done for gas cars, if this be possible. This matter was referred to the Lighting Division and they recommended the standard focal length of 1¼" for both electric and gasoline propelled vehicles.

Standardization of Battery Compartment

Mr. Hanks was instructed to bring up at the Standards Committee meeting the question of whether or not the 1¼" focal length applies to all bulb sizes. If it does apply to all sizes, it should be so stated, and if it does not, the limits should be specified.

Mr. Ford referred to a letter he had received from W. P. Stone & Co., South Boston, Mass., suggesting that their interchangeable battery compartment be standardized. The fact that this battery compartment is patented prevents any action whatever upon this specific type. The subject of compartment sizes is now before the Division.

Mr. Hertner submitted copies of correspondence from representatives of the manufacturers of electric passenger cars. The consensus of opinion is that the battery compartment is so closely allied to the body line of passenger cars that no standard can be adopted which will apply to existing vehicles; if, however, some standard sizes could be worked up, they might be applicable for future designs. It was suggested that the manufacturers agree upon the specific sizes for future use.

Commercial Car Problem

Mr. Whitney, as Chairman of the Standardization Committee of the Electric Vehicle Section of the National Electric Light Association, reported that a Sub-committee had been diligently attacking the problem of commercial cars, and it was his opinion that some results of their work were available. He promised to obtain whatever data and conclusions this Sub-Committee had arrived at and submit them to the Division for action.

This Division had been given to understand that the tire people must be convinced of the merits of the present Whitney test, or the Whitney test must be revised so that it would be satisfactory to the tire people. Several truck manufacturers are buying tires based upon the Whitney method of testing. The matter was put before the Standards Committee once before and was acted upon unfavorably, due to the attitude taken by the tire manufacturers. The only reason that this subject has been in the hands of the Electric Vehicle Division is that the electric vehicle manufacturers have been more interested in obtaining solid tires of high efficiency. With the high cost of gasoline, tire efficiency is becoming more important to manufacturers of gas cars, and perhaps the time is ripe when the subject is of enough general interest for it to be put before the Standards Committee again.

Letter from A. I. E. E.

Mr. Hanks read a letter received January 7 from the American Institute of Electrical Engineers, stating that the A. I. E. E. had no standard specification for electric vehicle cable and that their only cable standards were those on pages 68 to 76 inclusive of the standardization rules. Table XIII on page 71 is probably the best suited. This gives the number of strands and wire sizes for different sized cable. It was suggested that information based upon this table be obtained to show what kind of insulations are being used in regular practice. Recommendations for standardization will then be based upon this information.

The Miscellaneous Division, of which Mr. Ehrman is chairman, extended the table of rod end pins to include pins for ⅞-in. and 1-in. rods.

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Latest News of the

Kettering President of S. A. E.

Beecroft First Vice-president —Hinkley, Houston, Glover, Sutphen and Brate Vice-presidents

NEW YORK, Jan. 10—Chas. F. Kettering, vice-president of the Dayton Engineering Laboratories Co., is the president-elect of the Society of Automotive Engineers.

Kettering has been connected with the Dayton Engineering Laboratories Co. since 1909. Prior to that he was engineer in charge of development work on electric apparatus for the National Cash Register Co. He was graduated from Ohio State University in 1904.

David Beecroft, who is directing editor of the Class Journal Co., and has been active in society affairs for a number of years, is first vice-president. The complete slate follows:

President—Chas. F Kettering, vice-president Dayton Engineering Laboratories Co.

First vice-president—David Beecroft, directing editor Class Journal Co.

Second vice-president—C. C. Hinkley, president and general manager Hinkley Motors Corp, representing motor car enginering.

Second vice-president—Geo. H. Houston, representing aviation engineering.

Second vice-president—Fred Glover, Emerson-Brantingham Co., representing tractor engineering.

Second vice-president—Henry R. Sutphen, vice-president Submarine Boat Corp., representing marine engineering.

Second vice-president—H. R. Brate, representing stationary internal combustion engineering.

Secretary-General Manager — Coker F. Clarkson.

Treasurer—Chas. B. Whittelsey, vice-president Hartford Rubber Works.

Councillors 1918

B. B. Bachman, engineer Autocar Co., Ardmore.

H. L. Horning, engineer Waukesha Motor Co., Waukesha, and chairman Automotive Section of the War Industries Board.

C. W. McKinley, chief engineer, Willys-Overland Co.

George W. Dunham, past president.

Russell Huff, past president.

Councillors 1919

Chas. S. Crawford, chief engineer Premier Motor Corp.

Chas. M. Manly, vice-president and chief engineer, Curtiss Aeroplane Co.

J. V. Whitbeck, chief engineer, Chandler Motor Car Co.

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To Have Gasoline Administrator

WASHINGTON, Jan. 10—In addition to the administrators of food and fuel there is now to be an administrator of oil and gasoline. He will operate under Director Garfield of the fuel administration. His name has not been made public, but it is said he will not be connected with any of the large companies. A. C. Bedford of the Standard Oil Co. has thus far acted as chairman of the Petroleum War Service Committee.

During the early stages of control the oil industry will be allowed to continue on its present basis without interference that would not be supported by full information on its position. The initial stages of control will deal almost exclusively with the problems of facilitating distribution and promoting conservation measures. The immediate task which will confront the administration will be the perfection of an organization adequate to handling the complex phrases of the industry which must be dealt with.

—

M. A. M. A. Re-elects Officers

NEW YORK, Jan. 9—The Motor & Accessory Manufacturers' Association to-day held its annual meeting and re-elected four retiring directors: Christian Girl, Standard Parts Co., Cleveland; E. H. Broadwell, Fisk Rubber Co., Chicopee Falls, Mass.; E. W. Beach, Manufacturers' Foundry Co., Waterbury, Conn.; L. M. Wainwright, Diamond Chain & Mfg. Co.

All of the officers of the association except the secretary were re-elected as follows: President, C. W. Stiger, Stromberg Motor Devices Co., Chicago; 1st vice-president, C. E. Thompson, Steel Products Co., Cleveland; 2nd vice-president, E. H. Broadwell, Fisk Rubber Co., Chicopee Falls, Mass; 3rd vice-president, T. J. Wetzel, Precision Die & Casting Co.; treasurer, L. M. Wainwright, Diamond Chain & Mfg. Co.; assistant treasurer and secretary, W. O. Rutherford, B. F. Goodrich Co. Mr. Sloan, formerly assistant treasurer, remains a member of the board of directors.

—

500 Attend M. A. M. A. Banquet

NEW YORK CITY, Jan. 9—The fourteenth annual banquet of the Motor & Accessory Manufacturers' Assn. held at the Waldorf to-night was attended by over 500 members of the association and guests. After an address of welcome by President Chas. W. Stiger, a combined dinner, vaudeville performance, war lecture, and war movie show took place, and continued until 1:30 a. m. The war talk by Corp. R. Derby Holmes of Boston, and late of an English regiment, was one of the most interesting war talks of the season. This was followed by five reels of Italian war films showing the Italian army fighting in the region of snows and ice, and also the work of the Italian motorboat submarine chasers, dirigibles and airplanes.

Show Hits Old-Time Stride

Weather and Rumors Make First Days Small—Good Net Already—Result Seems Assured

NEW YORK, Jan. 9—The New York show hit its old-time stride to-day after a rather bad beginning. The first day, Saturday, was the end of the coldest spell New York has ever had. People were still sticking close indoors and rumors were afloat that Grand Central Palace was cold.

Monday the people had not fully awakened to the fact that the show was on as big as ever, but by Tuesday, with the newspapers carrying advertising and their usual show stories and the hotels packed to the roofs with automobile people, the city waked up and the city flocked out to supplement the big army of out-of-town people who began to arrive in force.

To-day, Wednesday, the old-time show has "come back." The attendance is as big as last year if not bigger, and the management estimates that if the relapse of the first few days should prove only to be a delayed attendance the last few days might be bigger than ever before.

High-priced Cars Sell Well

Business also is beginning to pick up, and among the high-priced cars, too. Stutz, McFarlan, National, Pierce-Arrow, Packard, Franklin and Marmon report a strong business tone, and Auburn, which looks more to the West than to the East for business, said it felt greatly encouraged with the response it was meeting. Paige reported a good business.

On the accessory floors the feeling of optimism is supreme. People are said to be purchasing heavily, especially of the smaller articles, such as car locks, lenses and other easily carried articles. Ford devices sell in volume.

At the dealer dinners that are being held business experts are showing the dealers why business is bound to be good. The end of the week should see a wonderful stiffening of the backbones of some who came to the show expecting to see an exhibition of gloom and impending disaster, which they have not found.

Jobbers are here in numbers, looking for goods to supply the biggest demand they believe they have ever been able to foresee.

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Automotive Industries

No G. M.-Chevrolet Merger Yet

Concerns Maintain Their Relative Independence at Least for Time Being — Declare 3% Dividend

NEW YORK CITY, Jan. 9—Plans for merging the Chevrolet and General Motors companies were again pigeon-holed after a joint directors' meeting yesterday. Wall Street had freely predicted that such a merger would take place, and it had been accepted generally as an almost foregone conclusion that yesterday's meeting would see the deal through. It is very possibly due directly to General Motors war business in trucks, shells and Liberty airplane engines said to total $60,000,000 during 1918 that the deal did not go through.

Both companies have declared a 3 per cent dividend to stockholders as of Jan. 18, the dividend being payable Feb. 1. This is a regular dividend and was simply a matter of form as far as the meeting was concerned, as the directors of the General Motors Co. declared the dividend and then adjourned, after which the directors of the Chevrolet company held their meeting. Directors of both companies stated that there is no immediate intention to consolidate.

—

Central Warehouses for Airplane Repair

INDIANAPOLIS, Jan. 6—A $600,000 airplane warehouse is being erected here for the repair of all army airplanes located east of the Mississippi and north of the Ohio River. The building for body repair is 241 x 264, and the motor repair building is 239 x 294. Four large barracks are to be built to house 25 officers and 700 enlisted men in charge of the airplane work.

—

Curtiss Output 12-15 Planes Daily

BUFFALO, Jan. 8—Curtiss Aeroplane & Motors Corp. is turning out from 12 to 15 machines daily, and is preparing to increase this output in 1918. The volume of shipments for the last six weeks has been about $3,000,000. It is estimated that by March the monthly turnover will be $5,000,000.

—

Wright-Martin Profit $1,000,000

NEW YORK, Jan. 8—It is estimated that the Government contract with the Wright-Martin Aircraft Corp. for 550 Hispano-Suiza motors at $5,000 each will yield $1,000,000 profit, or the equivalent of $1 a share on the company's outstanding common stock. About 200 of the engines have been shipped already and the remaining 350 are ready for shipping instructions. The problem of changing the production from 150 hp. to 220 hp. engine was accomplished without great cost or confusion, and work has already been started on the latest Government order for 4000 Hispano-Suiza motors and parts, making the equivalent of 5500 engines. This contract involves $28,000,000.

—

Aircraft Inspectors Band Together

DETROIT, Jan. 5—The Detroit Aircraft Inspectors club, composed of the engineers who construct and inspect airplanes in this city, has been organized for more complete co-operation in the work of the members. Captain James Haeslett, who has charge of the Government aircraft equipment in the city, and Captain Hotchkiss of the Washington division of aircraft equipment addressed the members. The officers elected follow: President, Lieutenant E. T. Jones; vice-president, George Gray; secretary-treasurer, A. T. Davidson. Monthly meetings are scheduled. It is stated that the first of the Detroit built war planes was successfully demonstrated during the past week.

—

Coal Still Short in Detroit

DETROIT, Jan. 5—The coal situation still occupies the center of the stage, and receipts have dropped off in the last week. Last week something over 500 carloads were received, but this week only about 150 carloads arrived. Manufacturing plants are still running with limited supplies, and relief is looked for through Government control of the railroads. Flint, Jackson and Lansing are possibly in even worse condition, and two Lansing factories will have to close this week if coal does not arrive.

—

Canada Sees Trouble Ahead

MONTREAL, Jan. 5—It having been reported throughout the trade in Canada that the Government proposes to restrict the importation of gasoline and motor cars, the automobile dealers are planning to lay facts before the Government to prove that such action would be harmful to the dominion. The Montreal Automobile Trade Association through its manager, T. B. Kirby, is gathering information and it is probable that a meeting of the trade will be held at an early date.

—

Furniture Men Making Airplane Parts

GRAND RAPIDS, Jan. 3—The Bissell Carpet Sweeper Co. is working on a large war contract for airplane parts, which will extend through a long period. This is but one of many received by Grand Rapids furniture manufacturers.

N. A. C. C. Reports Record Shipments

Deliveries Exceed Any Previous Year — Production Slowed by Material Shortage

NEW YORK CITY, Jan. 9—The total shipments of automobiles by members of the National Automobile Chamber of Commerce and by the country in general, for 1917 greatly exceeded the shipments of 1916 or any other previous year in the history of the industry. Taken month by month the shipments during 1917 exceeded those of the previous year with the possible exception of December. There was no slowing up on production until a shortage of materials arose in October, and during October, November and December production figures fell below those of the corresponding months of 1916.

According to reports from the regular monthly meeting of the directors of the National Automobile Chamber of Commerce held to-day the automobile manufacturers have been playing their part in relieving railroads of automobile shipments, because there has been a substantial falling off in shipments during the past few months due to the increased driveaways from factories.

Several factories in the Great Lakes zone, which may be said to include Cleveland, Toledo, Detroit, Pontiac, Flint, Lansing and adjacent places, are driving away a large percentage of cars produced. One distributer in the Southeast drove away over 1000 cars during the month of November.

Some of the large New York distributers are now arranging to drive all of their cars to Buffalo, where they will be stored. Other manufacturers are arranging similar plans to relieve the railroads during the coming months and through the Spring. It is hoped road conditions will not interfere with the plans.

At to-day's meeting, Chairman A. W. Copland, of the Automobile Industries Committee, and Hugh Chalmers, of the same committee, reported at length on the work of the committee in Washington and on its co-operation with the War Industries Board. The committee has done commendable work by way of placing or arranging for Government work other than automobile manufacture with many factories that are slack.

Roy D. Chapin, chairman of the Highways Transport Committee, and Windsor T. White, president of the White Co., reported on the truck conference held yesterday.

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The Platform on Which the N. A. C. C. Truck Makers Stand

1—RESOLVED, *That the motor truck manufacturers of the United States, in convention assembled in New York on January 8, 1918, hereby tender to the President of the United States, to the Secretary of War and to the Council of National Defense, their services and co-operation in meeting the transportation needs of the Government and the country, and offer the facilities of their factories to aid in the prosecution of hostilities against the Governments of countries with which the United States is at war. It is resolved, That copies of this resolution be addressed to the President and the Secretary of War.*

2—WHEREAS *the present unprecedented crisis in the railroad transportation service of the country has made imperative an extraordinary development of motor trucking by highway to meet the needs of the War Department of the Government and of the industry and commerce of the United States, and*

WHEREAS *it is essential to the effective use of motor vehicles as a measure of relief of freight and express congestion that the main highways be put and kept in good usable condition for the movement of the products of farm and factory, it is*

RESOLVED, *That the Director-General of the Railroads be urged to raise the embargo against the use of open-top railroad cars for the shipment of road materials and machinery in sufficient time to permit of resumption of highway construction and repair early next spring in the northern states and, if conditions permit, that this portion of the order be rescinded this winter in so far as it affects the Southern States and California.*

3—RESOLVED, *That a committee of five representatives of motor truck manufacturing companies be appointed by the president of the National Automobile Chamber of Commerce to co-operate with and assist the Highways Transport Committee of the Council of National Defense in working out problems arising in connection with the organization and development of transportation by public highway for the relief of railroad freight congestion and to facilitate the movement of military trucks and the transportation of the mails.*

4—RESOLVED, *That the representatives of motor truck companies in attendance at this convention indorse unanimously the work and plans of the Highway Transport Committee of the Council of National Defense and hereby tender the full co-operation of the motor truck industry in developing ways and means for increasing the effectiveness of the motor truck in moving merchandise and other freight and express matter.*

5—RESOLVED, *That the motor truck manufacturers of the United States, assembled in convention January 8, 1918, who view with increasing apprehension the various forms of drastic motor truck legislation already passed and other forms threatened, hereby appeal to the Council of National Defense, asking the council to request the various states in this time of stress when transportation is the need of the hour, to refrain from passing or enforcing any unreasonable legislation that would interfere with motor truck transportation.*

Motor Trucks Will Help Win the War

N. A. C. C. Urges Necessity of Truck Makers and Users Co-operating with the Government—Must Help Relieve Railroads

NEW YORK, Jan. 8—"The automobile industry is more interested in having democracy as usual after the war than business as usual now." This was the stirring remark of Hugh Chalmers made at the Motor Truck Manufacturers' Convention being held in the boardroom of the N. A. C. C. H. L. Horning, Automotive Section of the War Industries Board, said: "The truck has now come to the point of being a national necessity." About 100 of the most prominent truck makers of the country were present.

The keynote of the meeting was service to the Government. This service was expressed in co-operating with the Government motor truck program; in assisting to relieve the railroad congestion by the use of motor trucks and the additional service of the motor truck industry so that manufacturers may better understand the demands to be made upon them and be better prepared to meet them.

He spoke of the new kind of slackers which we have among us and who are not only those who refrain from going to war. He mentioned particularly people who complain about the absence of parlor cars and smokers on railroad trains and concluded by stating that these men were just as much slackers in preventing the full co-operation of our citizens toward winning the war as those who unfairly seek to evade the draft law.

George M. Graham, assistant commercial manager of the Pierce-Arrow Motor Car Co., Buffalo, N. Y., briefly outlined the work which the motor truck industry has already rendered to the Government. He told of the work which motor trucks did on the border with General Pershing's expeditionary force in Mexico, and traced the industry's work from that time up and including the many weeks of effort of the best brains of the motor truck industry in the development of our standardized trucks.

Truck Transport Necessary

The great problem now before the motor truck industry is to prove the feasibility and practicability of employing the motor truck to relieve the acute railroad congestion which is bound to increase as our rolling stock wears out through lack of proper care and as our Government's preparation increases to keep our army of one million men supplied 3000 miles from their base.

Major Edward Orton, Jr., Q. M. C. U. S. A., told of a great work which the Government is now doing in driving its standardized war trucks and other trucks still being shipped on previous orders overland from their points of assembly to the seaboard. He pointed out that the most important effects of these overland drive-aways of war trucks are not in the 15,000 freight cars saved for other needs or for the 100,000 tons of freight which they will carry, but instead are the great educational value which these long convoys of trucks will have upon the people of America to make them wake up to the fact that we are really at war.

These trucks will be the first physical contact which a large proportion of our citizenship has had with the materials of the war. We have not yet been bombed by enemy airplanes, nor have our coasts been shelled by the guns of great dreadnoughts lying out of sight of our coast behind the horizon. These war trucks will be one of the first object lessons of the war and of the great preparations which our officials in Washington are making to assure a victory for our arms.

The second great benefit of these drive-aways will be the bringing to the citizenship of the great necessity for overland motor routes and roadways capable of withstanding motor truck traffic and of roads which actually lead somewhere, and do not branch out to obscure points as had been caused by the individual road-building programs of our several states. This need has long been

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in existence, but it will be the lesson taught by these war trucks that will bring it to the fore and result in the great development of our national highways. These great drive-aways of our 30,000 or more war trucks will have a bigger immediate military advantage than a commercial one. This will be in the training of the great personnel of truck drivers, truck masters and mechanicians required to keep our trucks in motion.

He briefly outlined the many months of study which were necessary before the first drive-away was successfully accomplished. He told of how engineering reports on the roads had to be secured; how routes had to be selected; how road maps had to be secured from the topographical departments of the several states through which the route led; of building gaps in the proposed road; of repairing such parts of roads selected as were impassable for trucks; of the cooperation which had to be expressed by the state highway departments of the various states to keep the route clear of snow during the winter months and of the necessity of supplying doctors, kitchen equipment, oil-filling stations along the route, sleeping quarters and a plotting of the various truck assembly plants and their relation to the main cross-country route.

Properly Handling Freight

He also told of the great detail work which had to be successfully completed in getting the freight which the trucks will carry to the proper points so that it might be loaded into the trucks. It was also necessary to see that this freight was of the proper kind, size and nature that it could be economically loaded into the prescribed motor truck bodies.

He then told briefly of the plans of the Government for training the drivers of these trucks. He mentioned the possibility of seriously damaging the trucks if run overland by green or inexperienced drivers, and was of the opinion that the Government's eventual policy would be to have a green crew act as observers along with a trained crew on one trip and then to let the green crew take out a new fleet on the second trip. In this way he pointed out that the trucks would be much less liable to be damaged while under the eye of an experienced driver on the seat of each vehicle with the novice. At the present time the personnel for only twelve motor truck companies of thirty-three trucks each had been drafted from the various cantonments for the work. Undoubtedly others will be selected as soon as the standardized war trucks begin coming through in quantity.

David S. Ludlum, president of the Autocar Co., Ardmore, Pa., spoke of the positive necessity of establishing schools where motor truck drivers could be trained instead of trying to give them training for a few hundred miles in the overland drive-aways. He brought out the fact that the great purchase of motor trucks would mount into millions of dollars and that it would be folly to entrust this vast investment to the hands of unskilled men who might abuse the trucks by their inexperience.

He also spoke of the fatality of one of the truck drivers on the Packard train which left Detroit Dec. 14 and arrived at Baltimore Dec. 28. Although one of the rules which every army truck driver must learn is that he must bring his truck to a stop before crossing a railroad track to see if the way is clear, one of the truck drivers was struck by a locomotive on the trip while passing through Warren, Ohio. The truck driver was killed and the truck demolished. Mr. Ludlum brought out the fact that this accident occurred at 2 a. m. and was of the opinion that no night driving should be permitted on the overland drive-aways unless each driver had received a sufficient amount of actual road driving previously. Even then he thought that 10 hours continuous driving was all that should be required of the new drivers now.

Hugh Chalmers made a great appeal for a better understanding of what the war really means to the automobile and motor truck industry. He briefly sketched the work of the automobile industry committee in Washington and how it was partially instrumental in blocking the proposed curtailment of the automobile industry because of the misinformed assumption that it was a non-essential. He stated that there would be no official curtailment of the motor car industry except in so far as the question of materials arose.

Several Shocks to Come

He stated that the citizens of the United States will have to meet several great shocks in the near future. The automobile industry will have to meet these shocks as well as the other great industries of the nation. He told of a recent movement in Washington to cancel the New York and Chicago National Automobile shows in order to save railroad transportation and coal with which to heat the show buildings. It was partially due to the work of his committee that these movements were sidetracked. He pointed out that of all years in the history of the automobile industry 1918 was the one year in which the shows should be continued, in order that the necessary readjustment between the passenger car maker, his distributer and his dealer might be effectively met and that the calling off of the shows at this time would entail a great financial loss of thousands of dollars due to previously arranged contracts and preparations.

He also spoke of the possibility of closing down all the schools and churches in this country for a period of one week. In this connection he said it was also possible that all of the industries might have to shut down completely for one week, including those of the automobile and motor truck, in order to relieve the acute railroad congestion and start off anew under better conditions at the end of the shutdown. He gave it as his opinion that he would rather shut down completely for one week than to run at the present inefficiency with the almost positive assurance that the efficiency of the plants would be further decreased unless the present railroad congestion was immediately removed.

H. L. Horning, of the Automotive Section of the War Industries Board, pointed out that the motor truck has the greatest chance for development in the history of the industry. He pointed out the possible use for from 100,000 to 300,000 motor trucks in the parcel post delivery system of this country, and said that it was necessary for motor truck manufacturers to get behind legislation in Washington to make this possible. With the use of motor trucks in this work made possible through government legislation, the various truck companies would advance the idea of the necessity of the motor truck much more rapidly than they would if they should first try to sell their trucks separately to the Post Office Department. It was also his opinion that the motor truck has not yet been sold to the country at large, and that the surface of the possibility of motor truck use has only as yet been scratched.

Plenty of Gasoline

One of the startling statements made by H. L. Horning was to the effect that there is an over-production of gasoline to-day of more than 1,000,000 gal. a day.

Mr. Horning, in his official capacity in Washington, has already been in receipt of many inquiries from motor truck manufacturers as to obtaining priority orders for the shipment of goods entering into motor truck manufacture, and brought out the fact that notwithstanding that these makers have A-1 priority orders, they could still not get materials. In his opinion, the remedy for this difficulty lies in the motor truck establishing its status as a national necessity. If motor truck makers can prove to the Government the necessity for using more and more motor trucks in order to relieve the freight congestion and can actually relieve it, the status of the motor truck will become firmly fixed and there will be no question as to the various makers not getting sufficient material to produce their vehicles.

He further pointed out that the motor truck is the means whereby our armies in the field can strike the blows which will result in defeating the Germans. The trucks carry the ammunition, the food and all sorts of military supplies, without which these sledgehammer blows cannot be given.

The need for a Federal statute controlling the operation of motor trucks in every State of the Union was the outstanding feature of the talk given by Windsor T. White, chairman of the N. A. C. C. Commercial Vehicle Committee on "Legislation Affecting the Use of Motor Trucks." Mr. White's paper treated of the present non-uniformity of existing laws regarding the operation of motor trucks, and the fact that a truck owner operating his vehicle in more than one State would have to equip his trucks with different sized tires if the various laws were carried out to the letter. In

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Coal, the Avenue To Curtailment

Coal-Budget Plan Devised To Curb Non-War Industries by Fuel Administration

WASHINGTON, D. C., Jan. 9—The Fuel Administration has worked out a budget plan of coal allowance by percentage for 1918 to all industries not immediately essential to the conduct of the war and the National interests—and the automobile industry is included in this classification. In other words, the Fuel Administration despite its assurances of no unessential classification, is still headed in that direction. The long forecasted curtailment and stigmatizing classification made in these columns in past issues is again threatening. However, the new plan contemplated by the Fuel Administration does not include issuing a list of the so-called non-essential industries. It is not so brutal. The battle-axe method has been discouraged. A more polite, painless and quiet plan is now adopted. In place of the brutal and direct classification of industries as non-essential, the Fuel Administration expects to force each industry to classify itself as not being essential to war.

The Coal Budget Plan

The method is called the "coal budget plan." Committees representing the large industries of the nation not engaged immediately in war work will be called into conference with the officials of the Fuel Administration. They will be told the amount of coal available for all purposes, the quantities required for war purposes and domestic consumers and the total curtailment of the use of coal necessary to satisfy these demands. They will be asked how they are regarded and what standing they have as to their essential qualifications with the war industries board. They will be asked to volunteer a reduction of their coal consumption for 1918. They will be asked to show the Fuel Administration the best way to accomplish this curtailment and as to how to arrange restrictions so as to affect only the less essential portions of their own business if possible. For example, the Fuel Administration intends to call in the Automobile Industry Committee and try to learn how many passenger cars are used for pleasure and what percentage are used for utilitarian purposes and will then attempt to cut the coal supply to the automobile factories from 100 per cent down to a point in proportion to the percentage of passenger cars required for war work. About one dozen industries have already been called into conference and results promise a saving of 20,000,000 tons, while the total offering from all non-war, which is the new word used instead of non-essential, industries is exepected to be 50,000,000 tons.

The Fuel Administration asks that the automobile industry get in touch with it without waiting for formal notice. It believes that this new plan of voluntary conservation will "forever lay the ghost of the 'cut off the non-essential industries' agitation."

Fuel needed in 1918 for army and navy purposes, for munitions works, for public utilities, for domestic consumers and for factories engaged in war work is scheduled in the budget for 100 per cent fulfillment. With this figure and the estimated production of coal in 1918 as a basis a subtraction shows the amount left for non-war industries. The Fuel Administration when queried about the estimated production for 1918 replied that it was impossible to formulate such an estimate.

Backbone of Industry

Dr. Garfield, head of the Fuel Administration, stated that he realizes that the non-war industries, which have sometimes, as he put it, been miscalled non-essential industries, are the backbone of the country's economic system and that they employ 10,000,000 workers upon whom the nation must depend for bonds and taxes to pay for the war. The percentage of reduction, according to the Fuel Administration, will vary partly upon the advice of the leaders of the industry as to what is practicable and safe shrinkage as compared with the business activity of 1917, and will also partly vary with the character of the business, which means that in proportion as an industry contributes less to the war or domestic necessities it will naturally increase its contribution of self-limitation.

The plan has two advantages aside from the disadvantage of curtailment and stigmatizing classification, and these are:

1. Its elasticity, which will be equalized if the coal production for 1918 is found to be more or less than is now anticipated.

2. Its ability to secure equal compliance by every member of each industry, thus assuring equal sacrifice and no unscrupulous advantage by competitors.

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New Government Labor Plan

WASHINGTON, D. C., Jan. 9—A new plan of labor policies and program for securing labor has been worked out by the Secretary of Labor and the Council of National Defense. The plan includes:

1. A means of furnishing adequate and stable labor supply to war industries by use of a system of labor exchanges, methods of training workers, establishment of an agency for determination of priorities of labor demand, and agencies for dilution of skilled labor.

2. Machinery to provide for immediate and equitable adjustment of disputes between labor and capital without stoppage of work and dealing with wages, hours, shop conditions, etc.

3. Machinery for safeguarding conditions of labor in production of war essentials, including industrial hygiene, safety, women and child labor, etc.

4. Machinery for safeguarding conditions of living, including housing, transportation, etc.

5. Organization to assemble necessary labor data.

6. Information division to develop public sentiment, promote local machinery in industrial plants to help carry out the national program.

Of these agencies the mediation service, labor exchange and bureau of statistics are already in existence. The Secretary of Labor expects to call in for assistance a well-balanced corps of experts representing capital, labor and the public.

Expect $5,000,000 Shell Contract

Jackson Manufacturers Organize $500,000 Corporation to Handle Government Work

JACKSON, Jan. 5—The Jackson Munitions Corp., formed by local manufacturers and business men, and incorporated for $500,000 for the purpose of manufacturing shells, has practically secured a $5,000,000 Government contract. Mayor William Sparks of the Sparks-Withington Co., prime mover of the organization, will spend next week in Washington completing the arrangements, and after his return the board of directors will be elected. Arrangements have been practically completed whereby the plant of the Mutual Motors Co. will be used for the manufacture of large shells, and that of the Jackson Automobile Co. for smaller shells. The smaller industries in the city will also receive proportionate parts of this and other contracts. It is stated that the Government desires the $5,000,000 contract completed by next September. At present about thirteen of the Jackson factories are engaged in Government work.

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Record Sales in Vancouver

VANCOUVER, Jan. 5—The past season has been the most successful in the memory of dealers. Since the beginning of June last, no less than fourteen hundred cars have been sold in local territory. Reports from the local licensing department tend to show also that winter is having little or no detrimental effect on sales. Medium-priced cars have held the lead in point of sales. That the Province of British Columbia is a prolific field, still virgin soil so far as the automobile industry is concerned, is evidenced by the fact that new companies are stretching their tentacles to include the farthest west Province of the Dominion.

One matter that is causing no little concern to dealers locally is the question of deliveries. So far, Vancouver dealers have been singularly fortunate in keeping pace in large measure with demands but it is almost too much to expect that this gratifying state of affairs will continue during 1918.

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Vanderlip Preaches Economy

Financier Tells Rubber Club Greater Efficiency, Too, Is a Prime Requisite Today

NEW YORK, Jan. 7—Frank A. Vanderlip, of the National City Bank, and who is now operating for the Government in connection with the war thrift stamp loan campaign, addressed the Rubber Assn. of America to-night at the Waldorf-Astoria, and reiterated those policies which he has been mentioned before as expounding.

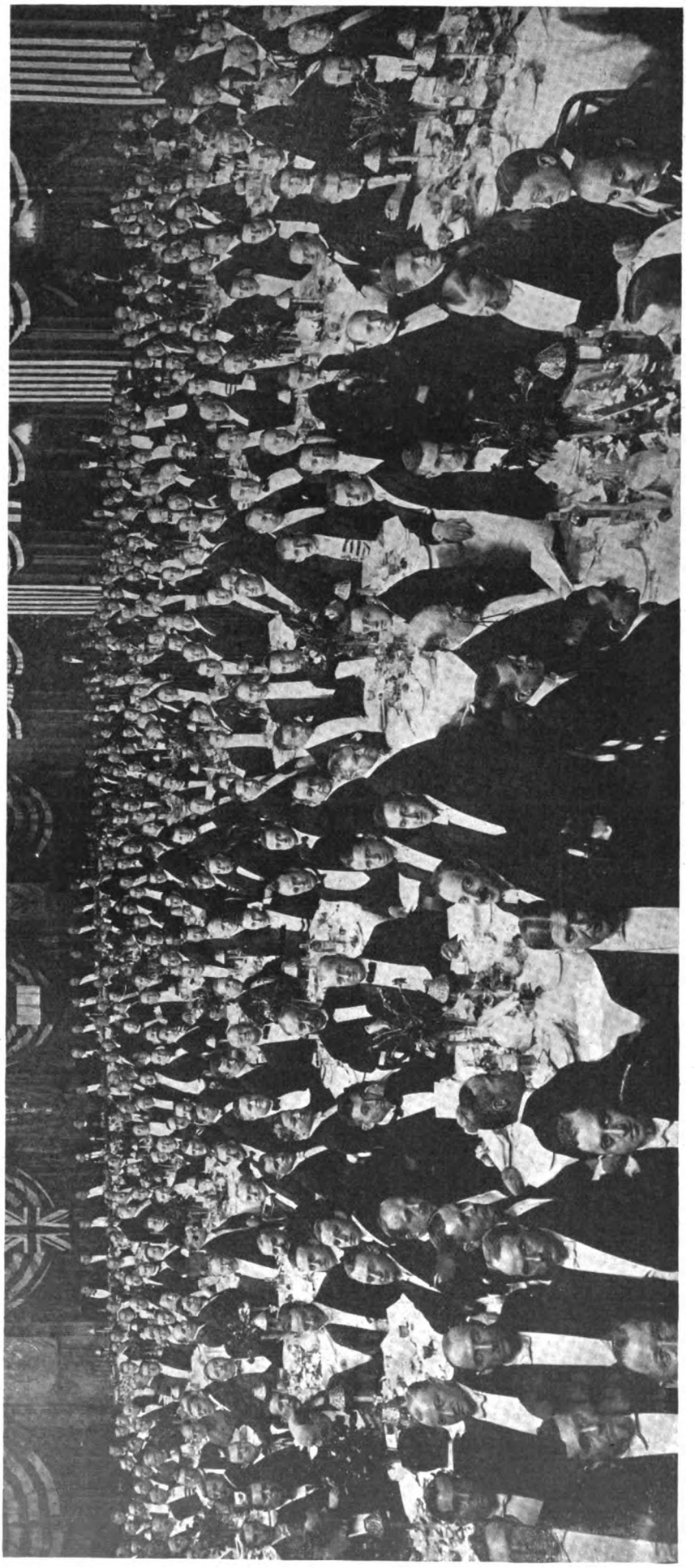
Mr. Vanderlip maintained that the individual in our nation should be more economical, and that he should not spend money. He maintains that if we are to win the war we must cease to buy many of the things we have purchased in other years; that we must cease to buy what he termed luxuries, and he is credited with having indicated earlier in the day that the motor car was non-essential. The car, by the way, has long since ceased to be classed by our Government as a non-essential.

Mr. Vanderlip talked of the need for greater factory capacity, but he did not point out any particular use that would be made of factory capacities if all the factories in America offered themselves to the Government to-morrow. He talked of the need for releasing labor for Government work, but he did not point out where men are needed, what they are needed for or anything of that kind.

He is also credited with having stated previously that if a man's old hat will last 6 months longer he should not buy a new hat until 6 months from to-day. He said some people fear that we may disorganize business. He said: "The tragedy of it is going to be that we are not going to disorganize certain kinds of business enough. In the period of such tremendous prosperity, in a time when the wage fund is so great, when the profits of agriculture are so tremendous, it is going to be impossible to take this lesson of economy with 100 per cent efficiency to 100,000,000 people. What I fear is that we shall have the greatest business in luxuries we have ever known, that people will unconsciously exercise their command over labor, over material, over shop room and transportation, and will interfere with outfitting this army."

He said the Government had appropriated $19,000,000,000 for the purchase of raw materials and had been unable to spend this money because there were not enough things produced to spend it for. He did not agree with the policy that we must expand our industries to promote greater production, but indicated that we must cease some of our production in order to make room for war work, which is contrary to the idea of the expansion of industry that is now recognized by most of our readers as the only sound course to follow.

He also stated that the breakdown of



The annual banquet of The Rubber Association of America, held at the Waldorf in New York, Jan. 7

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the railroads began long ago, and that it was due to the form of Government control that had been exercised. He said we doubtless have seen the end of Government control as we have known it in the past, and he was loudly applauded by the rubber men when he indicated that greater leniency should have been shown to the railroads, and that they should have been permitted to advance rates and put profits on a better basis during the period when costs of all kinds were rising rapidly.

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Rubber Association Elects Works President

NEW YORK, Jan. 8—The Rubber Association of America has elected new officers. They are: President, B. G. Works, president of the B. F. Goodrich Co.; first vice-president, H. Stuart Hotchkiss, formerly with the United States Rubber Co. and now in government work; secretary-treasurer, H. S. Vorhis, re-elected.

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First Aviators Graduate

WASHINGTON, D. C., Jan. 8—The first group of completely trained American aviators ready for service has been graduated by the air school nearest the front line in France. The men have completed the final courses in aerial photography and observation. All received their commissions with one exception.

Champion Ignition Develops A. C.-Baldwin Speedometer

Will Produce Magnetic Type Named for Albert Champion and Russell Baldwin

NEW YORK CITY, Jan. 10—A new speedometer has been developed, known as the A.C.-Baldwin, which is to be made by the Champion Ignition Co., Flint, Mich. It is a magnetic type, which has been under development for over 2 years and has been tested out very extensively. It will be manufactured at the Champion spark plug factory, the plans being to erect new buildings for its manufacture. Production will not start for some months. The speedometer takes its name from the initials of Albert Champion, coupled with the name of Russell Baldwin who developed the instrument. Mr. Baldwin was for years connected with the Stewart Speedometer Corp.

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"Hot Spot Demonstration"

NEW YORK CITY, Jan. 8—A demonstration showing the value of the Chalmers "Hot Spot" manifold was made today by having one of the touring cars stand for 15 hours on the street near the Grand Central Palace under the observation of an official observer. The motor was stopped for that period during which thermometers showed the temperature to average below 30 deg. Fahr. all the time. At 10:30 at night, after the 15-hour stop, the motor was officially started. It required 8 seconds with a starter before the first explosion occurred. After this there were one or two stops when the starter had to be again used but 41 seconds after the first attempt the motor took hold and began accelerating.

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Reo Prices Changed

DETROIT, Jan. 9—The following prices on Reo models will be effective immediately:

Model	Price
R, 4-cylinder, with rod top— roadster	$1,285
S, 4-cylinder	1,085
(same with Rex top)	1,260
T, 4-cylinder (either touring or roadster model)	1,225
M, 6-cylinder touring or roadster	1,550
(either rod or Bonnet top).	200 extra
F, Speed wagon chassis	1,100
(with express body)	1,175
J, 2-ton truck	1,800
(with stake body)	1,950

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Schwerdtseger Air-O-Flex Engineer

DETROIT, Jan. 10—F. W. Schwerdtseger has been appointed designing engineer of the Air-O-Flex Automobile Corp. He was formerly chief engineer of the United States Motor Truck Corp. and latterly has been connected with the Federal and Denby companies.

Motor Trucks Will Help Win the War

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some cases the trucks which could be operated in one State could not be run in another on account of the difference in the existing laws.

S. M. Williams, of the Garford Co., Lima, Ohio, made an appeal for the immediate building of national highways suitable for continuous motor truck traffic. These roads will have to come first because our present thoroughfares are not able to withstand the greatly increased amount of freight which trucks will have to carry over them within the next year.

J. F. Winchester, secretary of the Motor Truck Club of New Jersey, told of unfair laws controlling the operation of motor trucks in his State, and of how from 60 to 70 per cent of all the trucks operating in New Jersey at the present time will be barred if the new law were inforced to the letter. He brought out the fact that according to the present law, which went into effect Jan. 1, 1918, 5-ton trucks like the Pierce-Arrow, Packard, Mack and others which carry over 66 per cent of their total load on the rear wheels, would not be allowed on the road if the present reading of the law that not more than one-third of the total weight be carried on any one wheel were strictly enforced.

Roy D. Chapin, chairman of the Highways Transport Committee, told of the great need of transportation in order to win the war. He mentioned the inadequacy of our present rail, inland water and ocean transportation, and of the great possibility of motor truck haulage provided suitable roads were built and properly maintained.

The great reliance which the Government departments are now placing upon the motor trucks was brought out by a request made to the Highways Transport Committee by the Shipping Board asking that the war trucks driven overland carry parts of ships now urgently required at the yards along the Eastern seaboard. The work which trucks can accomplish in relieving the present terminal congestion was also discussed, and the necessity for good roads kept opened all the year around made evident the trucks were to succeed in this important work.

The problem of return loads must also be solved if the trucks are to operate at their maximum efficiency. Mr. Chapin told of the plan now being introduced in the State of Connecticut in which a Return Loads telephone number be placed in the telephone directory of each city. Then if a driver carries a load from one city to the other, all he has to do is to call up Return Loads in the city to which he has driven and inquire if there are any loads to be returned to the city from which he has come.

George H. Pride, also a member of the Highways Transport Committee and himself an operator of a large fleet of motor trucks, told of the great possibility of motor truck use in emergencies where time is paramount; in the delivery of express material; in the haulage of high grade or high rate L. C. L. freight shipment; of the possibility of eliminating grating when goods are hauled by trucks, and of combined long inland water way hauls by garages and short motor truck hauls at each end of the route.

The positive need for a new type of motor truck road built upon a new engineering and logical basis was gist of the remarks of George C. Diehl, who is chairman of the Good Roads Committee of the American Automobile Association.

The necessity for and the probable appointment of one centralized Government purchaser of motor trucks in Washington was the high spot of the important address of Christian Girl, director of production, military truck division, Quartermaster Department U. S. A. Mr. Girl outlined briefly the development of the Government motor truck program and of the necessity of the truck industry selecting a representative in Washington to assist the Government in carrying out this vast undertaking. He favors putting the burden of the production of suitable motor trucks in sufficient quantities to make possible the Government's ambitious program directly upon the motor truck industry. Such a move would greatly simplify matters and will undoubtedly come to pass within a short time.

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Formula for Tractor Radiators

Slower Fan Speeds and Larger Sizes Recommended — 3% Engine Power for Fans

MINNEAPOLIS, Jan. 5—With the thought of clarifying the atmosphere with regard to radiators for farm tractors, and the many problems connected therewith, A. B. Modine, of the Modine Mfg. Co., manufacturer of tractor radiators, gave one of the most comprehensive expositions of this subject that has ever been given, before the Minneapolis Section of the Society of Automotive Engineers at its January meeting.

Mr. Modine really spilled the beans so far as the tractor radiator question is concerned and spoke in no uncertain terms as to what were the necessities in the way of changes for tractor cooling. After discussing the questions of temperature rise in the air to that of the velocity of the air, he proposed a standardized air velocity to gross radiator area of 2000 ft. per minute.

Mr. Modine went into the question of fan capacity, and stated that while as high as 4½ per cent of the engine power was in some cases necessary to drive the fan, he believed not more than 3 per cent should be required. He recommended larger fans and slower speeds as a means of higher efficiency, and submitted a series of sizes and speeds for fans suitable for different engines ranging from 20 to 50 hp.

Mr. Modine has made a very broad investigation of temperature rise of the air, with the result that during the year there should be a conservation of several million pounds of copper in radiator construction, which copper otherwise would have been needlessly used. In this work he approached the subject under two heads, namely, water delivery and air velocity.

The amount of heat given off from a source is proportional to the difference in temperature between the radiating body and the air. Further, the loss of heat by convection is nearly proportional to the difference in temperature between the hot body and the air. With this accepted, the problem is that of maintaining the surface of a radiator at as high an average temperature as is practical, and this becomes a question of water circulation.

The subject then becomes a question of choosing a standard for circulation that will give practical pump sizes and still maintain a reasonably small temperature drop throughout the radiator.

With this problem in view, Mr. Modine proposed as a standard a rate of water circulation that will give a temperature drop to the water circulated through the radiator of not more than 5 degrees.

In applying his conclusions Mr. Modine declared that such a standard would check up well with that group of tractor engines of 20 hp. providing a few of the engines would run their 18-in. fans at a higher speed than 1450 r.p.m. In the 30-hp. division L-head engines the radiators used show an actual size of 12 per cent larger than that proposed by the Modine standard.

In the 30-hp. valve-in-the-head division the radiator based on the Modine standard would be 3 per cent larger than that in actual use. The same is true of the 35-hp. L-head engine division. In the 40-hp. division the radiator size required under the Modine formula checks exactly with the size of radiators in use. In the 50 hp. size the formula radiator is 12 per cent larger than those in use.

After a further analysis of radiator size in relation to engines, Mr. Modine recommended larger fans with slower speeds, and declared that the power consumption for fan drive should not be more than 3 per cent of the rated engine power. He considered that a consumption of 4½ per cent of the rated engine power for fan drive is too high.

—

Triangle Truck Prepares for Production

ST. JOHNS, MICH., Jan. 8—The Triangle Truck Co. has increased its capital stock from $50,000 to $100,000 and is preparing for active production. The first 1½-ton truck was completed this week and a new factory is in process of construction.

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National Hearse to Issue $100,000 Stock

GRAND RAPIDS, Jan. 8—The National Hearse & Motor Co. will issue $100,000 of 7 per cent preferred stock, with dividends payable quarterly, in order to take care of the increasing business. The company is operating at full capacity, and sells $40,000 worth of cars each month. The business for 1918 shows an increase of 100 per cent over that of last year.

—

General Vehicle Plant Sold for $861,000

LONG ISLAND CITY, Jan. 8—The plant of the General Vehicle Co. has been sold to the United States Government. The consideration was $861,000, and not $2,500,000, as was rumored last month.

Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co.	48	50	..
*J. I. Case T. M. Co. pfd.	73	75	—2
Chalmers Motor Co. com.	2	4	..
Chalmers Motor Co. pfd.	..	50	..
*Chandler Motor Co.	71	72½	+5
Chevrolet Motor Co.	113	115	+20
*Fisher Body Corp. com.	28	34	..
*Fisher Body Corp. pfd.	70	87½	..
Fisk Rubber Co. com.	38	43	—2
Fisk Rubber Co. 1st pfd.	98	103	..
Fisk Rubber Co. 2nd pfd.	60	70	..
Firestone Tire & Rubber Co. com.	98	100	+2
Firestone Tire & Rubber Co. pfd.	96	98	..
*General Motors Co. com.	114	115½	+7½
*General Motors Co. pfd.	82	83½	+5½
*B. F. Goodrich Co. com.	39	40	+3
*B. F. Goodrich Co., pfd.	93	97¼	—1¾
Goodyear Tire & Rubber Co. com.	150	154	+14
Goodyear Tire & Rubber Co. pfd.	95	97	+3
Grant Motor Car Corp.	1½	3	+1
Hupp Motor Car Corp. com.	2	3	+1
Hupp Motor Car Corp. pfd.	72	78	..
International Motor Co. com.	15	16½	+3
International Motor Co. 1st pfd.	33	40	+15
International Motor Co. 2nd pfd.	15	20	—5
*Kelly-Springfield Tire Co. com.	43½	45	+4
*Kelly-Springfield Tire Co. 1st pfd.	75	85	+7
*Lee Rubber & Tire Corp.	15	16	+1½
*Maxwell Motor Co., Inc., com.	27	27¾	+3¼
*Maxwell Motor Co., Inc., 1st pfd.	58	58½	+3½
*Maxwell Motor Co., Inc., 2nd pfd.	21½	21½	+ ½
Miller Rubber Co. com.	130	140	..
Miller Rubber Co. pfd.	95	98	..
Packard Motor Car Co. com.	95	103	..
Packard Motor Car Co. pfd.	92	96	..
Paige-Detroit Motor Car Co.	14	16	+3½
Peerless Truck & Motor Corp.	12	14	..
Portage Rubber Co. com.	109	111	..
Regal Motor Car Co.	..	23	+3
Reo Motor Car Co.	16	18	+2
*Saxon Motor Car Corp.	8	9	+1½
Springfield Body Corp. com.	..	..	..
Springfield Body Corp. pfd.	..	..	..
Standard Motor Construction Co.	9	10	+1½
*Stewart-Warner Speed. Corp.	47	49	+4
*Studebaker Corp. com.	50	51	+5
*Studebaker Corp. pfd.	91	94	+3
Swinehart Tire & Rubber Co.	16	26	..
United Motors Corp.	21⅛	21½	+2½
*U. S. Rubber Co. com.	53	54	+2
*U. S. Rubber Co. pfd.	97¼	98	+4
*White Motor Co.	38	39	+2
*Willys-Overland Co. com.	20	20½	+1
*Willys-Overland Co. pfd.	76	77	+2
Standard Parts Co.	..	70	—8

*At close Jan. 5, 1918. Listed N. Y. Stock Exchange.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	Bid	Asked	Net Ch'ge
Auto Body Co.	7½	8½	..
Bower Roller Bearing Co.	19	..	..
Chevrolet Motor Co.	113	115	+21
Commerce Motor Car Co.	4	..	..
Continental Motor Co. com.	5⅞	6⅛	+ ⅛
Continental Motor Co. pfd.	..	..	..
Edmunds & Jones com.	..	..	..
Edmunds & Jones.	80	90	..
Ford Motor Co. of Canada.	165	..	+15
Hall Lamp Co.	..	14½	..
Michigan Stamping Co. com.	12¼	12⅝	+ ⅛
Motor Products	..	..	..
Packard Motor Car Co. com.	89	92½	—1
Packard Motor Car Co. pfd.	..	91	..
Paige-Detroit Motor Car Co.	15	16	+2⅛
Prudden Wheel Co.	12¾	..	+2
Reo Motor Car Co.	16¼	16½	+ ⅛

INACTIVE STOCKS

Atlas Drop Forge.	..	32	..
Kelsey Wheel Co.	70	78	..
Regal Motor Car Co.	..	26¼	..

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1000 S.A.E. Members Added in 1917

Membership Increased 47% and Now Totals 3119—Big Dinner Attendance Sure

NEW YORK CITY, Jan. 9—At the closing meeting of the 1917 Council of the Society of Automotive Engineers held to-day, the rolls of the society showed a total membership of 3119 as of Jan. 1, 1918. This represented an increase of 998 members during the year. As the membership a year ago was 2121, the increase during the year approximated 47 per cent.

The membership committee reported that for the S. A. E. War Dinner to be held in Chicago, Friday, Feb. 1, approximately 861 tickets have already been sold. This gives evidence that the entire seating capacity of the New Morrison Hotel should be sold out some time in advance of the meeting.

For the Special Motor Boat Dinner to be held in New York, Friday evening, Jan. 25, nearly 100 tickets have already been sold.

The total seating capacity of 1000 at the Automotive Industries Dinner at the Hotel Biltmore on Thursday evening, Jan. 10, in connection with the annual meeting of the society, has been taken up, and there is a waiting list of over fifty.

It is possible that there will be a special tractor dinner at Kansas City in connection with the tractor show to be held in that city.

—

Kanary Manager for United Motors

GRAND RAPIDS, Jan. 8—M. H. Kanary has been appointed general manager of the United Motors Co., succeeding George P. Sweet, who recently resigned to accept a commission as lieutenant in the motor truck division, Aviation Section of the Signal Corps, at Washington, as was previously announced in AUTOMOTIVE INDUSTRIES. Kanary is president and general manager of the Samson Trailer Corp., Grand Rapids, and also president of the Chicago Structural Steel Co., Chicago.

—

Fuller & Sons in New Plant

KALAMAZOO, MICH., Jan. 8—The Fuller & Sons Mfg. Co. is now manufacturing in its new plant. This plant has approximately 100,000 sq. ft. of floor space, and consists mainly of reinforced concrete buildings of fireproof construction. Steel sashes are used to give a maximum amount of daylight, and the building is heated by forced circulation.

—

Fire in Perlman Rim Factory

JACKSON, MICH., Jan. 9—The Perlman Rim Co. was damaged to the amount of $100,000 yesterday by a fire supposed to be of incendiary origin. The Government work being done in the factory was not affected, and the general production will be delayed only 48 hours.

—

King Prices Increased

DETROIT, Jan. 7—The following are the prices on the new models manufactured by the King Motor Car Co.:

Model	Former Price	Present Price	Increase
7-pass. touring	$1650	$2150	$500
4-pass. Foursome	1700	2350	650
3-pass. roadster	1585	2150	565
7-pass. convertible sedan	2300	2950	650

Wire wheels are extra on all models except the Foursome, and this is regularly equipped with wire wheels and 32 x 4½ cord tires.

—

New Prices for Dort

NEW YORK, Jan. 5—New prices for the Dort were made public to-day. The five-passenger touring car and the roadster, which were $725, are now $865. In the four-season line, the sedan, which was $1,095, has been made $1,265; the sedanet, a convertible type, has been raised from $845 to $1,000. A new coupe model not heretofore manufactured has been brought out at $1,265.

10 Per Cent Drop in Exports

November Shipment $1,114,767 Less Than October—Average for 11 Months Correct

Mos.	1917 Cars	Value	Trucks	Value	Parts
Nov.	5006	$4,820,738	1435	$3,430,162	$2,535,230
Oct.	5536	4,481,127	1333	4,374,470	3,045,300
	1916				
Nov.	5337	4,016,930	1655	5,175,114	2,151,434

WASHINGTON, Jan. 8—Export figures for the month of November show a decrease in value for that month as compared with October, of 10 per cent. There were 530 less passenger cars exported, but the increase in value shows a gain of 7 per cent, equal to $339,611. Although the number of trucks exported during November was 102 greater than the October figure, there was a decrease in value of $944,308, or 27 per cent. The decrease in the value of parts exported was 17 per cent.

Australia was our largest customer for passenger cars, having purchased 673 at a cost of $551,859. Argentina followed with a bill of $355,443 for 485 cars. England bought almost the entire shipment of trucks, since 1037 out of a total of 1435 exported were sent to the United Kingdom. The value of the trucks shipped there was $2,472,390.

The most noticeable drop was the number of cars sent to Canada. During October, 1020 at a cost of $676,483 were sent, but the November figure is only 325 cars at a cost of $291,838. Likewise, Canada's truck purchases in October amounted to $69,709, whereas in November they were only $36,092.

The shipment for the month of November likewise shows a decrease of 5 per cent or $557,348 as compared with November, 1916. The figures for November, 1917, in spite of the decrease maintain a correct average for the year, being almost exactly 1/11 of the value of exports for the 11 months ending Nov. 30, 1917.

Exports of Automobiles, Trucks and Parts for November and Ten Previous Months

	November				Ten Previous Months			
	1916		1917		1916		1917	
	No.	Value	No.	Value	No.	Value	No.	Value
Passenger cars	5,337	$4,016,930	5,006	$4,820,738	57,036	$40,066,427	59,442	$46,982,008
Commercial cars	1,655	5,175,114	1,435	3,430,162	17,572	49,181,460	13,431	34,390,904
Parts, not including engines or tires	.....	2,151,434	.....	2,535,230	.....	22,243,227	.....	26,791,289
	6,992	$11,343,478	6,441	$10,786,130	74,608	$111,491,114	72,873	$108,164,201
	Passenger Cars		Trucks		BY COUNTRIES 1917 Passenger Cars		Trucks	
Denmark	.....	.....	.....	.....	247	223,616	.....	.....
France	88	212,704	68	240,546	1,349	905,015	2,542	7,831,851
Norway	1	2,600	.....	.....	676	715,585	.....	.....
Russia in Europe	202	454,781	57	185,802	720	1,721,781	600	1,914,318
United Kingdom	123	168,675	1,037	2,472,390	1,310	1,860,852	7,355	19,700,594
Canada	325	291,838	29	36,092	14,586	11,082,919	725	949,180
Cuba	260	297,063	.....	.....	2,635	2,314,586	193	622,883
Argentina	485	355,443	.....	.....	3,901	2,583,560	.....	.....
Chile	337	417,592	.....	.....	3,401	2,879,943	.....	.....
British India	6	5,755	.....	.....	1,509	1,165,158	.....	.....
Dutch East Indies	408	374,820	.....	.....	2,144	2,083,299	.....	.....
Russia in Asia	.....	.....	.....	.....	260	419,463	.....	.....
Australia	673	551,859	.....	.....	4,135	3,199,318	.....	.....
New Zealand	351	304,262	.....	.....	2,682	2,029,140	.....	.....
Philippine Islands	53	34,817	.....	.....	989	742,788	.....	.....
British South Africa	219	174,545	.....	.....	3,189	2,321,455	.....	.....
Other Countries	1,475	1,173,984	244	495,332	15,709	10,733,530	2,016	3,372,078
	5,006	$4,820,738	1,435	$3,430,162	59,442	$46,982,008	13,431	$34,390,904

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Second Truck Train Ends Trip

46 Pierce-Arrows Arrive at Governor's Island After Trip from Buffalo

NEW YORK, Jan. 8—The largest fleet of government war trucks yet driven overland arrived at Governor's Island today after a 300-mile trip from the factory of the Pierce-Arrow Motor Car Co., Buffalo, N. Y. The train consisted of forty-six 5-ton Pierce-Arrow trucks, manned by 100 members of the Twentieth U. S. Engineers in command of Capt. J. K. De Loach and Lieut. G. C. Eastman. The convoy left the Pierce-Arrow factory on New Year's morning and ran east across the State to Albany and then followed the Hudson River Valley on the eastern side of the river down through Ossining, Peekskill and Yonkers to New York.

Much Snow Encountered

Much snow was encountered on the trip and the temperatures often fell below zero, requiring that the trucks be given the best of care in order to prevent the engines from freezing up. Very little preparations had been made by the State Highway authorities, so that the leading truck of the fleet was equipped with a snow plow to clear away the drifts so that the rest of the train could follow. The personnel of the fleet was treated royally in every one of the large cities through which the train passed.

The trucks were made up into three sections, each accompanied by a trained Pierce-Arrow mechanic to assist the drivers in making repairs in case of trouble on the road. Two drivers were assigned to each truck and motorcycle outriders kept Captain De Loach in touch with the three sections all along the route.

Drivers Billeted in Factory

The men of the Engineering Corps which drove the trucks received a week's training at the Pierce-Arrow plant before the start of the trip. They were billeted in the Pierce-Arrow plant, where a large room was cleared for the purpose and where the men set up their folding cots that form a part of their regular equipment. Meals were served in the main dining room of the factory and smoking and lounging rooms were set aside in another part of the factory for the drivers' comforts.

Operators Were Trained

Each of the men underwent an intensified week of instruction laid out by the Pierce-Arrow truck engineers in order to familiarize him with the details of construction and the operation of the truck. The standard instruction book furnished by the Pierce-Arrow company was used but augmented by special lectures on the various parts of the equipment. The last portion of the course was devoted to intensified road driving under the watchful eye of expert instructors of the Pierce-Arrow company.

Before the beginning of the trip, all of the men received some actual overland driving experience when twenty-three of the trucks, lacking bodies, were driven to Dunkirk, N. Y., 47 miles from Buffalo. At Dunkirk each truck was fitted with a body, an extra body loaded in knocked-down form, and the entire fleet driven back to Buffalo.

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Gotfredson Heads Saxon

DETROIT, Jan. 10—Benjamin Gotfredson was elected president of the Saxon Motor Corp. at a meeting of the board of directors held in New York this week. Mr. Gotfredson will take the place formerly occupied by Harry W. Ford. He has been a stockholder in the Saxon organization for some time and has been more or less identified with the activities of the company. Mr. Gotfredson is president and organizer of the American Auto Trimming Co., Detroit.

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Abbott Sees Trouble

OVERLAND, OHIO, Jan. 4—An involuntary petition in bankruptcy was filed in the Federal Court Friday against the Abbott Corp., manufacturers of the Abbott passenger car. It is estimated that the assets of the corporation are $50,000 and the liabilities about $200,000. A. W. Gardiner, secretary of the Abbott Corp., states that the assets will reach a much higher figure. Concerning the bankruptcy proceedings, the statement of the company is that the plant has temporarily suspended operations, and that it is still believed that the contemplated merger of the Abbott Corp. and the Hal Motor Co. will still go through. It is the plan of the combine to make Abbott and Hal passenger cars, and bring out a motor truck.

—

Government Wants Women Drivers

WASHINGTON, D. C., Jan. 8—The Depot Quartermaster of the War Department has asked the Civil Service Commission to provide a list of women eligible to drive motor trucks. The Department will use one hundred women motor truck drivers on the streets of Washington at $70 per month to start. None of the drivers will be sent abroad.

—

Labor Department Has New Bureau

WASHINGTON, D. C., Jan. 8—The Department of Labor has organized a new bureau called the United States Employment service, which is an enlargement of the previous immigration service and includes the two auxiliary bodies, the United States Public Service Reserve and the United States Boys' Working Reserve. It is planned to secure the mechanics needed in the shipbuilding industry through this new bureau. J. B. Densmore has been appointed National Director and will be assisted by Robt. Watson and Charles Clayton.

Vanderlip's Opinions Criticised

Industrial Organizations Object to His Proposed "Labor Saving" Methods

NEW YORK CITY, Jan. 9—The views of Frank A. Vanderlip, president of the National City Bank, and who is now making speeches on the war-saving certificate problem, are arousing the criticism of many industrial organizations, which take objection to his statements that those industries not directly connected with the war should go out of business in order to liberate labor or what Mr. Vanderlip describes as more necessary industries. Automotive Industries for 2 weeks has been taking issue with Mr. Vanderlip's statements, showing that there is not the shortage of labor which he would have it understood there exists, and that shortage of clothing for the soldiers was not in any wise due to workers being used in industries which Mr. Vanderlip would put out of business.

It is believed that the National Automobile Chamber of Commerce has been taking cognizance of Mr. Vanderlip's statements and that not a few organizations, among which might be mentioned certain communities of department stores, will take issue on the points in question.

It would seem an opportune time for various industrial organizations that are the subject of Mr. Vanderlip's remarks to bring together the desired information on this subject. They would be performing a patriotic service in a presentation of the situation that would state the facts.

—

Kendall Tire Option on Ben-Hur Plant

WILLOUGHBY, OHIO, Jan. 3—The Kendall Tire & Rubber Co., Akron, has taken an option on the 9-acre plant of the Ben-Hur Motor Co. here. The factory is a 2-story, 150 by 400 building.

—

Goethals Also Transportation Head

WASHINGTON, D. C., Jan. 8—Major-General George W. Goethals of the Quartermaster Corps has been appointed to serve also as Director of War Department Transportation. This means a co-ordination and co-operation of motor truck design and production and insures economy in the use of them and in their maintenance. In the past the Ordnance, Engineers, Signal Corps, Aviation Service and Coast Artillery have been purchasing trucks, tractors and other motor vehicles individually.

—

New Engine Company in Brooklyn

BROOKLYN, N. Y., Jan. 8—The High Efficiency Motor Corp. has been organized with $200,000 capital by R. E. Weber and W. Rabsilber, Brooklyn, and M. Lewenthal, Hoboken, N. J. The company will manufacture motors, engines and automobiles.

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Industrial Review of the Week

A Summary of Major Developments in Other Fields

ANTHRACITE PRODUCTION FAVORABLE

The production of anthracite was naturally slightly curtailed last week on account of the holidays. This curtailment, however, was not as great as is often the case, since many of the miners observed only Christmas Day and did not take the three days to two weeks' lay-off which they frequently do at this season of the year. The intense cold which descended upon the eastern portion of the United States with temperatures in many instances well below the zero mark, and exceptional for this territory, coupled with a decided shortage of fuel throughout the East generally, caused considerable suffering in many localities. So far as is known, little advantage was taken of the stringent conditions by small retailers to boost the price to exorbitant levels. One or two instances of this kind have, however, come to light, and the offenders were promptly arrested. The larger towns and cities, while suffering to a considerable degree, were probably not in as bad condition as some of the country districts. Centers of dense population, such as New York and Philadelphia, may be relieved of coal scarcity much more easily than where the population is scattered. The orders of Secretary McAdoo throwing open to coal traffic the passenger tunnels of the Pennsylvania Railroad doubtless do much to relieve fuel scarcity in some of the boroughs of New York City.

The demand for bituminous coal shows no signs of lessening or abating. The steam demand, which has for months been insistent, is now quite as much so as ever. Many industrial plants, some of them engaged in war munition work, have been compelled to shut down for more or less extended periods, while many others are operating on a day-to-day supply. As has been the case heretofore, much of this stringency could be relieved if transportation facilities were available. There is little question but that New England, which ordinarily gets a large portion of its soft coal by water, will this year be compelled to ship it in all-rail from the mines of Pennsylvania and West Virginia. There is not, and of necessity will not be, much choice exercised as to the grade or quality of coal to be secured. What is needed is something that will burn and make steam. It makes little difference whether this is slack, run-of-mine or lump. The price is, and has been for some time, an entirely secondary consideration. Transportation facilities have also been considerably affected by the cold weather throughout the Middle West. In this region many mines are working two or three days per week where the operators and miners would gladly work them six or possibly even seven days per week if cars for loading could be secured. It is yet too early to say what government control of the common carriers will do to relieve the situation, but it is strongly hoped that a gradual improvement will take place. Many schemes have been brought forward, tending toward the conservation of fuel. Among the most prominent means is that of lightless nights. In many cities one or two such nights are observed each week, while it is strongly urged that at least six be observed in the future. Lightless nights at present means the abolition of glaring electric signs and similar electrical displays. In many instances the abolition of street lighting, either wholly or in part, might well be followed. It would appear that at least when the moon is full, or nearly so, and the ground is covered with snow, there is little real need for street lighting except at dangerous street crossings and similar localities. Throughout the entire country there is a decided and insistent demand for both domestic and industrial fuel.—*Coal Age.*

A New Service

¶ Herewith AUTOMOTIVE INDUSTRIES *supplies for the benefit of its readers a general summary of important developments in other fields of business. This is rendered possible by the editorial co-operation of leading industrial publications which are recognized authorities.*

By compressing the general industrial situation into this form we hope to give our readers a clear and comprehensive idea of up-to-the-minute developments which they could otherwise secure only with considerable expenditure of time and effort.

BLAST-FURNACE OPERATION DEMORALIZED

The first week in the new year has brought blast furnace and steel works' operation to the verge of complete demoralization. Western blizzards have made vastly worse what has been for weeks a serious situation and embargoes on shipments have made conditions at rolling mills almost hopeless.

Scores of blast furnaces have been banked in the Pittsburgh, Youngstown, Wheeling, Cleveland and Chicago districts. Steel works in the same territories have been able to operate at but 50 to 75 per cent of capacity. The East, while spared fresh snow blockades, has had record low temperatures and so little fuel has been delivered to steel plants that working schedules have gone to pieces. Never has the industry been so generally crippled or with so poor a prospect of any early return to normal conditions.

December pig iron statistics show the sharp cutting down of production in the second half of the month, and the January showing will doubtless be worse. The total of coke and anthracite iron last month was 2,882,919 tons, or 92,997 tons a day, against 3,205,794 tons in November, or 106,859 tons a day. Capacity active Jan. 1 was only 93,500 tons a day, against 106,953 tons on Dec. 1 and only 324 furnaces were in blast Jan. 1, a loss of 24 in the month.

So far as the market is concerned, the relation of supply and demand growing out of the serious operating conditions is secondary to question of Government price fixing. Reasoning that price changes will almost certainly be downward, buyers find no reason for contracting except that of getting a none too certain place on rolling mill schedules, and sellers are not making haste to write contracts that are likely to be revised from without.

Among questions raised by buyers is this: If there are new prices April 1 will they apply to deliveries carried beyond that date, even though contracted to be made in the first quarter? An authoritative answer is that they will.

Lower Prices Coming

While Washington assurance is given that no price changes are contemplated that will reduce steel production by going below costs of small producers, there is an evident purpose to reduce prices obtained by integrated companies. By the Pomerene bill or in some other way a Government control is aimed at that will take over all output, but at different prices to different producers. The market price would then be an average and not at a level fixed by the costs of high cost plants. In the face of such a proposal the steel trade has modified its first feeling of satisfaction with the recent official action on present prices.

Lake Superior ore producers, who make sales for an entire year, are organizing a protest against a possible revision of their 1918 contracts. Thus far considerable reservations of ore have been made at Cleveland, but actual sales are deferred until prices can be definitely fixed.

Hundreds of thousands of tons of export steel is piled up at Eastern ports awaiting shipment, and large sales for export could be put through if bottoms could be had. In wire a 50,000-ton inquiry has been up, but could not be entertained. The Government is seeking 50,000 tons of open-hearth rerolling billets for shipment abroad.—*Iron Age.*

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Men of the Industry

Changes in Personnel and Position

Disbrow Joins Moore Motor Vehicle

MINNEAPOLIS, Jan. 7—Louis Disbrow, famous automobile racer and engine designer, has joined the Moore Motor Vehicle Co. in the capacity of chief engineer. After attending the New York and Chicago shows he will assume full charge of the engineering department of the Danville factory.

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E. B. Foote has resigned from the sales managership of the New England District of the Mitchell Motors Co., Boston.

—

Walter Bamford, formerly with the Detroiter Motor Car Co., Detroit, has become production manager of the Fulton Motor Truck Co., Farmingdale, L. I.

—

P. W. Litchfield, vice-president and factory manager of the Goodyear Tire & Rubber Co., Akron, has been appointed a member of the War Service Committee by the Rubber Association of America. He will represent the rubber industry in its co-operative relations with the Government.

—

Thomas Wetzel has been elected vice-president of the Buffalo Pressed Steel Co., Inc., Buffalo, N. Y.

—

C. J. Cunningham has been promoted to the position of general service manager of the Detroit Weatherproof Body Co., Pontiac, Mich.

—

Arthur H. Wyatt has been elected president of the Pan-American Motors Co., Decatur, Ill. He has been with the company several years.

—

John B. Orman, who has managed several automobile shows in Indianapolis, was chosen by the Indianapolis Automobile Trade Association to conduct the 1918 show, which will be started Feb. 25.

—

J. R. Coleman, who has been chief engineer and assistant general manager of the Atterbury Motor Car Co., Buffalo, is now factory manager in charge of production and purchasing, with the Selden Motor Vehicle Co., Rochester, N. Y.

—

John F. Guider, formerly factory superintendent of the Pierce Arrow Motor Car Co., Buffalo, and an executive of that company for more than 12 years, has been elected vice-president of the Cadillac Motor Car Co., Detroit, and will have charge of manufacturing.

—

Elbert S. Maloney has been appointed manager of the Richmond branch of the Fisk Rubber Co. He was formerly Arkansas representative of the Diamond Rubber Co. and Washington representative of the Goodyear Co.

—

W. E. Palmer has been elected treasurer of the Goodyear Tire & Rubber Co., Akron. He is also secretary of the board of directors.

—

Glenn P. Thayre, manager of the Demountable Wheel Co., Pontiac, has resigned to enter Government service. Walter Brohe is now manager.

—

Benjamin F. Baker has been appointed wholesale representative in New York for the International Harvester Co. He will make his headquarters at the Philadelphia factory branch. Baker was formerly Brooklyn manager and efficiency expert for the Garford Motor Truck Co.

—

Earl W. McGookin has been appointed to represent the Tillotson Mfg. Co., Toledo, in Michigan and Cleveland.

—

C. H. Bassett has been made southern zone manager for the Elgin Motor Car Corp., Chicago.

—

S. H. Woods, formerly with the General Vehicle Co., Long Island City, and the International Motor Co., New York, is now a captain in the Quartermaster's Corps, and is connected with the Military Truck Production Section in Washington.

—

William Field has been appointed assistant sales manager of the Fisk Rubber Co., Chicopee Falls, Mass.

—

Ford Takes Part of Holley Plant

DETROIT, Jan. 7—The Ford Motor Co. is taking over the part of Holley Brothers Co. plant used in the manufacture of carbureters for the Model T car. At present the carbureter company is reorganizing as the Holley Kerosene Carbureter Co., and will manufacture a new kerosene carbureter together with the regular models.

—

Dividends Declared

CLEVELAND, Jan. 4—The Kelly-Springfield Tire Co. has declared the regular quarterly dividend of $1 a share on common stock, payable Feb. 1, to stock of record Jan. 15.

—

WEST CHESHIRE, CONN., Jan. 5—The Connecticut Brass & Mfg. Co. has declared an initial quarterly dividend of $2 a share on its second preferred stock, payable Jan. 21 to stock of record Dec. 31.

—

NEW BRUNSWICK, N. J., Jan. 5—The United States Rubber Co. has declared a quarterly dividend of 2 per cent on first preferred stock, payable Jan. 31 to stock of record Jan. 15.

New Companies Formed

Latest additions to ranks of Automotive Industries

$1,000,000 Company to Operate Carriers

WILMINGTON, DEL., Jan. 3—The Capp Motor Transfer Co. has been incorporated to operate private carriers by water and air. The incorporators are: Seth Bunker Capp, F. R. Hansell, Philadelphia, and J. Vernon Pimm, Camden, N. J. The capital is $1,000,000.

—

To Make Vehicles of All Kinds

DOVER, DEL., Jan. 3—A company to manufacture motor cars and vehicles of all kinds has been organized here under the style United Owners' Supply Co. The incorporators, J. Berliner, P. Zak and B. F. Cowan, Chicago, have listed the capital at $200,000.

—

Russel Co. to Make Tires

NEWARK, N. J., Jan. 3—The Russel Tire Co. has been incorporated with a capital of $100,000 by R. T. Blinder, Frank Hahl and Benjamin Singer. The company will manufacture tires.

—

BUFFALO, Jan. 7—William H. Race & Sons Motor Co. has been incorporated to manufacture engines. The incorporators are William L. Race, L. W. Race and Wilfred E. Race and the stated capitalization is $25,000.

—

Hassler, Ltd., Opens in Canada

HAMILTON, ONT., Jan. 5—Robert H. Hassler, Ltd., has been incorporated and has leased a factory on Sherman Avenue, North. The new company will manufacture shock absorbers for Fords. J. C. Piper has been appointed managing director.

—

Airplane Parts Company Formed

MILWAUKEE, Jan. 7—The United States Aero Propeller Co. has been incorporated with a capital stock of $30,000 to manufacture propellers and other parts for airplanes.

—

Dealers Discard Night and Sunday Service

GRAND RAPIDS, Jan. 4—Eighteen leading dealers here have done away with night and Sunday service, as a means of reducing overhead expenses. In order that service may still be rendered at night, they have designated Bronson's Garage in the downtown section, as an emergency service station for all dealers, and have notified 5000 car owners here of the new plan. Short-time repair jobs will be done night and Sunday by Bronson's Garage, but work which cannot be finished in a short time is turned over to the proper dealer at the beginning of the next day.

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Mercury Cars, Inc., to Start Production

NEW YORK, Jan. 7—Mercury Cars, Inc., which was recently formed in New York, is preparing to place on the market a 4-cylinder car powered with a 3½ by 5½ Weidely engine, to sell for $2,750 to $2,950 in open models and $3,600 to $3,900 in closed models. The company has established a factory of limited size at Hollis, L. I., and plans to enlarge this long before active production of cars is commenced, which probably will be mid-summer of this year. The car, the first of which is on view at the Astor salon, is very simple in construction, and has been designed to require the minimum of care. It will have a wheelbase of 114 in.

—

Kelly-Springfield Opens Milwaukee Branch

MILWAUKEE, WIS., Jan. 7—The Kelly-Springfield Tire & Rubber Co., New York, has established a branch house in Milwaukee, at 426 Jefferson Street, in charge of J. A. Glaspy. Another office will be maintained in the Bay Building, Madison, Wis.

—

Gillette Tire Co. Enlarges Plant

EAU CLAIRE, WIS., Jan. 7—The Gillette Tire Co. is contemplating the erection of 2 additional stories on its present 1-story main factory. To provide immediate warehousing and shipping facilities, the company has planned a 3-story concrete and brick building, 66 x 100, adjoining the main factory.

—

Reliance Truck to Move to Appleton

APPLETON, WIS., Jan. 7—Contracts will be awarded this week for the erection of the new Appleton plant of the Reliance Motor Truck Co., which is moving from Racine, Wis. The first unit will provide about 22,500 sq. ft. of floorspace and cost $50,000. The building will be ready for occupancy about April 1, at which time the equipment and machinery of the present plant in Racine will be moved. New equipment is being purchased for delivery early in April. The Reliance commercial car will be in regular production in Appleton about May 15.

—

Service Motor Truck Plans Additions

INDIANAPOLIS, Jan. 6—The Service Motor Truck Co., Wabash, Ind., which recently obtained a government contract for the manufacture of trucks, is planning the construction of two large additions to its plant. One of the buildings will be 75 x 200, and the other 50 x 400.

—

Hawke Transferred to Detroit

DETROIT, Jan. 8—Clarence B. Hawke will be associated with the sales division of the motor parts department of the Rich Tool Co., Chicago. His headquarters will be in the Detroit office.

Current News of Factories

Notes of New Plants—Old Ones Enlarged

Damrow Co. to Occupy New Plant

FOND DU LAC, WIS., Jan. 7—The Damrow Bros. Mfg. Co., Fond du Lac, Wis., manufacturer of sheet metal containers and stampings, will move into its new plant at Western Avenue and Brooke Street on Jan. 15. Because of the shortage and difficulty of obtaining supplies of sheet tin, the company has decided to install a complete rolling mill and will manufacture its own supply of sheets from the rough pig.

—

Cassidy Branches Out

NEW YORK, Jan. 7—The Edward A. Cassidy Co. has opened a Western branch office at 1716 Michigan Avenue, Chicago, with the idea of bringing its Western trade into close contact with the company officials. R. G. Ames, division manager for Chicago and surrounding territory, will have charge.

—

Changes of Capital

CLEVELAND, Jan. 3—The Ohio Rubber Co. has increased its capitalization from $400,000 to $500,000.

—

AKRON, Jan. 7—The Goodyear Tire & Rubber Co. has issued $15,000,000 of 8 per cent cumulative second preferred stock. The company is asking authority to increase its capital stock $50,000,000, half preferred and half common. If this is done, the authorized capital will be $100,000,000.

—

CLEVELAND, OHIO.—The Fred P. Brand Motor Co., increase of capital from $30,000 to $250,000.

—

COLUMBUS, OHIO—The Independent Tire Co., increase of capital from $10,000 to $50,000.

—

Capital Increases

COLUMBUS, OHIO, Jan. 5—The following are the capitalization increases in the past week: Buckeye Motor & Cycle Co., Akron, $15,000 to $50,000; Dayton Reliance Tool & Mfg. Co., Dayton, $20,000 to $50,000; Fred P. Brand Motor Co., Cleveland, $30,000 to $250,000; Steubing Truck Co., Cincinnati, $5,000 to $80,000.

—

Bigsby to Investigate Factories

WASHINGTON, Jan. 7—G. L. Bigsby, engineer for the Anderson Electric Co., has been loaned by his company to the Automobile Industries Committee, and will serve on the corps of engineers now employed by that committee for investigation of automobile and parts factories.

Haskelite to Build Grand Rapids Factory

GRAND RAPIDS, Jan. 5—The Haskelite Co., capitalized at $1,000,000 for the manufacture of special veneer airplane parts, is preparing to establish a factory near Fuller station. This company already has a factory at Ludington, Mich., but the main factory will be in this city. It is estimated that the industry will bring about 3000 persons into Grand Rapids.

—

Ford Producing 78,258 Cars a Month

DETROIT, Jan. 5—All rumors to the contrary, the production of the Ford Motor Co. still continues above normal. During the months of September, October and November a total of 234,774 cars have been manufactured, or an average monthly production of 78,258 cars. This has been done coincidently with the manufacture of Government material and unless subsequent Government orders materially decrease the production, the company will reach its schedule for the year totalling 900,000 cars.

—

Butler-Veith Takes Fageol Output

BERKELEY, CAL., Jan. 4—The Butler-Veith Co. has contracted for the entire truck output for the United States of the Fageol Co. A branch has been opened at 1628 Market Street, San Francisco, with W. A. Knuckey in charge.

—

Flottorp Starts Propeller Production

GRAND RAPIDS, MICH., Jan. 5—The Flottorp Mfg. Co., manufacturing aircraft propellers, expects to make the first shipment this week. At present about 40 employees are working and it is expected that this will be increased to 250 when the full running schedule is reached.

—

Premier Motor Increases Force

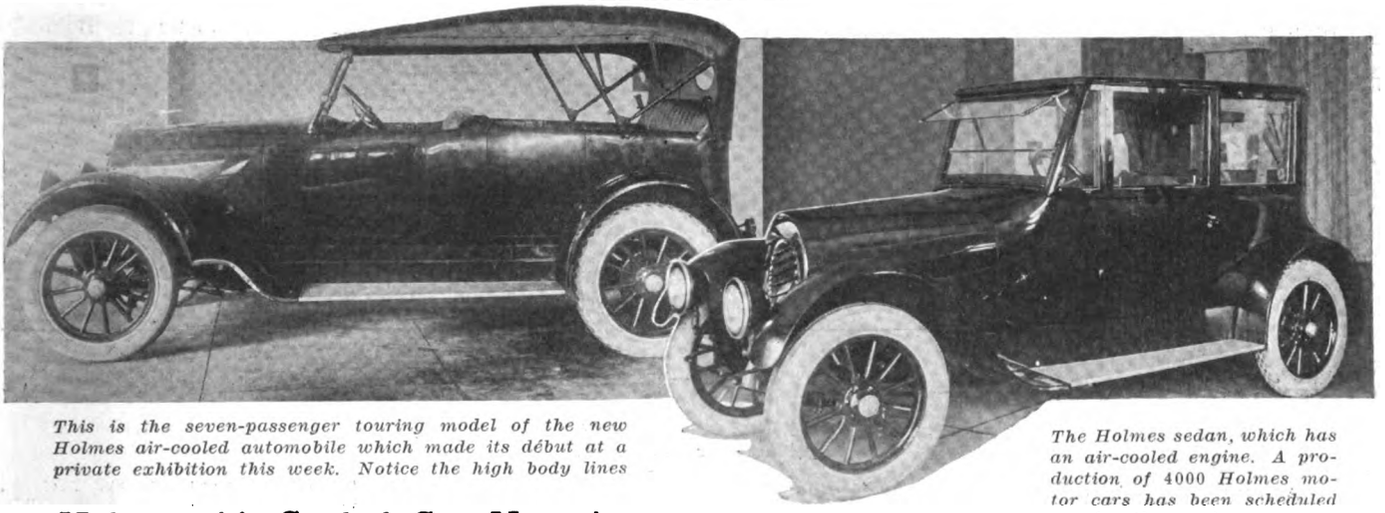
INDIANAPOLIS, Jan. 6—The Premier Motor Corp. is making rapid strides to fill its Government contract for the manufacture of Liberty trucks. The working force is being increased rapidly, and officials of the company announced to-day that it would be necessary to employ at least 300 women to rush work on the contract.

—

Brewer-Mosel to Sell Wisconsin Tractors

SAUK CITY, WIS., Jan. 7—The entire output of the Wisconsin Farm Tractor Co. will be sold by the Brewer-Mosel Automobile Co., Madison, and an active sales campaign has been undertaken already. The Wisconsin company, which was organized in 1915, manufactures a kerosene tractor capable of drawing 4 plows and serving as a power plant for grain separators and other farm machinery.

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This is the seven-passenger touring model of the new Holmes air-cooled automobile which made its début at a private exhibition this week. Notice the high body lines

The Holmes sedan, which has an air-cooled engine. A production of 4000 Holmes motor cars has been scheduled for the coming year

Holmes Air-Cooled Car Now in Production

Canton Product Has Overhead Valves and Vertical Fins

AMERICA'S second air-cooled car, the new Holmes, about which there has been much speculation, quietly made its debut at a private exhibit this week. As was expected the design of Robert Holmes, formerly vice-president of the Franklin company and for seven years its chief engineer, the new car has a number of features which are the same in principle as those of the older ones, but differs considerably in the method of their working out.

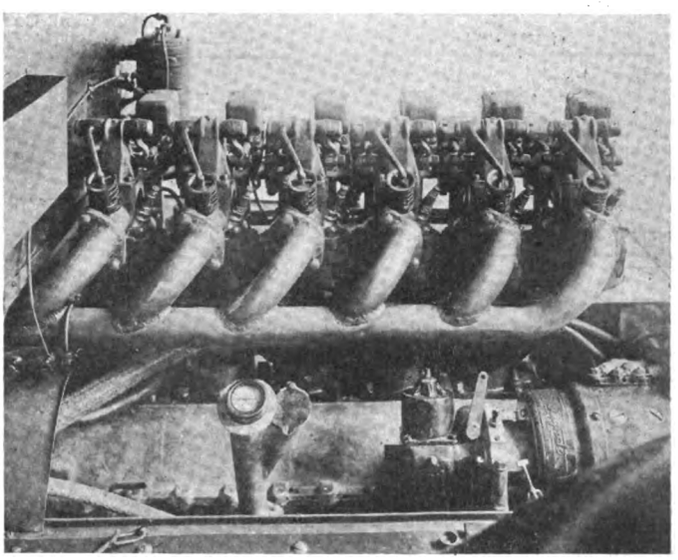
This is the product of the Holmes Automobile Co., Canton, Ohio, organized about a year ago. A production of 4,000 has been scheduled for the year, with the first twenty cars coming through this month. The car appeared as a seven-passenger touring and a sedan on the immediate program, with a roadster to come through later. The price has not been fixed definitely, but is between $2,000 and $2,500.

The method of cooling which has characterized Franklin practice, that is by means of a draft of air induced by a suction fan and led around vertically finned and separately cast cylinders is incorporated in the Holmes car, but instead of having the air jacket around individual cylinders the Holmes has its air jackets inter-connected. The construction of the cylinders themselves is similar to the older type, but the Holmes has removable cylinder heads of dome shape carrying inclined valves, which are operated by a patented mechanism designed to compensate more fully for elongation and contraction due to changes in temperatures in the bush rods. The valve mechanism consists of a connection between bush rod and valve stem through two bell cranks and an adjustable linkage so arranged, that even with the maximum elongation of the push rod there is less than .001 in. variation in the distance between tappet and valve stem.

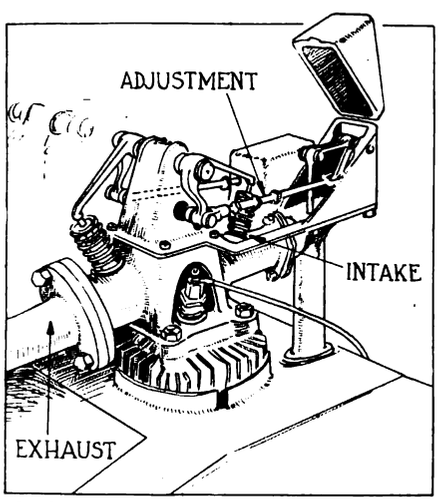
The use of the dome-shaped cylinder head into which the valves are set at an angle permits exceptionally large valves, particularly exhaust valves, and producing in addition to more power the more important factor with an air-cooled car, a cooler cylinder with minimum combustion chamber area. The removable head can be taken off by taking out four machine screws and one nut, which displaces the entire valve mechanism as a unit.

Details of the engine design aside from the valve mechanism and cooling arrangement include a six-cylinder, individually cast engine 3½ by 4½ in. Lubrication is pressure feed throughout by gear pump with oil leads to each main bearing. The crankshaft is drilled, carrying the oil to the connecting-rod bearing and oil is sprayed from these for piston lubrication so that the engine base is dropped.

The Sirocco type of induction fan, which is incorporated with the flywheel, draws the air through the louvres in the front and thence through an air jacket around all the cylinders instead of through individual jackets. This permits less space between cylinders, making a more compact engine with shorter crankshaft.



Exhaust side of the new Holmes engine



Right side of Holmes engine, showing a portion of the valve mechanism



Front view of new Holmes car

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Standing Cars Must Be Lighted

BOSTON, Jan. 5—The Massachusetts Supreme Court has decided that motor cars standing by the side of the road at night must have lamps lighted the same as when being operated. James E. Henry left his car standing on the road in Malden at 8.30 p. m. May 3, 1915. He was arrested and found guilty in the lower court. He appealed from one court to another, taking the matter to the Supreme Court as a test case. The higher court now finds that he was guilty of operating his car without lights later than one-half hour after sunset. Judge Crosby, who wrote the decision, said:

"It is obvious that an automobile standing upon a highway under such conditions may be fully as great a menace to the safety of the travelers as if running upon the way, without lights. The word 'operated' is not as the defendant claims, limited to a state of motion produced by the mechanism of the car, but includes at least ordinary stops upon the highway, and such stops are to be regarded as fairly incidental to its operation."

International Harvester to Have New York Distributer

NEW YORK, Jan. 8—The International Harvester Co. hereafter is to be represented in New York. The Whiting Motor Co., which for the past 9 years has handled Mercer passenger cars, has been appointed International distributer for New York and Newark, N. J., territory. There will be a new 2-ton International truck brought out this month. The company will continue to handle the Mercer.

Calendar

ASSOCIATIONS

Feb. 4-7 — St. Louis, American Road Builders' Assn. Convention.

GENERAL

Jan. 11-16—New York, Convention, National Association Automobile Accessory Jobbers, Hotel Astor.

Jan. 16-20—World's Salesmanship Congress, Third Annual.

Jan. 29-31—Chicago, Annual Convention, Garage Owners' Assn. of Ill., Green Room, Congress Hotel.

SHOWS

Jan. 5-12 — New York Show, Grand Central Palace, National Automobile Chamber of Commerce.

Jan. 12-19 — Philadelphia, 17th Annual Show, Philadelphia Auto Trade Assn., Commercial Museum Bldg.

Jan. 11-19—Providence, R. I., R. I. Licensed Auto Dealers' Assn., State Armory, Percival S. Clark, Mgr.

Jan. 14-19 — Rochester, N. Y. Tenth Annual Exposition Park. C. A. Simmons, Mgr.

Jan. 16-25 — Milwaukee, Wis., Milwaukee Automobile Dealers, Inc., Auditorium. (First 7 days, passenger cars; last 3 days, commercial cars.) Bart J. Huddle, Mgr.

Jan. 18-24 — Des Moines, Ia., Ninth Annual Passenger Car and Second Annual Truck, Des Moines Automobile Dealers' Assn., Coliseum. C. G. Van Vliet and Dean Schooler, Mgrs.

Jan. 19-26—Detroit Automobile Dealers' Assn., Overland Bldg. H. H. Shuart, Mgr.

Jan. 19-26 — New York Motor Boat Show, Grand Central Palace, National Assn. of Engine and Boat Manufacturers.

Jan. 19-26—Detroit, Willis Avenue Overland Service Station.

Jan. 19-27 — Cleveland, Seventeenth Annual. Cleveland Automobile Show Co., Wigmore Coliseum. Fred. H. Caley, Mgr.

Jan. 19-26 — Montreal, Can., Montreal Automobile Trade Assn., Ltd., Almy Bldg. T. C. Kirby, Mgr.

Jan. 21-26—Manchester, N. H., Academy. Couture Bros.

Jan. 21-26—Scranton, Pa., Scranton Motor Trades Assn., Armory. Hugh B. Andrews, Mgr.

Jan. 21-26 — York, Pa., Queen Street Tabernacle, York Automobile Dealers' Assn.

Jan. 21-26 — Wilmington, Del., Hotel Du Pont.

Jan. 21-26—Buffalo, N. Y., Buffalo Automobile Dealers' Assn., Broadway Auditorium.

Jan. 21-26—Richmond, Va., Richmond Automobile Dealers' Association, First Regimental Armory. Henry B. Marks, Mgr.

Jan. 22-24—Montreal, Can., Convention of All Men Interested in the Automobile Industry in Eastern Canada.

Jan. 22-25—Oklahoma City, Oklahoma City Motor Car Dealers' Assn. Carhart Building.

Jan. 22-26—Baltimore, Md., Baltimore Automobile Dealers' Assn. and Automobile Club of Maryland, 5th Regiment Armory.

Jan. 22-26 — Oklahoma City, Okla., Oklahoma City Automobile Dealers' Assn., 701 No. Broadway. Roy H. Haun, Mgr.

Jan. 23-28—Allentown, Pa., Lehigh Auto Trade Assn., Traylor Motor Co.'s Garage. P. W. Leisering, Publicity Mgr.

Jan. 26-Feb. 2 — Chicago National Show, Coliseum and Armory, National Automobile Chamber of Commerce.

Jan. 26-Feb. 2—Chicago, Salon, Elizabeth Room of Congress Hotel.

Jan. 26-Feb. 2—Bridgeton, N. J., Bridgeton Auto Dealers' Assn. O. P. Riley, Sec.

Jan. 26-Feb. 2—Harrisburg, Pa., Capital City Motor Dealers' Assn. J. Clyde Myton, Mgr.

Jan. 26-Feb. 3—York, Pa., York County Auto. Dealers' Assn., Tabernacle, T. F. Pfeiffer, Sec.

Jan. 28-Feb. 2—Buffalo, N. Y. Buffalo Automobile Dealers' Assn., Broadway Auditorium.

Jan. 28-Feb. 2—Manchester, N. H., Academy. Couture Bros.

February — Greensburg Pa., Westmoreland Automobile Dealers' Association.

Feb. 2-9 — Minneapolis, Minn., Twin City Automobile, Truck Tractor and Industrial Exposition, Minneapolis Auto Trade Assn.

Feb. 5-9 — Kalamazoo, Mich., Kalamazoo Automobile Dealers' Assn., Armory.

Feb. 5-9—Binghamton, N. Y., Binghamton Automobile Dealers' Assn., Kalurah Temple. William M. McNulty, Mgr.

February — Peoria, Ill., Peoria Auto and Accessories Dealers' Assn. W. O. Ireland, Mgr.

Feb. 6-9—Lancaster, Pa., Automobile Trade Assn., Fidelity Bldg. R. W. Shreiner, Mgr.

Feb. 7-13—Portland, Ore., Ninth Annual Dealers' Motor Car Assn., Auditorium. M. O Wilhin, Mgr.

Feb. 9-16 — Bronx, N. Y., 2d Battery Armory, Bronx Automobile Dealers' Assn. D. J. Barrett, Mgr.

Feb. 11—Toledo, Terminal Auditorium, Toledo Auto Show Co.

Feb. 11-14—St. Louis, Mo., St. Louis Auto Mfrs. & Dealers' Assn. Robert E. Lee, Mgr.

Feb. 11-16 — Kansas City, Mo., Kansas City Motor Car Dealers' Assn., Convention Hall. E. E. Peake, Mgr.

Feb. 11-16—Kansas City, Mo., Third Annual National Tractor Show.

Feb. 11-16 — Toledo, O., Toledo Auto Shows Co.

Feb. 16-23 — Hartford, Conn., Hartford Auto Dealers' Assn. State Armory. B. F. Smith, Mgr.

Feb. 16-23—Albany, N. Y., Albany Auto Dealers' Assn. State Armory.

Feb. 16-24—San Francisco, Cal., San Francisco Dealers' Assn., Exposition Auditorium. G. A. Wahlgreen, Mgr.

Feb. 18-23—Syracuse, N. Y., Syracuse Automobile Dealers' Assn., State Armory. Harry T. Gardner, Mgr.

Feb. 18-23 — Nashville, Tenn., Nashville Auto Trade Assn., Hippodrome.

Feb. 18-23—Grand Rapids, Mich., Automobile Business Assn., Klingman Building. Ernest T. Conlon, Mgr.

Feb. 18-23—Newark, N. J., N. J. Auto Exhibition, Co. G, First Regiment Armory. Claude E. Holgate, Mgr.

Feb. 18-23—Des Moines, Ia., Des Moines Automobile Dealers' Assn., Coliseum. C. G. Van Vliet and Dean Schooler, Mgrs.

Feb. 18-23 — Springfield, Ohio, Springfield Auto Trades Assn., Memorial Hall. C S. Burke, Mgr.

Feb. 18-23 — Waterbury, Conn., United Shows Co.

Feb. 18-23—Duluth, Minn., Duluth Automobile Trade Association. John J. Lane, Mgr.

Feb. 18-24 — Des Moines, Ia., Ninth Annual Passenger and Second Annual Truck, Des Moines Automobile Dealers' Assn., Coliseum. C. G. Van Vliet and Dean Schooler, Mgrs.

Feb. 18-25 — Pittsfield, Mass., State Guard, State Armory. James J. Callaghan, Mgr.

Feb. 18-27—So. Bethlehem, Pa., Fourth Annual (cars 18-23; trucks 25-27). Coliseum. J. L. Elliott, Mgr.

Feb. 20-23—Quincy, Ill., First Annual, Armory. L. B. Bartlett, Mgr.

Feb. 23-Mar. 2—Brooklyn, N. Y., Brooklyn Motor Vehicle Dealers' Assn., 23d Regiment Armory. I. C. Kirkham, Mgr. Passenger cars Feb. 23-Mar. 2; Trucks Mar. 5-9.

Feb. 25-Mar. 2—Muskegon, Mich. Second Annual, Merrill Auditorium. John C. Fowler, Mgr.

Feb. 25 - Mar. 2 — Bridgeport, Conn., Fourth Regiment Conn. Home Guard, State Armory and Casino. B. B. Steiber, Mgr.

Feb. 27-Mar. 2 — Columbus, O., Auto Exhibitors Co. W. L. Carney, Mgr.

Feb. 27-Mar. 6 — Boston, Mass., Salon, Boston Automobile Dealers' Assn., Copley Plaza Hotel. Chester I. Campbell, Mgr.

Mar. 1 — Lyons, France, Third Sample Fair.

Mar. 2-9—Boston, Mass., Boston Auto. Dealers' Assn., Mechanics' Bldg. Chester I. Campbell, Mgr.

Mar. 2-9—Pittsburgh, Pa., Automobile Dealers' Assn. of Pittsburgh, Motor Square Garden. John J. Bell, Mgr.

Mar. 4-9—Utica, N. Y., Utica Motor Dealers' Association, Inc., State Armory.

Mar. 6-9—Clinton, Ia., Clinton Automobile Dealers' Assn., Coliseum.

Mar. 6-9—St. Joseph, Mo., St. Joseph Automobile Dealers' Assn., Auditorium. John Albus, Mgr.

Mar. 8-11 — Green Bay, Wis., Brown County Automobile Trade Assn.

Mar. 15-20—Great Falls, Mont., Montana Automobile Distributors' Association, Lexington Garage. A. J. Breitenstein, Mgr.

Mar. 16-20—Great Falls, Mont., Montana Automobile Distributers' Assn.

Mar. 19-24—San Francisco, Cal., Motor Truck Dealers of San Francisco, Auditorium. Ivan R. Gates, Mgr.

Mar. 19-24—Cedar Rapids, Ia., Cedar Rapids Auto Trade Assn., Auditorium.

Mar. 20-22—Houlton, Me., Second Annual, Houlton, Motor Car Dealers' Assn., Bangor St. Exhibition Hall. J. D. Luth, Mgr.

Mar. 20-23 — Trenton, N. J., Trenton Auto Trade Assn. Second Regiment Armory. John L. Brock.

Apr. 9-13—Stockton, Cal., San Joaquin Auto Trade Assn. Samuel S. Cohn, Mgr.

Sept. 23-28 — Chicago. National Accessory Show for Fords. Coliseum.

S. A. E.

Jan. 10—New York Automotive Dinner at Hotel Biltmore.

Feb. 1 — Chicago, War Dinner during Winter Meeting.

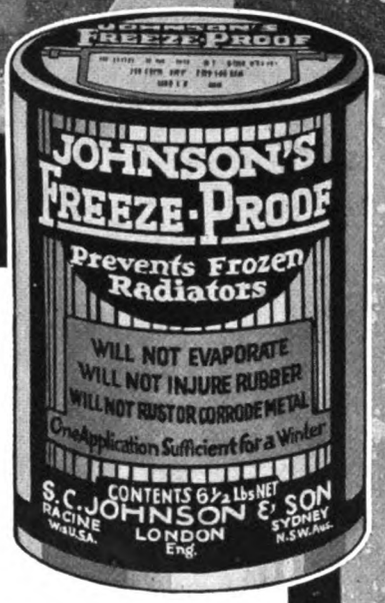
ENGINEERING

American Society of Heating and Ventilating Engineers.

Mining and Metallurgical Society of America.

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INSURE YOUR RADIATOR



THE only way you can be positive that your radiator won't freeze up this winter is to use a non-evaporating, anti-freeze preparation. The present high cost of alcohol—its low boiling point—and quick evaporation make it impractical. Besides, you are asked to conserve the supply of alcohol for use in explosives.

Does Not Evaporate

Johnson's Freeze-Proof does not evaporate so one application is sufficient for the whole winter unless the solution is weakened by leakage of the radiator or hose connection, through the overflow pipe, or by boiling over.

JOHNSON'S FREEZE-PROOF

Johnson's Freeze-Proof should be used wherever you wish to prevent water from freezing—in automobiles, gas engines, tractors, electro-lighting and heating plants, traction companies, etc. One box will prevent 3½ gallons of water from freezing at 5° below zero. For lower temperatures increase the portion of Freeze-Proof.

Absolutely Harmless

Johnson's Freeze-Proof contains no oil and does not interfere with the cooling system. It will not injure rubber, cloth, packing, or metal of any kind. It does not rust or corrode any metal. Johnson's Freeze-Proof is economical and easy to use and it raises the boiling point of water 12° to 25°.



Johnson's Freeze-Proof is put up in packages containing 6½ lbs. net which retail at $1.50 each in the U. S. A. One package will protect a Ford from freezing at 5° below zero. For larger cars use two packages to protect to 5° below zero, and three packages to protect to 20° below zero.

Write for our new booklet, entitled "Keep Your Car Young". — We will send it to you free and postpaid. — The information in this book will enable you to greatly improve the appearance and the performance of your car.

S. C. JOHNSON & SON DEPT. A, RACINE, WISCONSIN

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PEER

The "Loafing" Range

TO PURR along in the consciousness of tremendous reserve force—

To be able to loaf smoothly behind retarded traffic and yet be able to dash ahead the instant there is an opening—smoothly—without hesitation—and quickly reach any permissible city speed—

That is the charm of the Peerless Eight in its "loafing" range.

To have in reserve rugged resistless power *at no expense until you use it*—that is the economy of the Two-Power-Range Peerless Eight.

For in its "loafing" range the Peerless is on half rations—consuming fuel so sparingly as to shame many a lesser powered six, even many a four.

Here is eighty horsepower which you can use with true economy in every-day driving—yet eighty horsepower which you can use with full effect when you need or desire it.

In Two Whole Years No Unsold Peerless

IN ITS second year, just ended, the Two-Power Range Eight, in spite of doubled production, again outsold the output of the huge Peerless factories.

Among the master cars of the day the Peerless Eight stands second to none in the respect and regard in which it is held by the motor-wise public.

Continuing as it has, the Peerless traditions of super quality in every detail, mechanically and artistically, this successor of a long line of master cars has out-performed them all.

With its two separate and distinct power ranges the Peerless runs the whole gamut of motor car performance.

It yields nothing to those master cars produced with the sole idea of realizing the ultra soft smooth performance so prized in ordinary, everyday driving.

Yet it has nothing to fear from those other cars of exceptional distinction which sacrifice the gentler virtues for resistless power and speed.

And it naturally out-performs at all points those cars of class whose sponsors have realized their ideal of the best compromise between the gentler and the more rugged virtues.

The Peerless dealer's three big advantages are demonstrable economical, superior performance, conceded super-quality and the lowest price among recognized master cars of the day.

The Peerless Motor Car Company, Cleveland, Ohio

Peerless
TWO POWER RANGE
Eight

Seven Passenger Touring
$2340
Roadster $2340
Sporting Roadster $2490
Coupe $2850 Sedan $2990
Limousine $3690
All prices f. o. b. Cleveland
Subject to change without notice

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LESS

New Two Power Ranger Better Than Ever

IN TWO years of steady, uninterrupted, full capacity production during which the justly renowned Peerless engineering department has had the performance of thousands of these cars under constant critical observation, many mechanical and artistic improvements have been effected.

The unprecedented range of performance attained by the Two-Power-Range Eight has been measurably extended in both directions.

It is a smoother, more finished performer in its "loafing" range.

It is faster than ever, even more powerful in its "sporting" range.

It is notable among the cars of class.

From the standpoint of performance it stands today, more truly than ever, Peerless—all that the name implies.

And from the standpoint of low cost it is likewise without a peer in its class.

Eighty horsepower is not operated at so little expense in any other car.

And steady production in large volume, with exceptional resources and facilities, has enabled us to attain and maintain a price level hundreds of dollars below any of the other master cars of the day.

We offer dealers definite advantages. Have you, as a dealer, definite advantages to offer the manufacturer? If so, let's discuss opportunities for mutually profitable business.

The Peerless Motor Car Company, Cleveland, Ohio

80 horsepower, eight-cylinder motor—entirely Peerless-Built

Wheelbase 125 inches

35 x 4½ Cord Tires

Peerless platform rear spring suspension

Touring Car—seven passenger capacity—divided front seats

Fully equipped

Peerless
TWO POWER RANGE
Eight

The "Sporting" Range

TO TAKE a new lease on life and climb on with renewed courage when you would expect her to falter at so long and steep a grade—

To speed faster and yet faster after you thought she had delivered her final spurt—

That is thoroughbred performance—the kind that the "sporting" range of power makes possible in the Peerless Two-Power-Range Eight.

To reach her "sporting" range you have only to open her throttle wider to release her double poppets when a deep growl of brute power replaces the soft purr of her "loafing" range.

When you call upon the Peerless for feats of prowess of which few cars are capable, you get instant, willing, able response.

You need fear no contender no matter what "class" it may be able to show.

Digitized by Google

Comfort

¶ A car you'll want to live in. Fleet, buoyant, luxurious comfort for every passenger. Massive cushions and strainless ease. To its great springs and deep cushions, the Standard "8" adds its noiseless, throbless, uncomplaining whirl of machinery. Eight mighty cylinders pour their power into the short, rigid, perfectly-balanced crankshaft. The gears engage like velvet. You accelerate from speed to speed hardly conscious of swifter motion. ¶ Here is true beauty of performance. Not a trace of sidesway. Instantaneous getaway. You glide through the worst traffic without shifting from "high." Or mount a dismaying hill with robust acceleration without resorting to "low." ¶ Distributors and dealers in territory still open are invited to call on any of our representatives for a ride in this truly wonderful car.

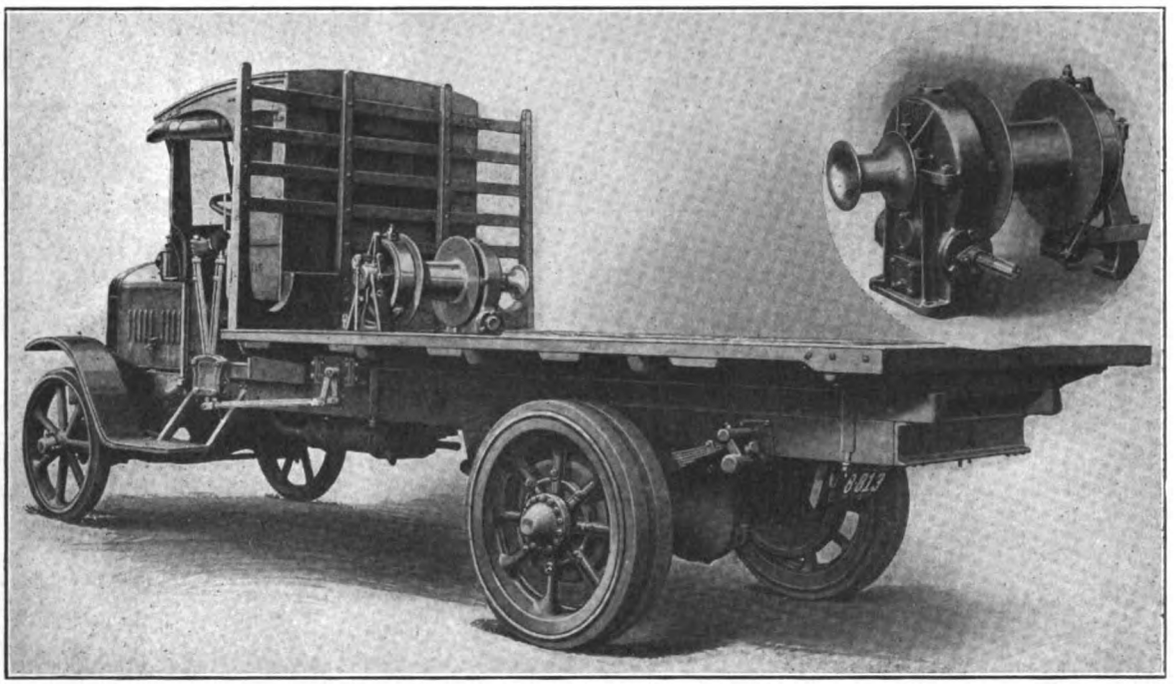
Prices, $2450 to $4000.

STANDARD STEEL CAR CO.
Pittsburgh, Pa.



STANDARD "8"
The Magneto Equipped Eight

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A MOTOR TRUCK POWER WINCH BEARING THE NAME OF OTIS

This means that it is designed and manufactured by the same concern which for more than sixty years has developed and brought to its present state of perfection the building and installation of elevators and other hoisting apparatus.

It means, in short, unqualified satisfaction.

The use of power winches on motor trucks is no longer a matter of experiment; but is recognized as a time and labor saving method of the utmost utility.

The Otis Power Winch

is a step in advance. It makes the truck a more profitable investment by doubling its operating value and usefulness. It enables a small crew to accomplish quickly what a large crew accomplished laboriously. It enables companies to utilize their trucks at their maximum capacity with a minimum of time and labor. It represents modern, practical methods as opposed to obsolete, impractical ones. It represents speed as opposed to delay, saving as opposed to waste, unlimited range of operation as opposed to limited.

As a matter of good business you owe it to yourself to send for our fully illustrated descriptive booklet. It is an interesting book, containing many pertinent and convincing facts. *Send for this booklet today.*

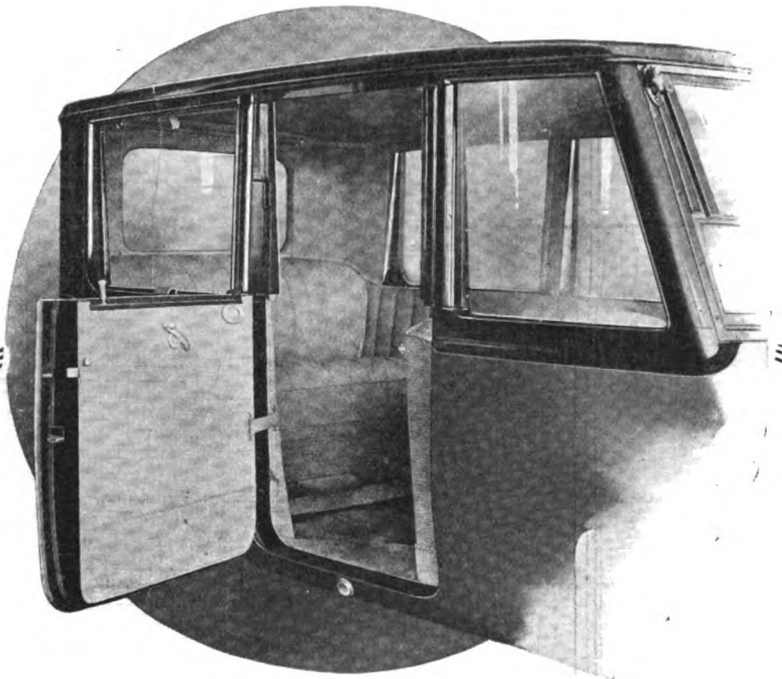
Industrial Department

OTIS ELEVATOR COMPANY

Eleventh Avenue and Twenty-Six Street, New York City

Makers of Otis Electric Steel Wheels

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ENCLOSED CAR BODY MODE

More beautiful and luxurious than ever before, have been pronounced the H & K body designs, in hardwood-framed steel, under active production at the works in Philadelphia.

Illustration shows the latest H & K Steel Body for the Paige Sedan. The daring yet graceful lines, luxuriously upholstered interiors, the smartness and individuality displayed in this work, equals that of the most expensive custom-made, and appeals to all lovers of the beautiful in automobiling.

Our great works at Philadelphia are engaged on the finest enclosed body work for several of the foremost cars of the country—reflecting the buyer's keen appreciation of a really valuable and enduring product, made entirely complete, ready for application to the chassis, and now being shipped in large quantities daily.

Suggestion is made for your engaging space here for producing your requirements in the most successful steel enclosed bodies; steel stampings of all kinds; complete cushion and back springwork, etc. Inquiries and drawings to the nearest office.

Hale and Kilburn Company

Philadelphia

New York *Washington* *Detroit* *London* *Chicago*

"While at the Grand Central Palace don't miss seeing the most unique and pleasing specimen of our 1918 enclosed body work—a limousine design for the Marmon car in aluminum, and embodying the very best appointments, blue-and-gold-fabric interior, and a beautiful blending of shades in the exterior color scheme. This example of our work is now in our extensive exhibit of enclosed bodies at the New York Show."

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Silence Wins!

Thousands of Fine 1918 Cars Will Carry the Famous

Morse Rocker Joint Silent Chains

as standard equipment. The list includes almost every famous American make. They will dominate the high grade car field by right of quality and fine mechanical construction—but not by noise.

Silence is only one of the winning features of Morse Chains, but it is of high importance in the selling field. Modern car buyers are motor-wise and know enough to use their ears in judging a car. And engineers know that efficiency is silent. The noiseless operation of a Morse-equipped motor is a joy to the expert.

A Big Selling Factor

Morse Chains not only make a good car better, but do so in such an outstanding fashion that they make it an easier car to sell. Your dealers appreciate it when you equip with Morse. The first demonstration wins the sale. Further, Morse Chains are a strong talking point. They are known and noted as standard equipment on over 30 of the best known of America's quality cars. Morse prestige counts.

No More Front End Gears

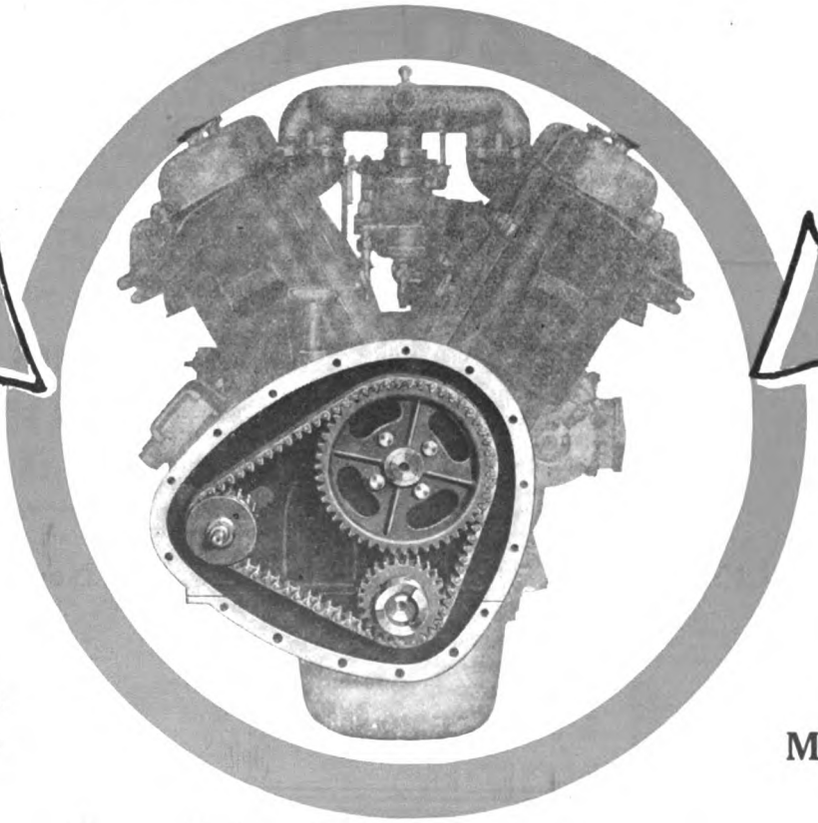
The more advanced car builders have long since abandoned the use of gears to drive cam and accessory shafts. Gears have long been recognized as trouble breeders, noisy, easily stripped and hence the cause of endless discontent. You won't find them on the typical high grade "4," "6," "8" or "12." Find out what National, Cadillac, Stearns-Knight or Packard use. You'll find "Morse" on cars of these types. The superior principles of design and construction embodied in Morse Chains make them the logical choice of discriminating engineers. Will you have details?

MORSE CHAIN COMPANY, Ithaca, New York

Largest Manufacturers of Silent Chains in the World

See Our Exhibit at the New York Show

(Space C-42, directly at the left of the 3rd floor landing.)



One of over 30 installations of Morse Chains on Famous Cars

Haynes "12" showing motor with standard Morse Equipment

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The National Auto Show

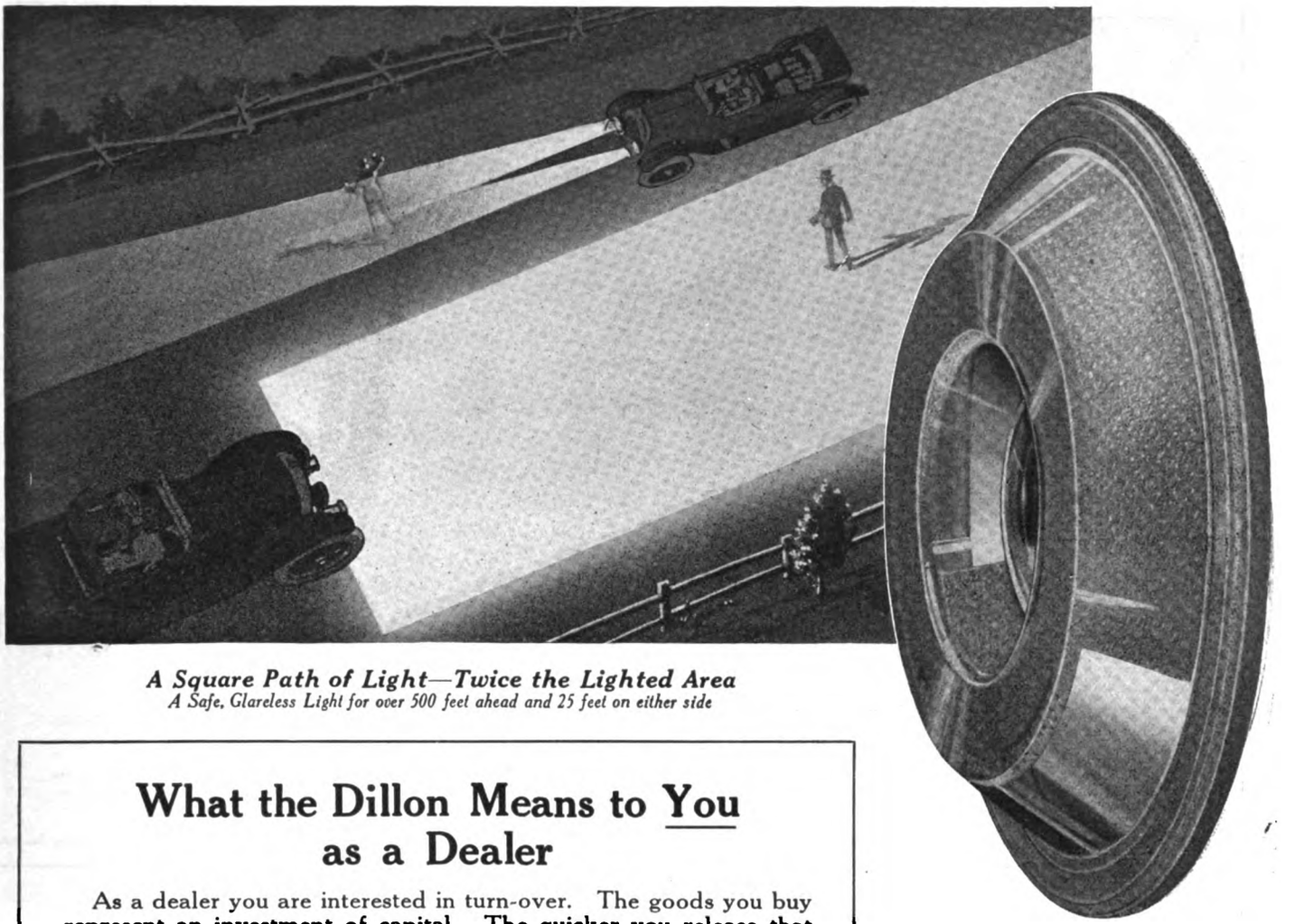
Under Auspices of National Automobile Chamber of Commerce, Inc.

Jan. 26—Feb. 2
at CHICAGO

Four Hundred Exhibits of Cars and Accessories

S. A. MILES, Manager **7 East 42nd Street, New York City**

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A Square Path of Light—Twice the Lighted Area
A Safe, Glareless Light for over 500 feet ahead and 25 feet on either side

What the Dillon Means to You as a Dealer

As a dealer you are interested in turn-over. The goods you buy represent an investment of capital. The quicker you release that capital—the sooner the goods are moved—the more successful you are as a dealer.

Consequently, you want only articles that move quickly, that require little effort to sell and only a minimum investment.

The Dillon Multi-Vision Lens is in that class. No lens possesses the innumerable selling points of the Dillon. No lens can claim, no lens can do, what the Dillon does.

The lens, the price, the demand, the advertising—everything—is to your advantage.

All sizes, from the smallest to the largest, sell for the same low price, $3.50 a pair. The Dillon advertising campaign is extensive and its plan unique. Every advertisement is made YOUR advertisement by **Otto Deeler,** a new trade character representing the auto dealer.

Get in touch with us—let us give you complete information about the Dillon Multi-Vision Lens and the selling co-operation offered

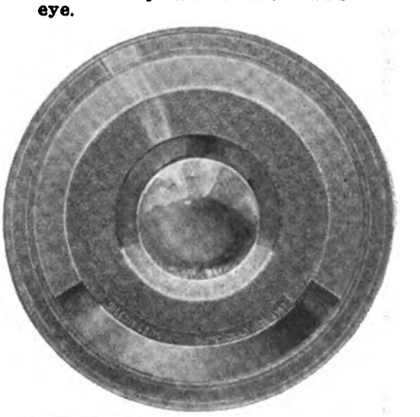
NATIONAL DISTRIBUTING BUREAU, INC.

Exclusive Distributors for the Dillon Lens

Oliver Building — Pittsburgh Penn'a

Dillon Lenses are manufactured by the
DILLON LENS & MFG. CO., Wheeling, W. Va.

THERE are three vital features of Dillon design, each of which contributes to the ultimate in light distribution. The mottled glass diffuses the light, while the clearer portion below illuminates the road at the side and front—hence a square path of light and, therefore, twice the lighted area. The bull's-eye in the center, a distinguishing feature of the Dillon Multi-Vision Lens, concentrates and magnifies the central beam of light below eye-level. These otherwise dazzling rays are scientifically neutralized, diffused and deflected from the clear glass immediately above the bull's-eye.

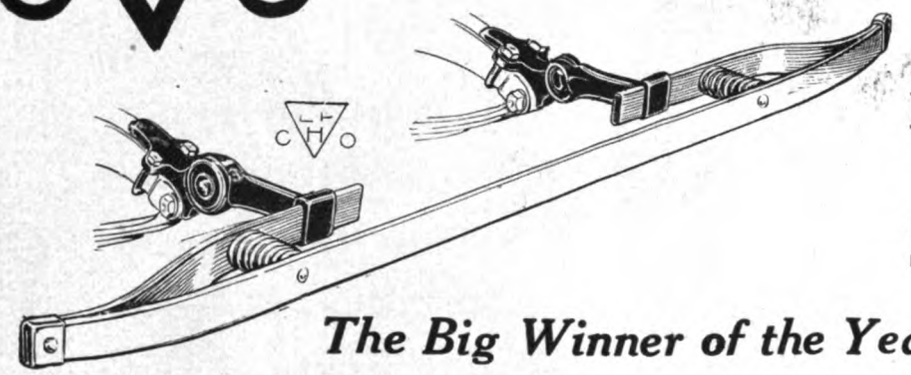


DILLON MULTI VISION LENS

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LPH

HALLADAY BUMPERS



The New
HALLADAY
MULTIPLE
SPRING BAR

The Big Winner of the Year for Live Dealers

The experienced car owner instantly recognizes its mechanical qualities and efficiency, and everyone appreciates its thorobred lines and beautiful finish.

Get busy now and get the business of your vicinity; write your jobber or the nearest distributor.

L. P. HALLADAY COMPANY, Streator, Ill.

DISTRIBUTORS:

ASCH & CO., 16-24 West 61st St., New York City.
E. L. THOMPSON CO., 817 Boylston Street, Boston, Mass.
GRAY-HEATH CO., 1440 Michigan Avenue, Chicago, Ill.
SANFORD BROTHERS, Chattanooga, Tenn., Southern Distributors.
HUGHSON & MERTON, Inc., San Francisco, Los Angeles, Portland and Seattle, Pacific Coast Distributors.

PARK-FORGED

COUNTER BALANCED CRANK SHAFTS

Patented July 10, 1917



Quick Get-a-way
Higher R. P. M.
Reduced vibration
Smoother running motor
Eliminated bearing troubles

We have shipped 57,974 Counterbalanced Crankshafts to Jan. 4, 1918

The Park Drop Forge Co.
Cleveland

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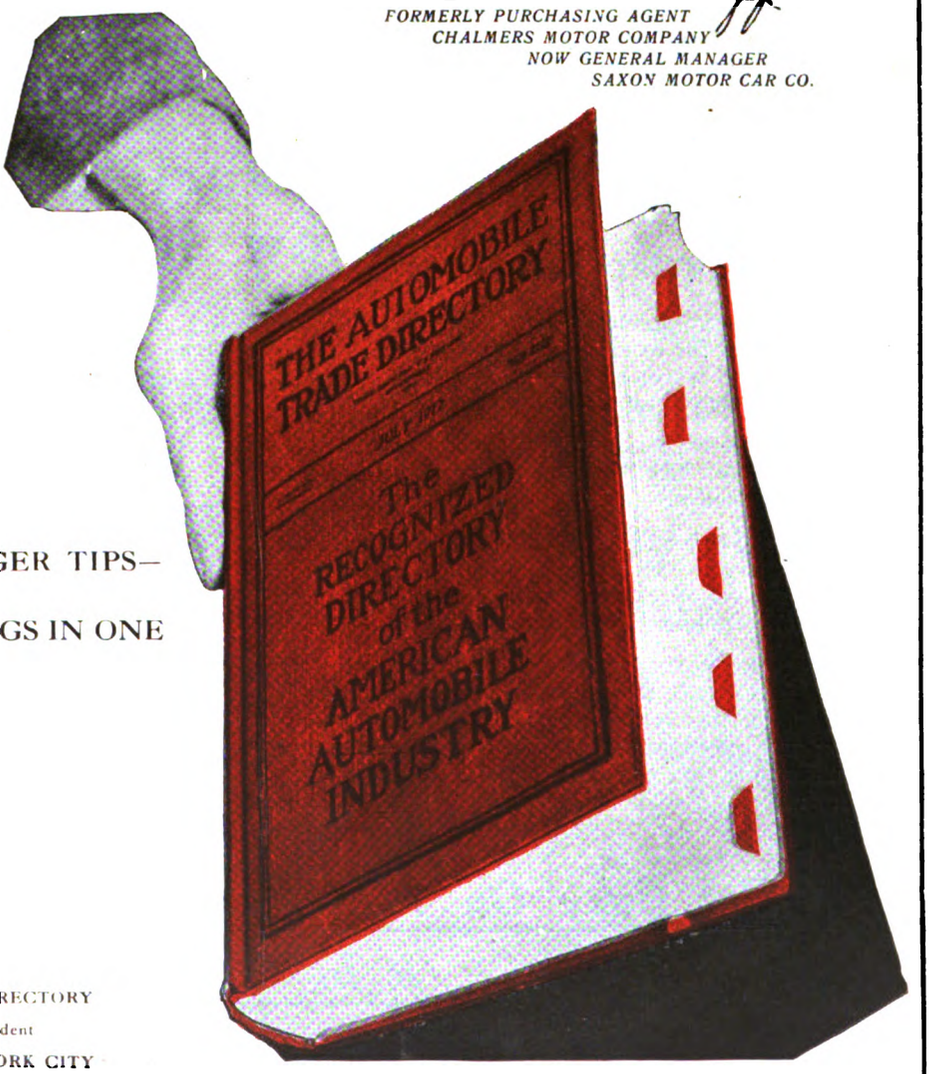


THIS MAN SPENT OVER TWENTY MILLION DOLLARS ANNUALLY

"I could not get along without the Automobile Trade Directory. It is the most important book in my office. Replaces catalogs."

C. A. Woodruff

FORMERLY PURCHASING AGENT
CHALMERS MOTOR COMPANY
NOW GENERAL MANAGER
SAXON MOTOR CAR CO.



RIGHT AT YOUR FINGER TIPS—

A THOUSAND CATALOGS IN ONE

THE AUTOMOBILE TRADE DIRECTORY
ROBERT WOLFERS, President
243 WEST 39th STREET, NEW YORK CITY

Please mention Automotive Industries when writing to Advertisers

Digitized by Google

It Has Actually Happened!

The progressive members of the industry rose up and showed their strength, their foresight and the courage of their convictions.

The "Before New York Show" Issue of MOTOR WORLD carried *more advertising than ever before!*

Were You One of Them?

If so, you are doubtless represented by proper space in MOTOR WORLD'S Before Chicago Show Issue. You realize that the use of such space *more than doubles the effectiveness* of your advertising in the New York Show Issue.

If not, the Before Chicago Show Issue of MOTOR WORLD offers your last opportunity to be adequately represented—at the *most important merchandising season of the whole business year!*

Do Not Forget That—

These Dealers, Jobbers and Garagemen are now making up their minds as to what cars, parts and accessories they are going to carry, and which ones it will be to their interest to push, during the coming season.

This Issue goes to press January 12th. Your advertising "copy" should reach us earlier than that. Prepare it *now* and send it *at once.* This is the Last Call!

It Pays To Advertise In These Show Issues!

The large volume of advertising that has come and is still coming in to our New York and Chicago offices for insertion in the Big Show Issues of "Automotive Industries" and "Motor Age" speaks louder than words of the confidence that prominent Manufacturers and Distributors have in the actual money value of such advertising.

These advertisers are not "taking chances," or "trying their luck." They *know* what such advertising will do and *has done* for them.

This advertising is placed by men who have had experience in publicity and who know that the very foundation of successful business lies in proper publicity in the Trade Papers.

They know that these particular issues are of *vital* importance to advertisers in the automotive fields, for this is the beginning of the 1918 season and the impression made now is a deep and lasting one, and one that puts the whole season's business on a solid foundation.

If you are not represented by a thoroughly adequate advertisement in these issues you are making a mistake of omission that will cost you much additional effort and considerable profit later on.

Don't hesitate about this. It is not a question of ifs, ands or buts. The advertising value of these issues has been absolutely demonstrated year after year.

And this year is of exceptional importance. What you do—and what you don't do—will count more heavily for or against you than ever before.

Get Busy On Your "Copy" Today and Send It In At Once!

Digitized by Google

MOTOR WORLD

Before Chicago Show Issue

JANUARY 16, 1918

More than 20,000 people, Dealers, Jobbers, Garage and Repair men, who will buy, sell and recommend, in 1918, such articles as you are manufacturing or distributing, will read this issue

They will read it to get just the sort of information *you can give them.* They are looking for facts about motor cars, car parts, accessories and supplies.

An advertisement in this issue is a real necessity to a fully successful season for your goods. Your competitors know this and act upon the knowledge.

This issue goes to press January 12th. Don't take any chances—send in your "copy" now to our New York Office!

AUTOMOTIVE INDUSTRIES

Chicago Show Issue

JANUARY 24, 1918

Advertisements in this issue reach the final arbiters in automotive matters. Through its pages you can tell your story to the man to whom your prospects go for advice

This publication is *the* authority on automotive matters. It is the choice of the Engineer, the Manufacturer, the large, substantial Distributors, and of the technically well informed car owner.

This particular issue carries the extra importance and selling value of Show Time. It is filled with special information regarding cars and car parts in a complete form not found in ordinary issues. It is therefore read with unusual attention by *all* of its readers.

Get your "copy" to our New York office before January 20th!

MOTOR AGE

Chicago Show Issue

JANUARY 24, 1918

No other journal in the motor car field possesses so strong a selling influence as Motor Age

It reaches practically all motorists who are worth reaching, the ones who really react to advertising. This fact has been abundantly demonstrated by actual results.

This particular issue is the most important of the whole year. Advertisements in its pages, while they cost no more than for ordinary issues, are of more actual value to producer and distributor.

The Chicago Show Issue of Motor Age offers the advertiser a chance to hook up his story with the full power and effect of the Show in a manner and with a force that is impossible in any other way.

Get your "copy" to our Chicago office before January 20th!

The Class Journal Company

239 W. 39th St., NEW YORK Mallers Building, CHICAGO

The Services of an Executive Manager of Sales and Advertising, Branches and Campaigns, for Selling good Products at a Profit will be available early in 1918. Twelve years in the motor industry. Six thousand a year and a share in the profits created. Will write, call or refer to others. Action wanted. Address Box N. 313, c/o The Automotive Industries.

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GALVANIZE RIMS AUTOMATICALLY IN MEAKER UNITS

Deposit a heavy, bright, uniform coating of pure zinc on all rims for your cars—the galvanized finish that looks good and is good.

Well galvanized rims are bright when they come from our machines and just as bright after they have made many thousand miles on your machines.

Superior Meaker Galvanizing will not cost you as much to produce as out-of-date, inferior, dark-colored, thin zinc coatings that do not even protect rims from rusting while they lie in storage.

Forward us a set of rims and felloe bands and we will give you some interesting figures.

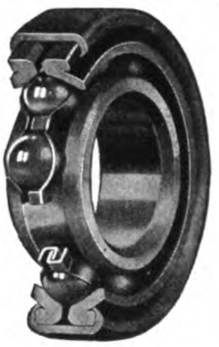
MEAKER GALVANIZING COMPANY
1249 Fulton Street Chicago, Illinois

SCHATZ "UNIVERSAL" Annular Ball Bearing

Efficiency Accuracy

THIS internationally standardized combined radial and thrust bearing sustains successfully from 300% to 400% more thrust load than any other known annular bearing.

No pleasure car, truck or tractor will see sufficiently hard service to wedge or jam the balls in its "Universal" bearings.



Write for Catalog and Data Sheets

You will be interested in the unique features which enable the "Universal" bearing to lead the field in thrust capacity without adjustment and without impairment of annular efficiency.

"THE SUPER BEARING"

The "Universal" takes end thrust in either direction; has an inner race a third deeper than the average; an outer race in two units; a rivetless separator; a three area contact; a quality throughout that establishes a new high standard in the manufacture of ball bearings.

THE FEDERAL BEARINGS CO., Inc.
30 WILLIAM STREET POUGHKEEPSIE, N. Y.

BOSSERT



Sheet Metal Stampings Are Standard



With the largest presses in the industry and a complete and modern plant for annealing, case hardening, nickel plating, electric and oxy-acetylene welding, we solicit your inquiries and orders. Estimates cheerfully furnished on your requirements.

AUTOMOBILE STAMPINGS
We make a specialty of:

Axle Housings
Brake Drums
Wire Wheel Hubs
Hub Caps
Ball Cups
Ball Retainers
Clutch Discs
Clutch Cones
Step Hangers
Torque Arms
Fan Blades
Felt Retainers
Brake Bands
Housing Covers
Wrenches
Running Boards
Washers
Clutch Spiders
Etc.





THE BOSSERT CORPORATION, Utica, N.Y.

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Automobile and Aircraft Instruments

ALIGHT AT NIGHT

WITHOUT WIRES, BATTERIES, SWITCHES OR ANY PERSONAL ATTENTION

MARVELITE

Provides continuous, practically permanent self-illumination of all instrument dials. It meets Government requirements. The basic light element in MARVELITE is radium (and radium only), the preparation containing a sufficient amount to generate a steady glow, lasting for many years.

MARVELITE is produced from formulas of the Schlesinger Laboratories, largest producers in the world of pure radium. It should not be confused with the short-lived phosphorus preparations which require exposure to light.

MANUFACTURERS: The luminous dial is of vital interest to the public, because of added safety and convenience. It brings the equipment of your machines up to date, and helps sell them. It is a necessity on aircraft, automobiles and motor boats. Insist upon having instruments that are "MARVELITED."

We will either sell the material to the manufacturer or apply it to his dials. Sample dials and hands prepared and estimates furnished upon request without charge.

The uses of Marvelite are too many and varied to be fully covered in this space. Send for Booklet No. 2 for information of importance to you.

THE COLD LIGHT MANUFACTURING CO., Inc.

558 West 158th Street, Telephone, Audubon 8047 NEW YORK



AC Carbon Proof
For Fords, Overlands and Studebakers

How Often Must You Clean Your Plugs?
Ford—Overland—Studebaker Owners

The new *AC Carbon Proof Plug* will permanently rid you of plug trouble and keep your motor running on *all* cylinders *all the time.*

The Reason

A deposit of carbon on the smooth surface of the porcelain is what causes short circuit with ordinary plugs. With the AC Carbon Proof plug the porcelain is provided with a number of ribs having saw tooth edges which attain a sufficiently high degree of heat to burn away the carbon. This keeps the edges free from deposits and breaks up any possible short circuit.

AC SPARK PLUGS

The Standard Spark Plug of America

Champion Ignition Company
Sole Manufacturers Flint, Michigan

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Blankets won't help much if—

the oil you are using does not flow freely at Zero

SUPREME AUTO OIL flows freely at Zero

STARTS WITH THE ENGINE

THIS is most important during the Winter months. You should know whether the oil you are using "flows freely at Zero." All oils do not possess this feature—notably the paraffine-base oils, which thicken up under cold and often cause great damage to the motor.

The safe way is to ask for SUPREME AUTO OIL—it "Flows freely at Zero" and leaves less carbon, owing to the fact that it is a Southern Asphalt-base oil containing no paraffine to gum, stick or thicken.

Manufactured by

GULF REFINING COMPANY

The Largest Independent Refining Company in the World

General Sales Offices: Pittsburgh, Pa.

District Sales Offices:

New York Philadelphia Boston Atlanta Tampa New Orleans Houston

Dyneto TRADE MARK REGISTERED

Electric Starting and Lighting Systems

SINGLE UNIT and TWO UNIT Equipments

Booklet on Special Ford Equipment

DYNETO ELECTRIC CO., Syracuse, N. Y.

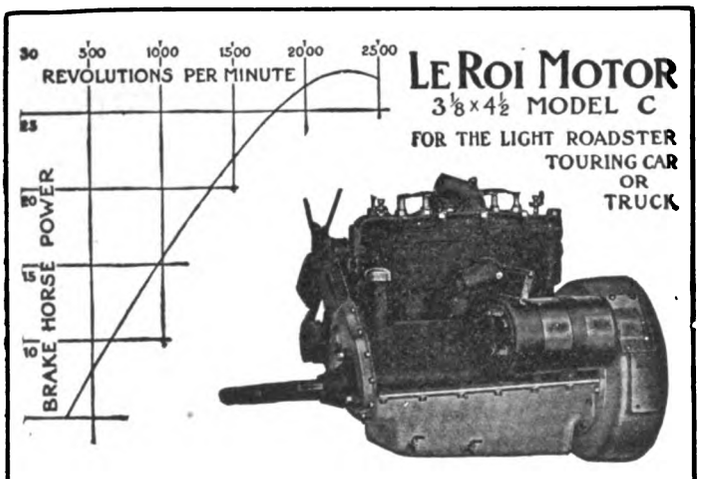
KING "8"

"The Car of No Regrets"

In Military Service as Armored Car and War Ambulance. More in use the world over than any other "Eight" save one.

Write for catalog

KING MOTOR CAR CO., Detroit



LE ROI MOTOR

3⅛×4½ MODEL C

FOR THE LIGHT ROADSTER TOURING CAR OR TRUCK

Used by leading manufacturers of best-known American-made light trucks.

The business of manufacturing Le Roi Engines, formerly conducted by Milwaukee Machine Tool Co., is now carried on by

LE ROI COMPANY

Mitchell St. and 60th Ave.

MILWAUKEE, WIS.

Write for Complete Information

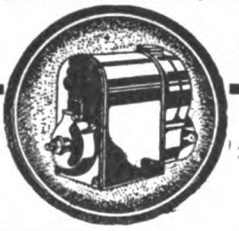
CABLE LE ROI MILWAUKEE

EISEMANN MAGNETO

THE EISEMANN MAGNETO CO.
Sales and General Offices: 32-33rd St., Brooklyn, N. Y.

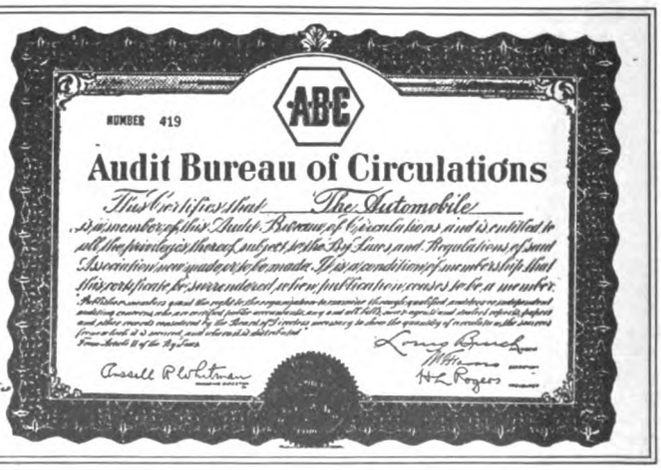
Chicago, Ill.
910 So. Michigan Ave.

Detroit, Mich.
802 Woodward Ave.



Powerful
Durable
Dependable

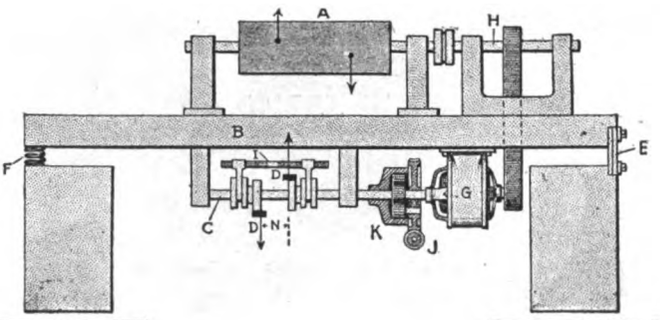
Standard Equipment for 117 Manufacturers



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District Representatives

The manufacturer of a well known automobile accessory will have several desirable District Agencies available very soon. Established business with jobbers and garages awaits a few high grade men with moderate capital and the ability to create and maintain aggressive selling organizations. Possible curtailment in automobile production means greater demand than ever. Our National advertising and liberal dealer helps will get this business for you. Address Box 13, Accessory Manufacturer, care of Motor World, Mallers Bldg., Chicago, Ill., for particulars.



don't guess—measure!

Suppose that every airplane crankshaft had to be heat-treated half a dozen times before the maker hit it right!

The Carwen Dynamic Balancing Machine is to balancing what the pyrometer and the scleroscope are to hardening. It gets the right result first time.

Ten minutes for static balancing—five minutes with the Carwen machine for measuring running unbalance—five minutes for chart conversion and drilling.

Twenty minutes from start to finish!

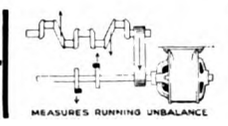
How many hours would that save in *your* factory?

Time is precious today. Make it count!

Demonstration gladly given. Have you your copy of the booklet?

THE CARLSON-WENSTROM CO.
Erie Ave. at Richmond St.
Philadelphia, Pa.
Makers also of Carwen Ball Bearings

CARWEN
Dynamic Balancing Machine
(AKIMOFF PATENTS)



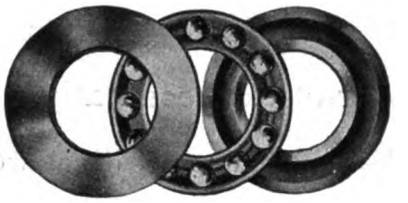


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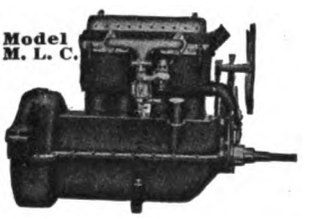
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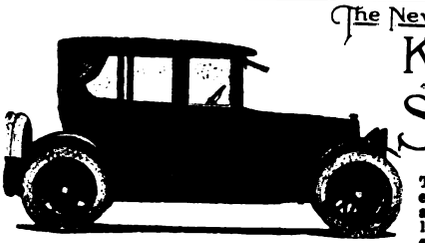
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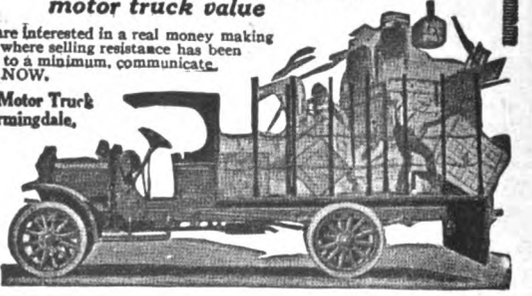
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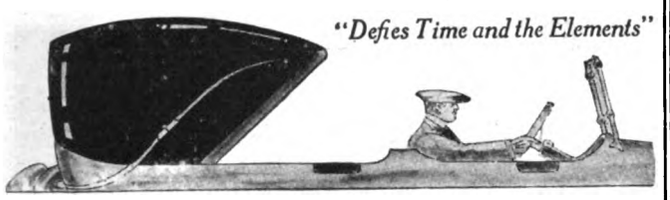
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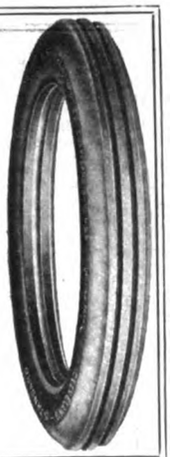
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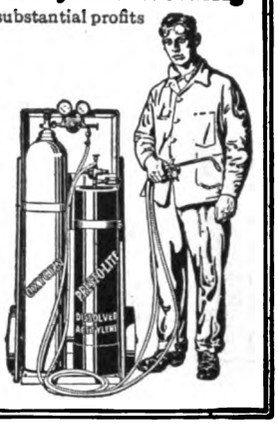
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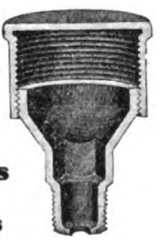
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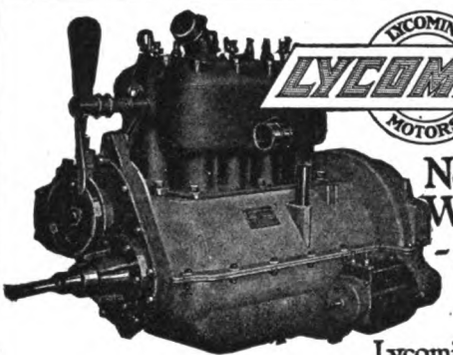
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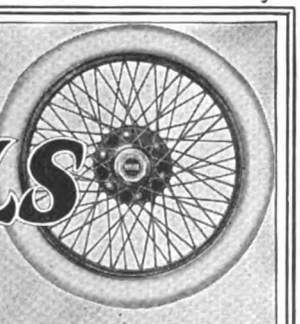


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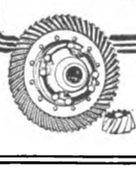


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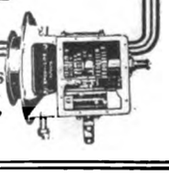
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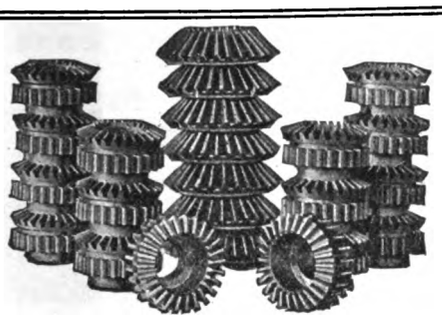
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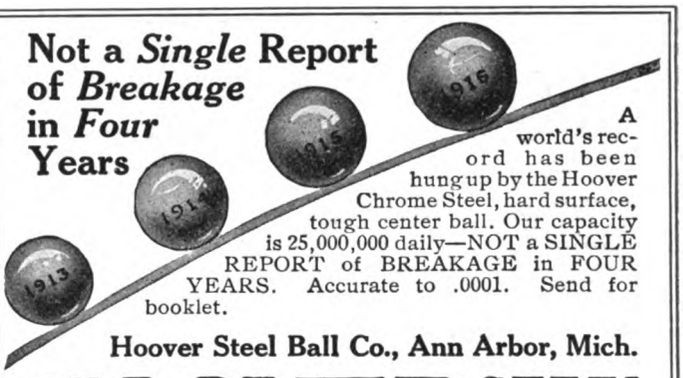
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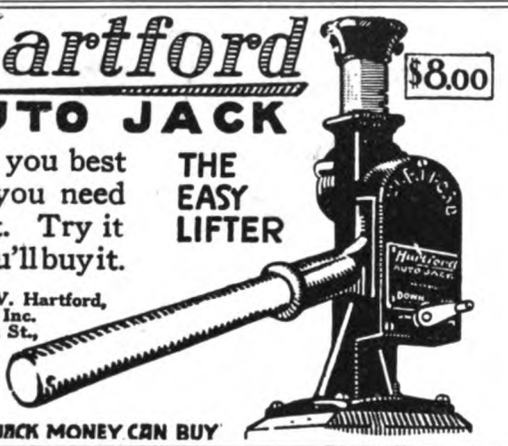
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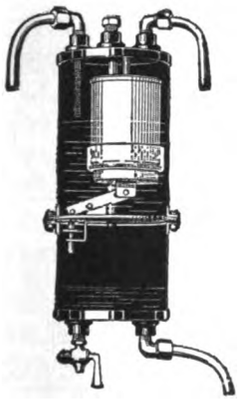
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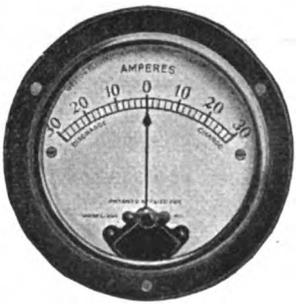
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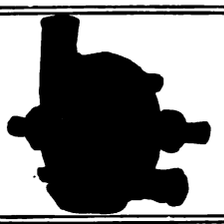
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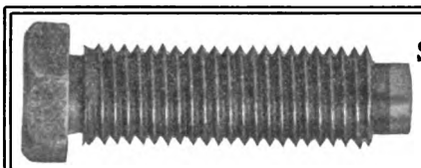
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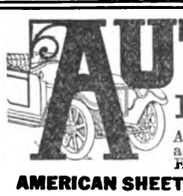
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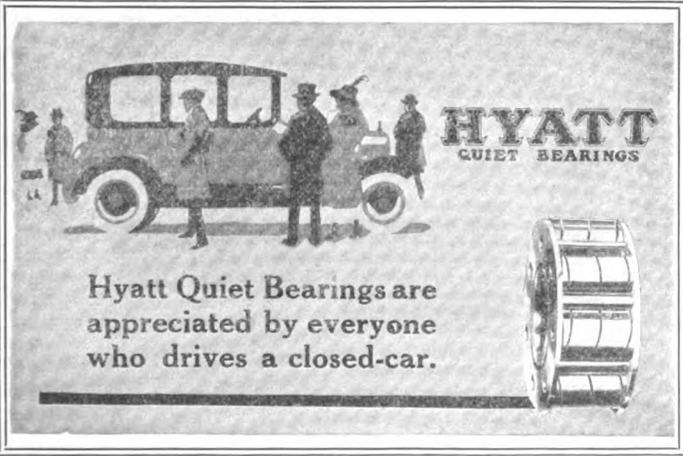
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33 x 4	7.50	3.25	7.80
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32x4	12.45	13.45	37x4	18.95	20.95
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Continued on Page 93

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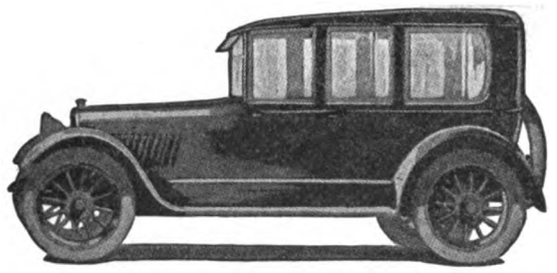
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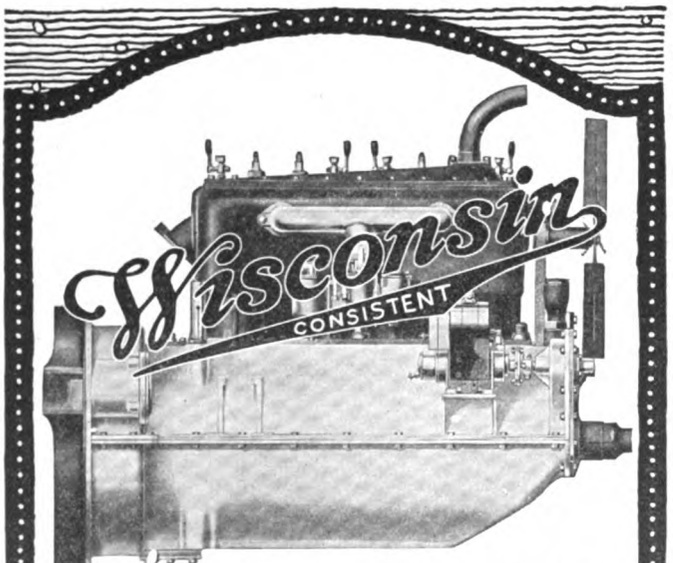
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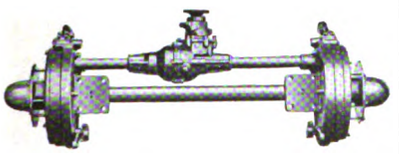
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Less complicated parts.

More efficient and reliable under all conditions of road or load.

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I am the Motor Truck. I am busy, effective, resistless as usual. Slippery pavements mean no more to me than snow or mud because I am weather-proof and feeling-proof.

I am equipped with the Russel Internal Gear Drive Axle. I deliver maximum power to both wheels, close to the rims. My load I carry on a separate axle of solid steel. Therefore, I am surefooted, unfailing and uncomplaining. These things make masters of transportation.

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North Detroit

Russel
Internal Gear Drive Axles

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Appearance, Performance,
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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Vol. XXXVIII
No. 4

NEW YORK, JANUARY 24, 1918

Twenty-five cents a copy
Three dollars a year

What Will You Do If You Can't Get Cars?

That Situation is Quite Probable With Dealers Who Do Not Make Early Arrangements for Territory

Never in the history of the world has there been so much money in circulation as there will be during the next twelve months.

The government program calls for a monthly expenditure exceeding a billion dollars. An appropriation of two hundred million dollars for railroad equipment is planned. Investors are to be guaranteed returns on their holdings. Farmers know there will be a certain and profitable market for all they can produce. There is evidence that wages are to be increased—in some lines the discussion mentions as much as 40 per cent.

Everyone knows what so much money in circulation does to the demand for automobiles. Add to that the growing needs of the nation for motor car transportation caused by the increased loads upon the railroads.

Now think how serious the situation promises to become because of curtailed production. This year's output will be at least 40 per cent under that of last year.

All the facilities of the Hudson factory that can be used to advantage for government work will be devoted to making army trucks and transmissions for army tanks. It leaves us with facilities for building 15,000 Hudson Super-Sixes.

Fifty thousand Super-Sixes, more built than of any other fine car, have been sold during the past two years. You can see how inadequate the number available this year will be.

We are merely meeting the minimum needs of our Distributors. They will first of all take care of their most loyal dealers. The eleventh-hour contractors may find it too late to arrange for deliveries.

Delayed decision on your part may deprive you of cars this year.

HUDSON SUPER SIX

HUDSON MOTOR CAR CO.

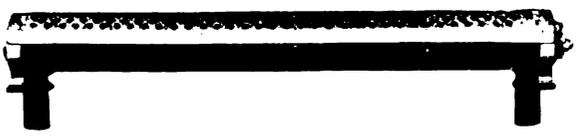
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Protected Foot Rail
HEATER

Heating Core Gets Hot Enough to Burn or It Would Not Heat Your Car



Protector Shield Stays Cool Enough to Touch So It Cannot Burn Shoes or Robes

—*manufacturers*

It is as much a duty to equip your cars that are to be used in winter with a UTILITY Protected Foot Rail Heater as it is the duty of the contractor to specify a heating system in your home, factory or office.

Other manufacturers include UTILITY Protected Heaters in their specifications for patrons' comfort—all because UTILITY installation actually sells cars.

—*jobbers*

Over 200 new jobbers added to our list this year—many of them veterans who know the heater market from A to Z—proves the established demand for UTILITY Protected Foot Rail Heaters.

Experience shows that UTILITY is the car heater it pays to catalog and sell.

—*dealers*

The selection of UTILITY Protected Heaters by the majority of jobbers in the United States, is their recommendation to you. UTILITY Protected Heaters are in their hands in force—favorites of the trade-wise men who know. UTILITY Protected Heaters sell. They have every advantage from price to service. Once in your stock, they move.

—*car owners*

Taking into consideration the matters of health, comfort, cleanliness, simple installation and operation, and actual warmth—UTILITY Protected Heaters, in service, answer every sanitary heating requirement at lower cost, and with better results than are obtainable from any other source.

—*prices*

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UTILITY Protected Heater	$15.00
UTILITY Jr. Protected Heater for Fords	7.50
UTILITY Front Seat Heater, for Maxwells, Chevrolets, Fords and Front Seat Installations in all other cars	10.00

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UTILITY Front Seat Heater	10.75
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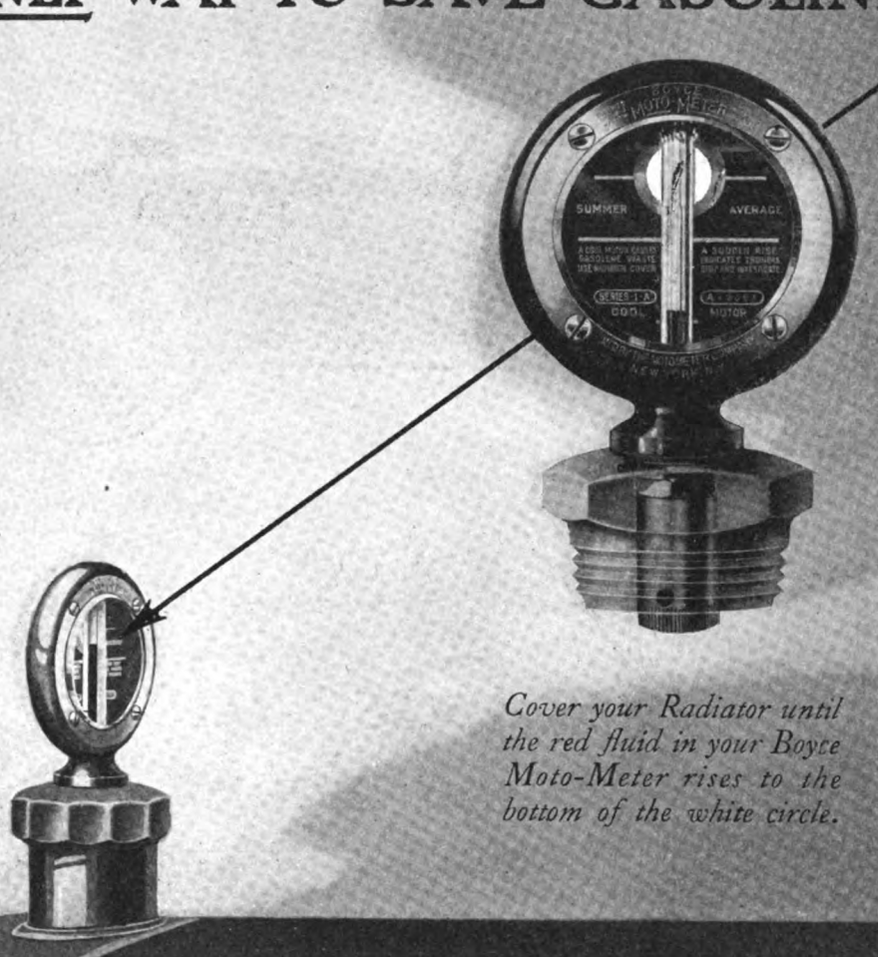
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HILL PUMP VALVE CO. UTILITY CHICAGO U.S.A.

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ENGINEERS have been telling us for years that the only way to save gasoline is to operate the motor at a high temperature.

If this is not done 30 to 40% of your gasoline goes out the exhaust pipe unburned and wasted.

Don't blame the manufacturer of your car for poor gasoline mileage. His duty was at an end when he supplied you with a Boyce Moto-Meter.

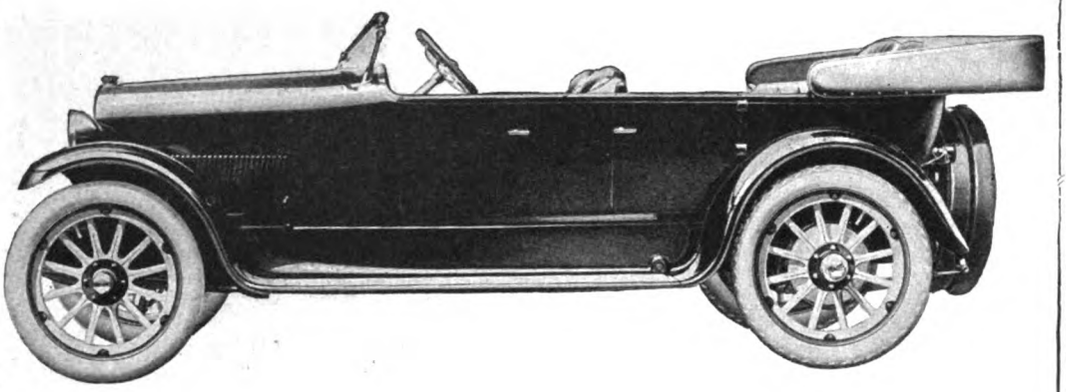
Cover your radiator until your Boyce Moto-Meter reads Summer Average. Then and then only will you start saving gasoline—simple isn't it?

THE MOTO-METER CO., Inc., Long Island City, N. Y.

BOYCE MOTO METER

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CASE SIX



The Case Idea
—and Yours

AT the New York Show there was widespread attention paid to the "All Feature" principle as exampled in the New Case Six. In this one car men found combined all the attractive features, and at a price lower than expected.

Mechanical excellencies are properly combined with beautiful design.

Here is complete pleasure and utility value, without untimely extravagances.

And as men go over the Case Six point by point they note the basic fundamentals of good car building, combined as never before. They realize that Case Engineers have created the finest Case Car ever offered.

Go over the specifications yourself. Note the tried and proven features. And when you examine the car, see how they are proportioned exactly, and how they are designed to make a harmonious and unified whole.

Every Case dealer knows that he offers in this New Case Six the finest car on the market for the money. Over-values are apparent. The customer is bound to be enthusiastic.

Family Model, a 7-Passenger Touring Car, color dark blue, $1875; Sport Model for four people, color periscope green, $1875; All-Seasons Model, Springfield Type, for 7 or 5 people, color dark blue, $2375.

If you haven't come to know this car yet, and our profitable proposition, write immediately. An opportunity such as this is rare.

J. I. CASE T. M. CO., Inc., 217 Liberty St., Racine, Wis.
Founded 1842

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE
THE CLASS JOURNAL COMPANY
231–241 W. 39th STREET NEW YORK CITY

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WYMAN-GORDON



Making Sure

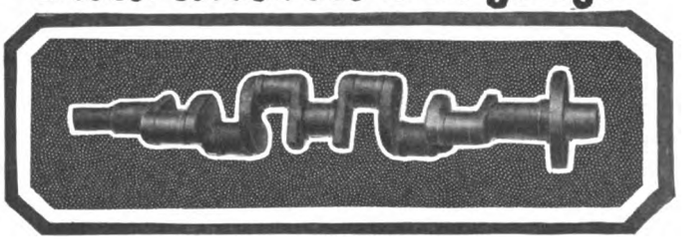
HERE IS A CORNER of the Wyman-Gordon laboratory where samples of every steel billet brought into our yards are tested to *make sure* that they are up to the Wyman-Gordon standard.

"MAKE SURE" IS THE WATCH-WORD of Wyman-Gordon. Our guarantee certifies that we have made sure to the full extent of our ability.

THE HIGH QUALITY of Wyman-Gordon Products extends beyond the quality of steel used and the character of workmanship involved. It includes designing, the capable handling of manufacturing problems submitted to us, the cooperation offered by a staff of experts who have concentrated upon this particular subject.

WYMAN-GORDON CO.
Worcester, Mass. *Cleveland, O*

Guaranteed Forgings



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THE SCHATZ "UNIVERSAL" Annular Ball Bearing



Letters from users of the "Universal" prove that **it leads the field internationally** in **safety** and **carrying capacity** and that it **triumphs** over the **hardest** service conditions.

Takes **300%** to **400%** **more thrust load** than any other known annular bearing. Takes end thrust in **either direction without adjustment** and **without impairment of annular efficiency.**

"The Super Bearing"

INNER race one-third deeper than the average and held to curvature only 4% greater than the curvature of the balls.

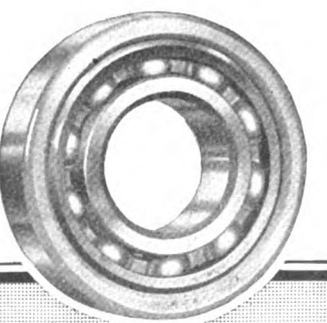
Outer race generated on two integral cups or race rings with space between to distribute radial load and to prevent binding strain under thrust load.

Separator free from rivets, rivet holes and distance pieces. It consists of two interlocking units and is sufficiently flexible to accommodate itself to changes in the axis of rotation of the balls.

Races and balls made from the highest quality of high carbon chrome crucible alloy steel to a specified analysis.

Raw material, parts in process and **finished product** are so rigidly and persistently inspected that the "Universal" has established a new standard of quality for ball bearing manufacture.

The "Universal" is a self-contained, combined radial and thrust bearing **internationally standardized** and **interchangeable.**



Engineers of motor cars and parts or of any other mechanism with rotating members should write for catalog and data sheets.

THE FEDERAL BEARINGS CO. INC.

26 WILLIAM ST., POUGHKEEPSIE N.Y.

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XXXVIII NEW YORK—THURSDAY, JANUARY 24, 1918—CHICAGO No. 4

Late Exemption Notices

Delay Production of War Orders

Many Firms Closed Friday and Saturday But Opened Monday—War Truck Factories Not Exempted—Illinois Tractor Makers Exempted But Wisconsin Not Exempt—Airplane Work Halted Friday and Saturday—Automobile Production Stopped—Dealers and Service Stations Closed

NEW YORK CITY, Jan. 23—While the entire automotive industry displayed an excellent spirit of patriotism in almost universally obeying the letter of the Fuel Administrator order closing factories for 5 days, there has been very general criticism in the way the order was carried out.

Unfortunately, exemption notices were not well timed, and great numbers of factories engaged in the manufacture of airplane engines and parts were closed all day Friday and all day Saturday, because the exemption notices did not reach them until late Friday night and it was impossible to get the working forces of the factories together for Saturday.

This was particularly true in such centers as Detroit, Cleveland, Indianapolis, Toledo and Flint. For example, Ford, which is one of the largest manufacturers of war parts, was closed down Friday, and practically closed all day Saturday. The injury and delay of such a closing down affected not only the Ford plant but others making aircraft parts for the reason that Ford supplies the cylinders for many makers.

Due to lack of proper notification with regard to exemptions, the tractor industry in Illinois and in Wisconsin suffered seriously. Many tractor makers received their exemption notices in time to begin work Saturday, but their factories had closed on Friday. In Wisconsin the J. I. Case Co., one of the largest tractor makers, was closed down completely and in all probability will have to remain closed during the 5 days as the Wisconsin State Fuel Administrator did not exempt the factories the same as did the Illinois administrator. In Minnesota the tractor interests were closed by the Fuel Administrator's orders.

One way in which the exemptions issued by the Fuel Administrator failed to carry was in connection with those firms manufacturing parts for the standardized war trucks of the Quartermaster's Depart-

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ment. While makers of aircraft parts and tractor parts received exemptions none were received by the makers of engines, axles and other parts for the war trucks.

In Milwaukee the shut-up of industries is almost complete, only five or six out of 2300 industries remaining in operation; even the Wisconsin Motor Mfg. Co., which is working on government work almost exclusively, received its exemption from the War Department too late and it was closed Friday and Saturday, but renewed work Monday morning.

In Cleveland, the closing up situation was made worse by the fact that the street railway company was put on a Sunday schedule, so that thousands of workers were hours late in reaching the factories that had been given permission to work.

Many factories engaged on government work were not given exemption notices in time, and they were closed during Friday and Saturday. Peerless, which is making 10 trucks a day for the British government, was closed during the 5-day shut-down. Stearns, engaged on aviation engine parts, did not receive its permission to go ahead until Tuesday, so that it virtually lost all 5 days. Standard Parts has only half its men at work, although it is on government orders. The Marvel Accessories Co., working on airplane parts, could not receive an exemption, although it wired for one; it shut down for 5 days and used the time to install machinery.

Manufacturing in Indianapolis was practically suspended by the rule, and on Monday only one or two concerns were exempted. Nordyke & Marmon got an exemption order on its aviation work only. Premier, which is manufacturing F. W. D. trucks, was also exempt. All other factories were closed.

The Detroit situation was very serious. Ford laid off 35,000 men; Packard 8000; Cadillac 6000; Hupmobile 12,000; Continental 3000, and Timken 5000.

The greatest criticism from Detroit was that the exemption lists did not come with the order to shut down. The order was issued so late Wednesday night in Washington that the morning papers were not able to carry it as were the daily papers in the eastern section of the country. Detroit feels that the economy of coal is not at all commensurate with the loss to the industry by the shutting down order of the Fuel Administrator.

Fuel Order Closed 90% of Detroit's Plants

More than 200,000 Men Temporarily Out of Work—Comparatively Little Coal Saved by Shut Down

DETROIT, Jan. 19.—One bitter thought overspreads all others in connection with the effect of the fuel edict throughout Michigan, Ohio, and the Middle Western territory. This is, that in spite of the hundreds of thousands of men thrown temporarily out of work, in spite of industries temporarily paralyzed, very little fuel is really being saved. It is necessary to heat the plants to save them from destruction by freezing, and this takes a large percentage of the coal ordinarily consumed. In some of the big plants not over 10 tons a day are being saved by the order.

The general attitude of manufacturers is expressed in the words, "As patriotic citizens we must obey the edict of the government regardless of our personal opinions." The factories at once closed down, some of them operating a short time Friday until the order was recognized as being authoritative. Friday night telegrams were sent out to plants engaged on war contracts, but these were received too late in most instances, with the result that many had a hard time getting their organizations together Saturday to go on with the work.

Plants like Packard, Ford, Cadillac, Fisher Body, General Aluminum & Brass, Detroit Copper & Brass Rolling Mills, and the American Car & Foundry Co. were included in the exemptions announced by the Fuel Administration in Washington late Friday. All of these companies have one or more departments on important war work, and these departments alone are in operation today. There are others, however, doing war work which were still closed in all departments this morning. These included local plants working on parts for the Liberty trucks, such as Continental and Timken.

About 75 per cent of Detroit industries were shut down Friday, and on Saturday morning virtually 90 per cent of the city's industries adjusted themselves to the schedule imposed by the Fuel Administrator.

In accordance with the protest meeting held at the Board of Commerce Thursday afternoon, about forty shops, employing large numbers of men, went to work as usual Friday morning, but when an order was sent out by Governor Sleeper declaring that it was unpatriotic to disobey the edict, and that the State would enforce it, these also fell in line.

The greatest confusion is being caused by the delay in announcing exemptions. Many of those engaged in different branches of war work are expecting their exemptions hourly, but cannot afford to pay their organizations and hold them at the plants in anticipation of these orders. It was not until very late Friday afternoon that the fuel administration admitted officially that important war work is not affected by the order, and gave out a list of hundreds of factories that may continue work on government contracts only during the 5-day period.

Local factories engaged in war work telegraphed the fuel administration offices in Washington and also to the Washington representatives, when they had them, asking for definite rulings on these war contracts, with the result that the exemption list was hurried to some extent. Automotive products covered in the plants exempted in a list prepared by Secretaries Baker and Daniels included aircraft and aircraft parts, Signal Corps equipment, electrical supplies, and certain steelwork. The army trucks were not mentioned, although word is being expected on them any minute.

Willys-Overland closed except in the departments doing government work. The Elmira plant is running night and day, and the Elyria plant is also going ahead with its airplane work. The number of men laid off by the Willys-Overland Co. is 8000. The coal saving of this company amounts to about 200 tons a day.

Practically the same conditions apply to Buick, where all but the aircraft men are laid off, making a total of

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about 12,000 employees out of work for the 5-day period. This company uses normally 600 tons of coal a day, of which 42 per cent will be saved through closing. The general coal situation in Flint is probably as bad as it is anywhere in the country. There are 4000 families practically without coal, and there is no coal anywhere near the city, and no cars en route. The schools have been closed for a week and the coal taken from the cellars and placed into the bins of private users. This company has voluntarily reduced its production by closing its plant over a week ago to conserve fuel to meet the serious situation obtaining in Flint.

Ford started Monday operating in the departments where government work is under way, the most important of this being the department concerned with the manufacture of cylinders for the Liberty aircraft engines. This highly important work was closed down with the rest of the factory because the Ford company did not get its exemption order until late Friday night, when it was too late to get the force together to start work again Saturday. In saving of coal the 5-day shutdown of the Ford company will mean about 60 carloads, or 12 carloads a day. The normal consumption is from 17 to 18 carloads per day.

The number of men thrown out of employment in Detroit alone is approximately 200,000. These men will not be paid during the layoff period, so far as is known by any of the companies, although one or two still have the matter under consideration. To give an idea of the number of men affected by the order, the Ford company has laid off temporarily 35,000 men, Willys-Overland 8000, Buick 12,000, Studebaker Detroit plant 3000, Continental 3000, Cadillac 6000, Packard 8000, Timken (both plants) 5000, and Hupmobile 12,000.

Some of the companies making motors and feeding back the power developed by these motors on test back into the lines really lose coal instead of gaining it by the closing order. A rough estimate of the coal saved by some concerns is: Hupp Motor, 10 tons a day; Packard, 35 tons a day; Studebaker, 150 tons a day; Timken, 100; Buick, 250; and Willys-Overland, 200. Figures from other companies are not available.

Illinois Tractor Makers Escape Shut Down

CHICAGO, Jan. 19.—The tractor industry in Illinois is the only portion of the motor industry where manufacture is not greatly restricted in this territory by the heatless-day order. According to an exemption ruling to-day, manufacturers of farm implements and agricultural tractors in the State are permitted to operate without interruption during the remainder of the five fuelless days and on the fuelless Mondays, as long as production is confined to orders for spring delivery.

Inasmuch as all of the more important tractor makers in the State have orders for spring delivery far ahead, the new ruling will permit them to resume operations, which have been suspended since yesterday.

So far as known now, tractor makers in other States are not so fortunate. In Wisconsin, the State fuel administrator has not exempted the implement and tractor men. The J. I. Case T. M. Co., Racine, Wis., one of the biggest farm implement and tractor manufacturers, as well as being a car builder, has closed down completely so far as work inside the plant is concerned, and will remain so till Wednesday, and on the following nine Mondays, unless a ruling is received to the contrary.

The instance of the Case T. M. Company is typical of larger concerns in many industries. This concern, though it is not making anything directly for our Government, is making the machines which increase the production of foodstuffs. Also it is making thousands of tractors for our Allies. At this time it is sending 700 carloads of tractors to Europe. Its 4500 men are idle, except those that can be used in clearing away snow and loading and unloading cars on its sidings.

Car and truck manufacturers who are not doing any government war business are shut up completely. Most of the concerns in this territory, however, are doing some Government work on war materials, trucks particularly, and are operating those portions of their plants devoted to the production of war orders. The remainder of their plants are closed. The Nash Motors Co., which is making war trucks, is operating the part of the plant solely devoted to U. S. orders, and has closed the rest. Velie is doing likewise, though 800 of its 1200 men will be idle during all of the heatless days. Root & Vandervoort, Moline, makers of the Moline-Knight, are devoting 85 per cent. of their facilities to war work, yet are closed down completely, and will remain so throughout the heatless days, unless they receive exemption orders.

Mitchell and Studebaker are closed to-day, and whether they remain so will depend upon rulings of the national or State fuel administrators. Both are working on government contracts.

One Milwaukee Plant Exempt

MILWAUKEE, WIS., Jan. 21—With the exception of the Wisconsin Motor Mfg. Co., every passenger and commercial car engine and parts factory in Milwaukee and vicinity was entirely closed for 5 days, throwing more than 7500 men out of employment. The Wisconsin Motor Co. closed with others Friday, but later received permission from the War Department to resume Monday morning to hasten Liberty engine production. Only five or six out of 2300 industries are in operation. All garages closed tight Monday. The loss of wages of 100,000 workmen is regarded as the worst result. The order is generally characterized as too arbitrary, considering peculiar local conditions, and hardly justified. No instances of violation are reported. The general effect is rather depressing.

Here, as in other cities, the exemption orders were received in many cases too late to permit the various factories to take proper advantage of them.

Indianapolis Industry Suspends

INDIANAPOLIS, Jan. 21—Industry in this city and central Indiana is all but suspended as a result of the enforcement of the federal Fuel Administrator's five days' closing. The Premier Motor Corp., which is manufacturing motor trucks for army use, is the only plant that has been in operation to-day, this company having received word from Washington Saturday to continue in operation.

Nordyke & Marmon, which is manufacturing airplane engines and milling machines in addition to automobiles, was the first company in the city receiving orders from the Fuel Administration to continue operations, but the order related solely to a continuance of the aviation and milling machinery departments.

The plants of the Cole Motor Car Co., the Stutz Motor Car Co., the National Motor Car & Vehicle Corp. and the Empire Automobile Co. have been closed, only enough heat being provided to keep automatic sprinkler systems from

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freezing. All automobile plants in central Indiana that are not engaged in manufacturing supplies for the Aviation Department, or which are not making trucks, are not in operation.

Officials of the companies, although realizing that they have been compelled to sustain a serious loss, are not complaining over the order, although its issuance is universally condemned. The chief difficulty from the Fuel Administration's act is expected to be increased freight congestion, which, it is believed, will embarrass the motor industries considerably within the next few weeks.

Cleveland Shut Up Tight

CLEVELAND, OHIO, Jan. 22—Cleveland has been shut down tighter than may have been anticipated even by Fuel Administrator Garfield. When the shutting down process began the interdependence of industries asserted itself in a striking manner and the shutdown became tighter than was intended.

In this situation the street car company played an important part. On Monday it put on what it said was a Sunday schedule, it not having been directed to do otherwise. The result was that schools were an hour late in opening, thousands of workers were late in arriving at shops that had permission to keep open, and the public arrived at an almost riotous frame of mind as the packed street cars filed by without stopping. At one corner the crowd pulled the trolley pole off and forced its way aboard.

During this trying period motor cars and trucks came partially to the rescue. Taxicab companies did yeoman service.

Some shops with government work could get no reply from Washington or elsewhere, so shut down. In some cases exemptions arrived too late to be of value. The city determined to live up to the order unless explicitly instructed to the contrary, and the result was a shutdown tighter even than a normal Sunday.

Peerless, which is making 10 trucks a day for the British Government, is closed tight for the five days. Even its offices were closed Monday.

White closed Friday and Saturday, but opened up on government work Monday when an exemption was received. Chandler is closed tight and has moved part of its offices to parlors in the Hollenden Hotel.

Winton has government work on lighting sets, but is shut for the five days because it could get no order to the contrary. It expects to keep its offices open Mondays hereafter if possible.

Stearns is almost entirely shut down for the five days. To-day it got permission to work on its airplane parts contracts. It is hauling coal on trucks to keep open.

The Warner & Swasey Co., which is making gun fire control instruments, is working a third of its men. One thousand are out of work. Its exemption was not received until Friday. It uses 15 to 20 tons of coal a day and has about 100 tons on hand.

The Standard Parts Co., which is making truck and airplane parts, has from 800 to 1000 men out of work. It has about 1500 employees.

The Marvel Accessories Co., whose shop is making airplane parts, sent a 92-word letter to Fuel Administrator Garfield, but got no reply, and is using the five-day period to install additional machinery. A few of the factories have supplies of coal. Many are working from day to day.

Newspapers in this section state to-day that the five-day shutdown seems to have done little good so far as getting coal to Ohio's industries is concerned. The same applies to coal for home consumption. Most of the factories are not paying their men for the lost days and not many see any chance of regaining the lost time.

The public attitude is that the order should be obeyed first and talked about afterward. There is also a feeling that the public should be let to know a little more of the inside situation when such drastic measures are stated to be necessary. A strong sentiment seems to be rising in favor of a shutdown in passenger traffic if such would help the situation. This was recommended Monday by Hugh Chalmers at a meeting of Ohio dealers.

A continuance of winter weather has been a handicap.

Minneapolis Hard Hit

MINNEAPOLIS, Jan. 21—Automobile, tractor and accessory factories closed five days in Minnesota with few exemptions and tire and repair shops and oil stations to-day, in addition to smaller automobile factories at St. Cloud, Luverne and Duluth. In Twin Cities closures are as follows: Ford Motor Co., 600 men; H. E. Wilcox Motor Co., 300; Wilcox-Bennett Carbureter Co., 100; Pence Automobile Co., 200; Maxwell branch, 40; Chevrolet and Willys-Overland, small forces.

Tractor companies in cities and suburbs have about 4000 men, of which perhaps 1700 are exempt, including employees of Minneapolis Steel & Machinery Co. and Emerson-Brantingham Co.

Repair shop and oil stations are allowed to do emergency work. About 200 oil station men and 150 tire repair men are out and 2000 repair shop employees. The automobile industries seem to regard the day as a regular holiday, but tractor companies regret setback on their seasonable product, requiring one extra day to get cold shops working again. This applies also to tractor accessories, on production of which output of finished tractors depends.

Kansas City Little Affected

KANSAS CITY, MO., Jan. 21—No manufacturing industries are closed here so far by the Fuel Administration order.

The Fuel Administrators of Kansas, Missouri, Arkansas, Oklahoma, Nesbraska and Iowa are in conference to-day in Kansas City. All say that in these states all industries apparently can be taken care of, but amusements, saloons, office buildings and retail stores are being restricted.

Partial List of Companies Exempted

FOLLOWING is one of the early and partial lists, showing some of the concerns which have been exempted from the Fuel Administrator's order:

For the Manufacture of Aircraft and Signal Corps Products:

A. C. Clark Co.	Chicago
Packard Motor Co.	Detroit
Ford Motor Co.	Detroit
Lincoln Motor Co.	Detroit
Trego Motors Corpn.	New Haven
Nordyke & Marmon Co.	Indianapolis
Union Switch & Signal Co.	Swissvale, Penn.
Pittsburgh Model Engine Co.	Pittsburgh
Willys-Overland Co.	Toledo
Wright Martin Aircraft Corpn.	New Brunswick
Aeronautical Engineering Co.	Long Island City
General Motors Corp.	Detroit
Curtiss Aeroplane and Motors Corp.	Buffalo
Thomas Morse Aircraft Corp.	Ithaca
Fisher Body Corp.	Detroit
Dayton Wright Airplane Co.	Dayton
Standard Aeroplane Corp.	Elizabeth
Cutler Desk Co.	Buffalo
Rubay Co.	Cleveland
Engel Aircraft Co.	Niles, Ohio
Lewis Spring and Axle Co.	Chelsea, Mass.
W. H. Mullins Co.	Salem, Ohio
National Gauge and Equipment Co.	La Crosse, Wis.
U. S. Gauge Co.	Sellersville, Penn.
Julius King Optical Co.	New York City
Taylor Instrument Co.	Rochester
National Cash Register Co.	Dayton
Sperry Gyroscope Co.	Brooklyn, N. Y.
American Radio and Research Corp.	New York City
American Steel and Wire Co.	Trenton
Bausch & Lomb Optical Co.	Rochester
Hartzell Walnut Propeller Co.	Piqua, Ohio
West Woodworking Co.	Chicago

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Flottorp Mfg. Co.	Chicago
John A. Roebling Sons Co.	Trenton
Western Electric Co.	New York City
Western Elect. Instrument Co.	Newark
Eastman Kodak Co.	Rochester
Splitdorf Elec. Co.	Newark
Wyman Gordon Co.	Worcester, Mass.
American Propeller Co.	Baltimore
Astoria Veneer Mill & Dock Co.	Long Island City, N. Y.

For the manufacture of emergency navy contracts:

Curtiss Engineering Corp.	Garden City, N. Y.
L. W. F. Engineering Co.	College Point, N. Y.
Aeromarine Plane & Motor Co.	Keyport, N. Y.
The Burgess Co.	Marblehead, Mass.

For the manufacture of products for Shipping Board:

General Electric Co.	Erie, Penn.
General Electric Co.	Schenectady
General Electric Co.	Lynn, Mass.

For emergency fleet orders and emergency Government work:

Bethlehem Steel Co.	Steelton, Penn.
Bethlehem Steel Co.	S. Bethlehem
Bethlehem Steel Co.	Sparrows Point
Midvale Steel & Ordnance Co.	Nicetown, Penn.
Midvale Steel & Ordnance Co.	Coatesville, Penn.
Midvale Steel & Ordnance Co.	Johnstown, Penn.
Lukens Steel Co.	Coatesville, Penn.
Carnegie Steel Co.	Pittsburgh
Crucible Steel Co.	Pittsburgh
Crucible Steel Co.	Harrison, N. J.
La Belle Iron Works	Steubenville, Ohio
Otis Steel Co.	Cleveland
Lackawanna Steel Co.	Buffalo
Illinois Steel Co.	Chicago
Jones & Laughlin Steel Co.	Pittsburgh
Donner Steel Co.	Buffalo
Inland Steel Co.	Indiana Harbor, Ind.
Central Steel & Iron Co.	Harrisburg
Republic Iron & Steel Co.	Youngstown
Brier Hill Steel Co.	Youngstown
Corrigan, McKinney & Co.	Cleveland
Forged Steel Wheel Co.	Butler, Penn.
Whittaker-Glassner Co.	Portsmouth, Ohio
Youngstown Sheet & Tube Co.	Youngstown, Ohio
Alan Wood Iron & Steel Co.	Conshohocken, Penn.

For the manufacture of "gas masks of the box respirator type":

B. F. Goodrich Co.	Akron
Goodyear Tire & Rubber Co.	Akron
Mechanical Rubber Goods Co.	Cleveland
C. Kenyon	Brooklyn
Nashawanna Mill	New Bedford, Mass.
Wamsutta Mill	New Bedford, Mass.
Sayles Bleacheries	Saylesville, R. I.
Hero Mfg. Co.	Philadelphia

For the manufacture of important forgings:

Bethlehem Steel Co.	South Bethlehem
Midvale Steel Co.	Nicetown, Penn.
Hydraulic Pressed Steel Co.	Cleveland
American Car and Foundry Co.	Detroit

Forgings for Destroyers:

Allis-Chalmers	Milwaukee
Camden Forge Co.	Camden, N. J.
Erie Forge Company	Erie

Miscellaneous:

Detroit Gear & Mch. Co.	Detroit
McCord Mfg. Co.	Detroit

Urge Permanent Highways Paralleling Railroads

Highways Industries Association Fosters Movement to Supplement Usefulness of Rail Carriers

CHICAGO, Jan. 21.—By telegram.—At the organization to-day of the Highways Industries Association, an organization which gives promise of much activity, the consensus of opinion was that this country must build and maintain permanent highways alongside of and paralleling our main trunk railroad lines, so as to supplement the movement of freight and passengers by the railroads with the transportation of these by automobiles and motor trucks.

To do this, superefforts must be made to connect up the disjointed sections of such highway systems as are in existence, and our road activities should be along such a national line rather than along a promiscuous, disjointed system of building in different States secondary highways which are not of primary importance during the war.

The main object to-day is to build and maintain these national systems of highways, which would preferably parallel our main trunk lines, as these, in the majority of cases, are the necessary channels of transportation.

One of the points of greatest interest brought out at the meeting was the announcement by James I. Blakeslee, fourth assistant postmaster general, who is in charge of the rural postal system, that if plans work out as expected there will be motor-truck parcel post within a short time under operation by the Government between all principal points.

One complete system which will be in operation within the next 60 days, according to these plans, is a route between Chicago, Indianapolis, Louisville, Nashville, Chattanooga and Atlanta, connecting with a similar route between Portland, Me., and New Orleans.

Organization of the Highway Industries Committee was one of national importance, as it brought together representatives from the Government as well as road machinery and material concerns with highway organizations, and State highway officials of the country. Over 150 delegates who were present represented 1500 plants with a combined capital of $4,000,000.

The objects of the organization, as outlined in the call to the meeting are:

To assist co-operation with all governmental agencies, both State and national.

The co-ordination of the highways with other transportation agencies of the country.

To encourage the development of highways that will advance the economic life of the nation and stimulate their use in such manner as to facilitate and cheapen the transportation of food, raw materials and finished products, to the end that our highways may be of maximum service in the transportation of the nation.

S. M. Williams of the Gramm-Bernstein Company, Lima, Ohio, was elected president; A. R. Hurst, Wisconsin State Commissioner of Highways, first vice-president; Leon Gardiner, New York, second vice-president; and S. T. Henry, Washington, D. C., third vice-president.

Secretary and treasurer are to be appointed by the directors. Headquarters will probably be in Chicago or Cleveland.

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Crude Oil Production Increased 29%

Increase from Wells 196,905 Barrels Per Day Over Output During 1916—Daily Capacity Now 1,085,455 Barrels

WASHINGTON, D. C., Jan. 23.—From official figures given out by the Bureau of Mines, the supply of crude oil for the calendar year of 1917 increased 29 per cent over that of 1916. This meant a daily increase of crude from the wells of 196,905 barrels. The daily averages for the 2 years are:

	Bbls.
1916 Daily average.....	674,849
1917 " " (first 6 mos.).....	796,106
1917 " " (last 3 mos.).....	871,774

These are reassuring figures in spite of the fact that there has been a scarcity of certain tiling or tubing for new wells, and in some places a shortage of labor for the sinking of wells.

While the production of crude has shown a great increase, there has been a growing on the storage supply of manufactured gasoline, and between June 30 and Sept. 30, a 3-months' period, the stored stock of gasoline was drawn on to the extent of 77,217,782 gal. While the supply of gasoline was thus drawn upon the supply of kerosene on hand increased during this period to practically the same extent, the exact gain being 68,493,824 gal.

The report from the Bureau of Mines shows that on Sept. 30 there were 234 refineries in active operation with a combined daily capacity of 1,085,455 barrels.

In the period between June 30 and Sept. 30 the difference in the amount of stocks of crude oil on hand at the refineries was caused by 11,000,000 barrels of pipe-line stocks being reported as refinery stocks on June 30, but not so repo rted Sept. 30.

The tabulation herewith shows the stocks on hand at the different refineries on July 31, Aug. 31, and Sept. 30 and June 30.

The outputs of the different refineries for the first 6 months of 1917 show a daily average of gasoline of 6,763,-457 gal. The total output of gasoline during the period was 1,224,182,157 gal.

The daily average of kerosene during the same period was 4,333,764 gal. Total kerosene production for the first 6 months was 784,411,291.

STOCKS ON HAND AT THE REFINERIES

	1917			
	July 31	Aug. 31	Sept. 30	June 30
Crude Oil (bbl.)...	10,866,357	10,811,355	10,925,892	24,183,830
Oils purchased to be Rerun (bbl.)..	1,618,821	1,640,861	1,878,512	———
Gasoline (gal.)....	345,199,195	298,548,699	287,758,562	364,976,344
Kerosene (gal.)...	516,752,342	511,639,188	508,461,071	438,967,247
Gas & Fuel (gal.).	596,865,830	602,779,662	633,216,982	716,427,186
Lubricating (gal.).	117,461,820	115,392,209	109,528,770	———

PRODUCTION OF CRUDE AND DISTILLATES

	1917 First 6 Months		1916 12 Months	
	Total	Daily Average	Total	Daily Average
Crude Oil Run (bbl.—42 gal.)..	144,095,162	796,106	246,992,015	674,842
Gasoline (gal.)...	1,224,182,157	6,763,437	2,058,880,596	5,625,357
Kerosene (gal.)..	784,411,291	4,333,764	1,455,495,732	3,976,764
Gas & Fuel (gal.).	2,724,646,700	15,053,297	4,663,895,284	12,742,883
Lubricating (gal.)	350,358,041	1,935,680	624,541,195	1,706,397
Wax lb.).....	203,975,713	1,126,938	386,180,898	1,055,139
Coke (tons).....	229,723	1,269	405,319	1,107
Asphaltum (tons)	320,805	1,772	716,490	1,958
Miscellan's (gal.).	139,467,183	770,537	239,244,468	653,673
Losses (bbl.).....	5,211,839	28,795	10,008,517	27,346

OUTPUT OF REFINERIES IN THE UNITED STATES BY MONTHS

1917	January	February	March	April	May	June	July	August	September	Total
Crude Run (bbl.).....	23,157,349	21,570,486	24,460,800	24,410,623	25,707,420	24,788,484	26,064,350	27,269,383	26,867,024	224,295,919
Oils Purchased and Rerun (bbl.).....	———	———	———	———	———	———	2,435,533	2,376,580	2,632,988	7,445,101
Gasoline (gal.).....	189,169,526	172,704,579	203,677,089	213,131,665	225,655,440	219,843,859	238,309,073	249,365,562	250,348,628	1,962,205,420
Kerosene (gal.).....	120,735,586	113,369,304	141,123,626	140,594,030	132,850,318	135,738,427	157,259,832	145,678,500	138,769,343	1,226,118,966
Gas & F. (gal.).....	443,955,903	424,115,567	467,378,504	439,724,364	481,281,431	468,190,931	585,932,568	620,029,660	618,067,279	4,548,676,207
Lube (gal).....	57,954,874	51,831,577	60,848,934	59,546,525	62,247,738	57,928,393	62,307,742	62,347,947	58,686,398	533,700,128
Wax (lb.).....	34,084,178	31,439,730	35,105,016	35,267,563	34,318,668	33,760,558	36,548,059	38,832,839	37,440,127	316,796,738
Coke (ton).....	37,622	35,672	41,968	40,084	37,919	36,458	39,814	43,787	40,101	353,425
Asph. (ton).....	48,860	39,795	51,265	50,404	63,692	66,789	65,272	73,878	62,520	522,475
Misc. (gal.).....	21,089,919	20,013,294	21,217,958	24,647,645	25,874,828	26,623,539	90,637,733	91,115,337	79,127,814	400,348,067
Loss (bbl.).....	844,007	864,931	794,009	887,243	886,767	934,882	1,060,020	1,241,281	1,130,900	8,644,040

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Quartermaster To Buy 5000 Class A Trucks

Between Five and Seven Makers To Get New Kind of Assembly Contracts Early in February

WASHINGTON, D. C., Jan. 19—The Quartermaster Corps will be in the market for 5000 Class A War Trucks early in February and has arranged a new scheme for placing contracts. Probably between five and seven different manufacturers will be given the assembly jobs.

Under the plan of contract devised a list of at least four and not more than seven parts makers will be made for each of the following assemblies:

Engines	Wheels
Axles, front and rear	Radiator assembly
Transmissions and controls	Springs
Clutches	Gasoline tanks, fenders, hoods and other sheet metal work.
Electrical equipment	Lamps
Universal joints and propeller shafts	Tool equipment
Steering gears	Carburetor and other accessories
Frames	
Dash assembly	
Seat assembly	

Complete sets of drawings and parts lists will be sent to each of these parts makers and each will be provided with a schedule of quantities ranging from 1000 to 3500. The makers will submit bids by mail within 10 days after receipt of prints, to Col. Drake, Quartermaster Corps, Washington, D. C., and all bids are to be f.o.b. factories. Maximum prices are to be submitted by parts makers to truck assemblers when quotations are asked by assemblers.

Government May Buy Tools

Costs of tools, jigs and fixtures are also to be submitted and the Government will have the option of purchasing any sets of these tools and fixtures at the conclusion of the contract, subject to a suitable depreciation.

The Engineering department of the Military Truck Production Section of the Quartermaster Corps will furnish any necessary weights, etc., of parts specified in drawings.

Parts makers are being advised by letter that 5000 Class A trucks will be ordered for delivery in July, August and September and that these trucks will be purchased by the Government from the truck makers completely assembled and that all parts will be purchased and furnished complete by truck makers.

Inspection to Be Rigid

Van Dyke prints and lists of specifications are mailed with the letters to the parts makers, the Van Dykes being marked "for estimate only." The Quartermaster Corps reserves the right to make inspection of any units furnished in the trucks either at point of manufacture or as a completed unit.

Bids found acceptable from parts makers will, if the company is satisfactory as regards financial condition, capacity and organization, be so rated and the company will be placed on an approved list of companies to be submitted to the truck maker to aid him in preparing his total bid for completely assembled trucks. Bidders are informed that prices submitted to the Government will be maximum in comparison to prices later furnished to truck makers who secure assembly contracts. The Government does not guarantee the financial responsibility of any truck maker or truck assembler to whom goods are furnished by parts makers.

Distribute Cost of Tools

Complete sets of tools, jigs and fixtures are to be made up for this work and estimated prices to be submitted in connection with bids on material, and the Government is to have the option of the purchase of these with reasonable depreciation at the expiration of the contract. The cost of these dies is to be distributed pro rata on an estimated order for 2500 parts. If a parts maker's contract for parts falls short of 2500 the Government will pay for the pro rata difference; if the order is above 2500 the tool cost will be estimated on the quantity above that number.

Parts makers receiving Van Dykes and letter invitations to bid are requested to wire at once, if interested, to P. W. Tracy, Supervisor of Parts Plants of the Motor Transport Section, 1421 Eye Street, Washington, D. C., stating if bids are to be made.

Invite Makers to Bid

Truck makers and assemblers are to be notified by letter that contracts for 5000 Class A trucks will be let shortly and invited to submit bids according to blue prints, lists of specifications and bills of materials to be provided by the Government.

Completed trucks or separate units or parts of units are to be subject at all times to inspection and rejection by the inspection division of the Motor Transport Section.

A minimum of 750 trucks and a maximum of 2000 trucks will be alloted to any one maker. Truck makers are to purchase all units and deliver them completely assembled to be accepted after final inspection by the Quartermaster Corps. The lists of approved parts makers will be given all assemblers by the Government, but no guarantee of responsibility of these makers is made, these being subject entirely to the supervision and inspection of the truck assembler.

In cases where the truck maker is also the maker of certain units, upon application, survey of his plant will be made, and if found satisfactory he will be placed upon the list of parts makers for those units he is best suited to make.

Complete sets of tools, jigs and fixtures made for this work are to be estimated in price and submitted with assembly bids. The Government retains the option of purchasing these with reasonable allowance for depreciation at the expiration of the contract. The cost of the dies is to be distributed pro rata on an estimated order for 2000 trucks, and if the order falls short of this figure the Government will pay for the pro rata difference.

A list of units and selected parts makers is sent each assembler and it is expected that parts not mentioned in the list are to be secured by the truck assembler without suggestions from the Government as to sources of supply.

Should Telegraph Acceptance

Truck makers and truck assemblers are requested to telegraph acceptance of invitations immediately to Christian Girl, Chairman of the Motor Transport Section, 1421 Eye Street, Washington, D. C.

All bids are to be open and not sealed, to secure a selective service of trucks much like the selective service of men for the army.

As far as possible tools, jigs, etc., are to be limited to three sets on all major units and less on minor units and the Quartermaster Corps reserves the right to direct the number of sets of tools to be made at its expense.

The Government reserves the right to reject any source of supply or any bid.

It is estimated that probably only five or six truck makers will be awarded the full amount of assembly contracts to thus avoid the delay and confusion arising from wide distribution of numerous small contracts.

Conference of Truck Makers

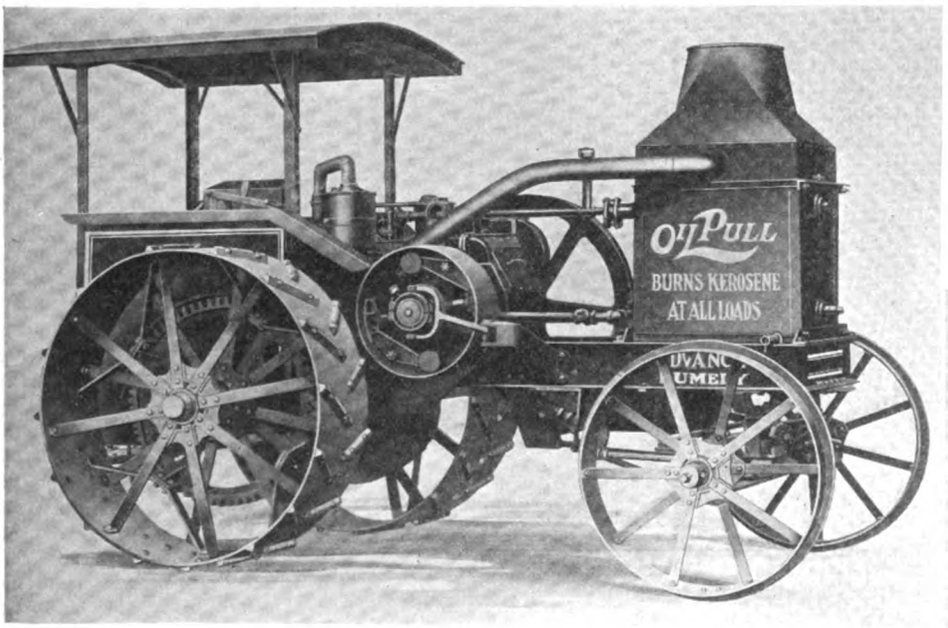
A meeting of the truck assemblers and truck makers who are interested in this business will not be called until after blue prints and specifications have been sent to the parts makers and detailed specifications are completed for the entire truck. Following this it is expected that truck makers and assemblers will be asked to submit bids for final decision within 15 days after the meeting.

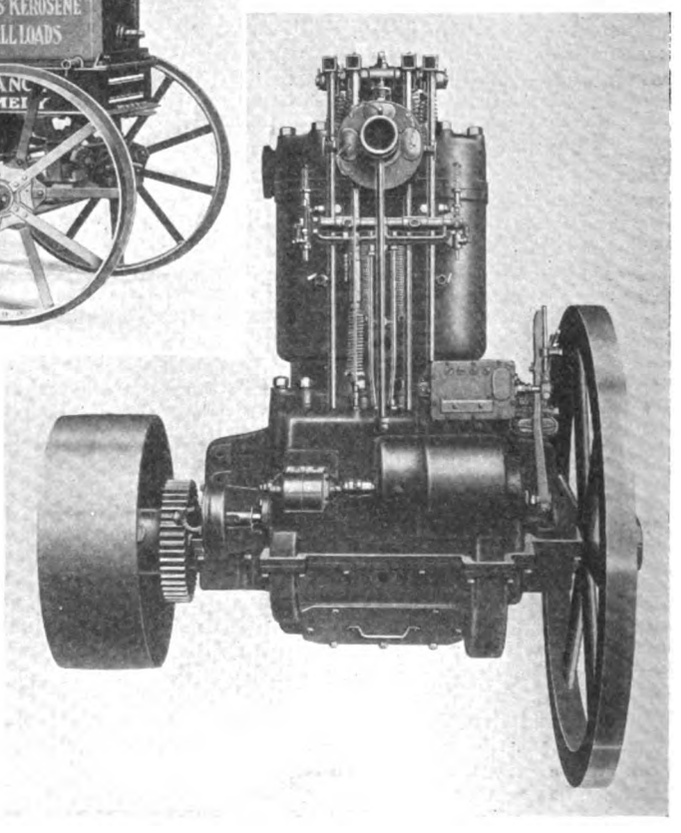
It may be possible that this meeting will be eliminated by sending the makers who display their interest the necessary information and data and then calling only for a final meeting to submit bids.

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Rumely Adds Smaller Tractor Model

Has a Rating of 14-28 H. P. and Burns Low Grade Fuel—Engine of the Low Speed, Two-Cylinder, Horizontal Type, Oil-Cooled and Governor-Controlled—All Spur Drive with Cushion Springs in Differential Drive Gear





On left: A general view of the Rumely 14-28 tractor. Below: Plan view of the horizontal two-cylinder engine

RUMELY tractors employing the Secor system of burning low-grade fuel, which are manufactured by the Advance-Rumely Thresher Co. of La Porte, Ind., have long occupied a leading position in the tractor field. Heretofore they have been built in large sizes only, but, recognizing the demand for a small tractor suitable for moderate sized farms, the company has recently added to its line a new model having a rating of 28 hp. on the belt and 14 hp. at the drawbar. This model, like every other one put out by the company, is guaranteed to successfully burn not only every grade of kerosene sold in the United States and Canada, but also fuel oils and distillate free from earthy matter. While the new tractor is spoken of as a small one, it is really a rather fair sized machine, for with all supplies on board, ready for work, it weighs no less than 8700 lb., and it is guaranteed to pull up to five 14-in. moldboard plows, to turn over 14 acres of ground in a 10-hour day, and to handle on the belt a 24-in. separator fully equipped.

The two cylinders of the engine are cast in a single piece, but the head is separate. With a bore of 7 in. and a piston stroke of 8½ in., the engine delivers its rated power at 530 r.p.m. For the purpose of securing balanced turning the two pistons are connected to a two-throw crankshaft with the two crank pins 180 deg. apart. To further improve the balance of the engine, balance weights are secured to the two short crank arms. Each piston is provided with four diagonally split rings above the piston pin and with an oil scraping ring at the lower end. It is not necessary to disconnect any piping in order to remove the cylinder heads. The valves are operated by means of push rods extending along the top of the cylinders and by means of tappet levers provided with means of lubrication.

The camshaft is driven directly from the crankshaft by a spur pinion and gear. A small gear driven from the camshaft gear operates the flyball type of governor and the low tension Bosch magneto. On the camshaft at the opposite end from where the driving gear is located there is another gear used for operating the circulating pump. All bearings on the crankshaft are 3¼ in. in diameter. They are provided with split bushings for easy adjustment. The crank pin bearings measure 3¼ x 3¼ in. and the main bearings

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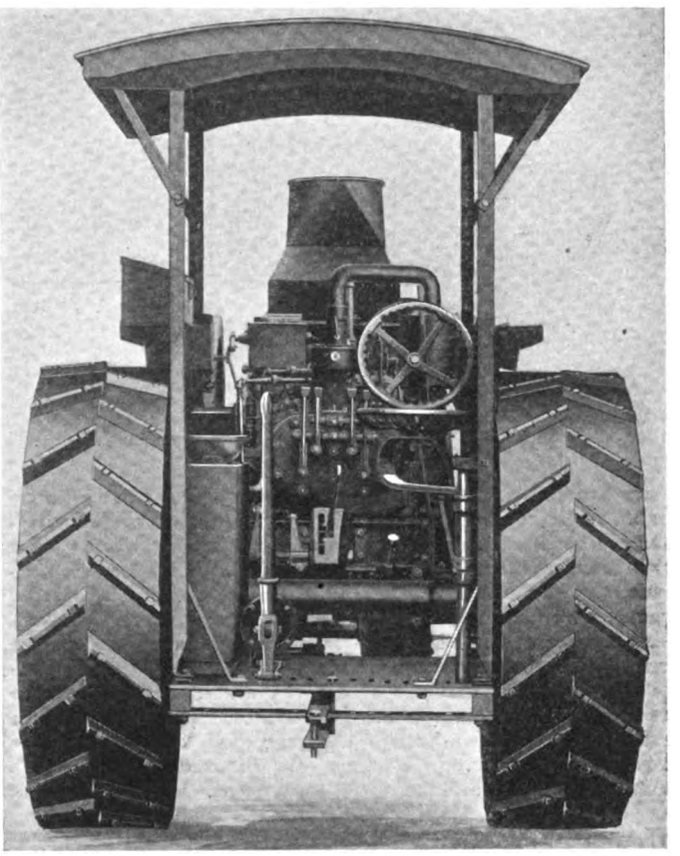
3¼ x 7 in. (flywheel end) and 3¼ x 8 in. (clutch end) respectively. The crankcase is of cast iron and is split in a vertical plane through the crankshaft axis. That portion of the crankcase to which the cylinder block is bolted supports the crankshaft bearings, the latter having caps secured by four bolts each. By removing a cover plate on the outer half of the crankcase any minor adjustment can be made. Only five gears are used for driving the camshaft and the various accessories, and all of these are fully inclosed and operate in oil. The camshaft driving pinion is located on the crankshaft inside the main bearing at the flywheel end.

As with other kerosene burning tractors, it is necessary to start on gasoline. The fuel tank has a capacity of 31 gal. of kerosene and 3½ gal. of gasoline for starting. The Secor-Higgins carbureter is used, and a sectional view of same is shown herewith. It will be seen to have two horizontal nozzles with a number of outlets each. One of these nozzles is for the kerosene and the other for the gasoline. One butterfly valve is located above the nozzles and permits of increasing the suction at will. The other butterfly valve, below the nozzles, serves for throttling the engine. With the Secor system water is injected into the cylinders to prevent pre-ignition when running under heavy loads.

Ignition is by low tension or make-and-break sparks. The spark plugs are manufactured by the Rumely company itself. The magneto which furnishes the current is of Bosch make. By referring to the cut of the engine in which the outer part of the crankcase is removed it will be seen that there are six cams on the shaft. The two inner ones of these actuate the spark mechanism. The trip rods can be easily adjusted for timing.

Engine Oil-Cooled

One of the features that undoubtedly adds to the success of the oil burning system is the use of oil cooling. Owing to the fact that mineral oil has a very much higher boiling point than water, it is possible to operate the engine cylinder at a much higher temperature with oil than with water cooling. The radiator is of the vertical type, of square cross-section, and is located at the forward end of the tractor. The capacity of the cooling system is 18 gal. No fan is required, and the power consumed in operating such a fan is therefore saved. With oil cooling the cylinder walls can be maintained at a temperature well above the boiling point of water. There are also other advantages connected with the use of oil for cooling. Oil will not freeze in the coldest winter weather, and as the oil never approaches its boiling point in the cooling system, it will not be lost by evaporation, and consequently needs not to be replenished frequently. Oil cooling is claimed to be particularly superior to water cooling when operating at low output, as in that case it is difficult to keep the cylinder wall temperature up.



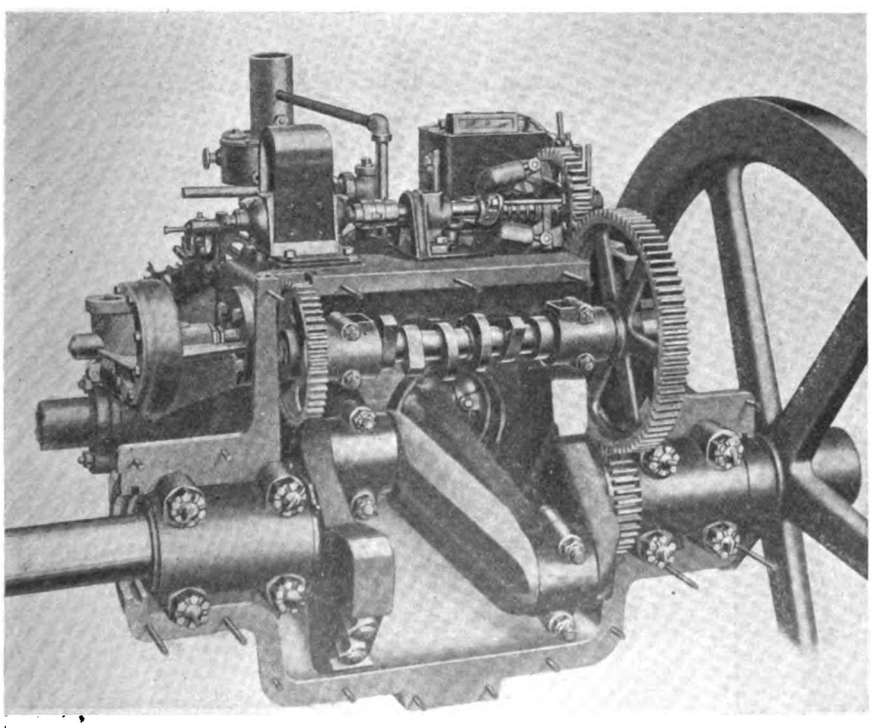
Rear view of tractor showing arrangement of controls

Lubrication of the engine is effected partly by a mechanical oiler and partly by splash. The oiler with its sight feeds may be plainly seen on top of the engine crankcase in one of the cuts.

An extension of the crankshaft carries the belt pulley, which is 23 in. in diameter and has a face width of 8½ in. At 530 r.p.m. this gives a belt speed of about 3200 ft. per minute. This pulley is ordinarily loose upon the shaft, but can be secured thereto by means of the friction clutch. The clutch is of the expanding sector or shoe type, comprising two shoes operated by means of a shipping lever. The expanding members are counterbalanced so that centrifugal force has no effect on them. As the clutch is located inside the belt pulley and near the outer edge of same, it is easy to adjust it. Only one adjusting device is provided.

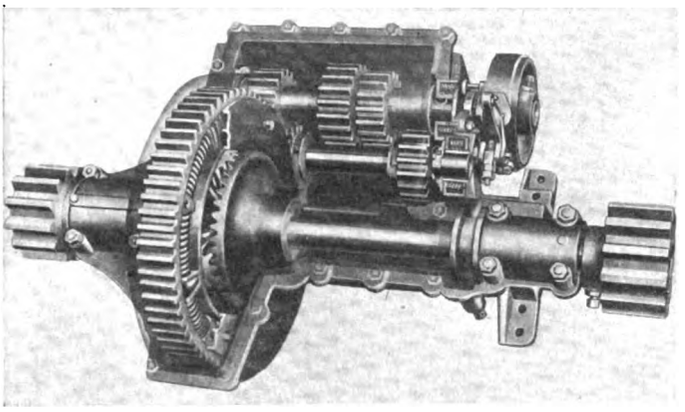
Transmission Two-Speed

The transmission is of the sliding pinion type and affords two forward speeds and one reverse. It is inclosed in a semi-steel casing made in two parts. Within this casing there are three parallel shafts, one receiving the power from the engine, the other one an intermediate shaft and the third the jackshaft or countershaft of the tractor, which carries at its end two bull pinions 4 in. wide each. The lower half of the transmission case is removable for purposes of inspection and adjustment. All



View of engine with outer half of crankcase removed

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The two-speed and reverse transmission

gears are of steel, have machine cut teeth and run in an oil bath. A brake drum is located on an extension of the intermediate shaft outside the gear housing. This brake is lined with friction fabric and is operated by a pedal located convenient to the driver. It is said to be capable of holding the tractor securely on either an up or a down grade of any ordinary steepness, and of stopping it within its own length. All bearings on the transmission shaft are of the Hyatt flexible roller type. The two speeds are 2.1 and 3 m.p.h., and the reverse speed is 2⅝ m.p.h. In order to make possible the removal of the lower half of the gear case, the bearings are provided with caps. These caps are grooved to receive felt packing in order to make an oil-tight joint.

All Frame Members Straight

The frame is made of 8-in. heavy section channel steel, the side members and cross members being hot riveted together with angle plates. Each frame member is a straight piece, thus insuring the maximum strength. The rear axle, which is of high carbon steel 3¼ in. in diameter, is mounted in Hyatt high duty roller bearings at both ends of a tubular supporting casting of the cannon type. By the use of this type of rear axle housing a generous lubricant capacity is provided. The driving wheels are 56 in. in diameter and have a width of 18 in. They are of the built-up type with T-head steel spokes. Detachable grouters are used, which permits of the tractor being used for hauling and road work without damage to paved streets.



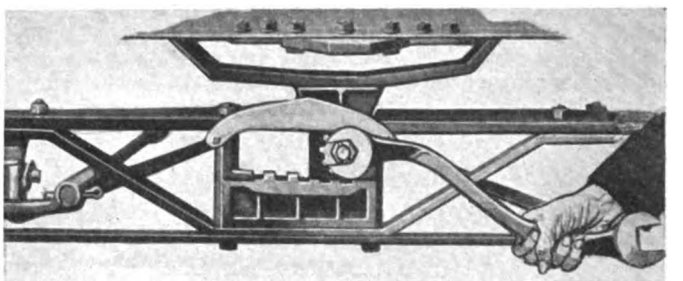
Rumely 14-28 tractor at work

The front wheels are 40 in. in diameter and have a width of 7 in. A built-up front axle is used, thoroughly braced. The steering gear is of the automobile type, the tractor being steered by means of a hand wheel, the shaft of which extends forward and carries a worm at its end. In order to permit the front wheels to accommodate themselves to sloping ground the front axle is pivoted at the center. To provide plenty of belt clearance, an arrangement is provided whereby the front axle can be moved laterally with respect to the frame whenever it is desired to use the tractor for belt work. This arrangement is clearly shown in one of the illustrations. On the pivot spindle of the frame there is a spur pinion which engages with a rack on the front axle. When it is desired to move the axle laterally, all that is necessary to do is to loosen a locking device on the axle and move the axle over by means of a wrench applied to a hexagon part on the pinion, which latter can be moved half a turn. This arrangement permits of the use of high front wheels properly placed, in connection with a belt pulley driven direct from the crankshaft.

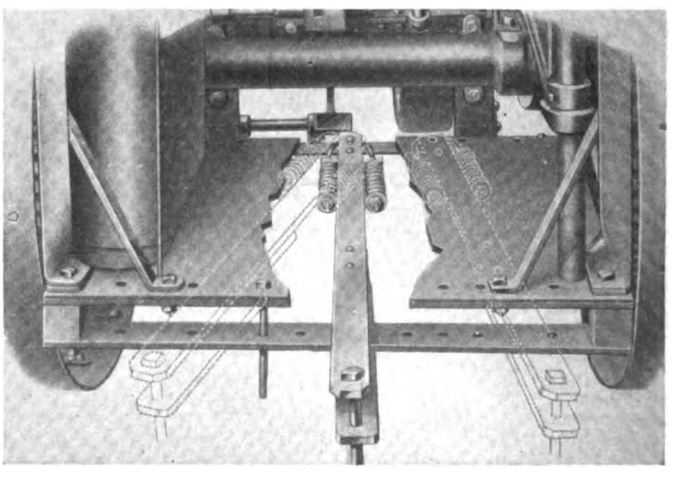
Operator's Platform Low

The operator's platform is placed quite low, only a step from the ground. A canopy over the driver's seat is regular equipment and is so constructed that the operator has a clear view in every direction. An arm rest is provided at a convenient height. All of the control devices are within easy reach, including the gear shifting lever, the clutch lever, the steering wheel, the brake pedal and the carbureter and ignition hand levers. The gearshift lever works on a slotted quadrant, the control being of the selective type. The fuel tanks, which are calculated for a day's supply, are so located as to be easily accessible for filling.

The drawbar construction is referred to as of the swinging, spring cushion type. It is located directly below the platform and so designed that the hitch can be made at from 14 in. to 19 in. above the ground, with a wide range of lateral adjustment.



Arrangement for moving front axle sideways



The spring-cushioned, laterally adjustable drawbar

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An Agricultural Power Unit*

Some Factors Governing the Design of a Small Tractor—Problems New to the Mechanical Engineer Involved—A Variety of Possible Types Considered

By Alan E. L. Chorlton

THE problem of providing mechanical power, to replace that of the horse, etc., in the most suitable and efficient form for the purposes of agriculture, is one of no inconsiderable difficulty, the guiding factors being such variables as the size of the farm, the class of land, the nature of crop, road transportation and the financial ones of first cost, annual charges, etc. The information relating thereto is so diverse, so variable and difficult to relate to actual fact (it seems more often a matter of opinion rather than fact) that the mechanical engineer investigating the problems on lines he is accustomed to finds himself at some loss where to begin, and is driven in the end, owing to this lack of precise information, to provide much of the essential data by actual experiment.

In this problem the difficulty of bringing together the agricultural expert and the mechanical engineer is a very real one. This difficulty is reflected in the tardy progress in this country of mechanical agricultural science, which, apart from the conservatism of the farmers themselves, has undoubtedly depended upon the cut-and-try methods so familiar in the past, and not upon scientific and technical research.

Though in the main the views held by farmers may be divided into two groups, those who favor a special power implement for each purpose and those who think a general purpose machine should be provided to deal with each and all, yet the problem should undoubtedly be considered, in the first instance, from the standpoint of capital expenditure and annual charges. The average farm in this country is comparatively small, and the farmer may find it financially impossible to purchse a special power-driven implement for each of his requirements, even should he be of opinion that such a policy is a desirable one. For example, if a light tractor were purchased for plowing alone, then a power unit would be needed for threshing, while on the road provision must be made for the mechanical power required for transport. A fourth power unit may even be required for other purposes, thus, a first cost of say £350 per unit might be increased approximately to £1,050, or even to £1,400, while the yearly writing off of capital, interest, etc., would be increased proportionately, each requirement now having to bear the full charge of its special machine. The effect on the working costs of the writing off of so large a capital expenditure incurred by unipurpose machines is very material; for example, the capital charges for a tractor costing £350 suitable for plowing alone, and allowing seven years' life and 100 acres per year, would be 10s. per acre, for 200 acres 5s. per acre, and even if an allowance is made for performance of light land work, subsequent to plowing, the cost would probably amount to 3s., equivalent to the cost of fuel (at 3 gal. per acre), and as great as, if not greater than, the wages of two operators.

The financial consideration of the problem brings out the advantages of a multi-purpose machine, a power unit—if it could be designed—to meet the majority of calls of the farmer, instead of a special power implement for each purpose. Such a desirable combination should never be lost sight of in any general investigation of the fundamental factors of design.

There will always be farms so large or special conditions of such a nature as to allow of the purchase of special machines for each purpose with a commercial advantage; such cases, however, must be considered individually, and are not dealt with here. There is no doubt, however, that despite the questionable soundness from a commercial point of view, of the use of many special purpose units for the average farm, there still remains a strong body of opinion that the use of such power implements is the right thing, and only the showing of the future, when the farmer has purchased on these lines, will clearly demonstrate whether due consideration had been paid to the financial aspect of the problem.

It is essential to bear in mind the incidence of the various duties called for from the tractor; will they so fall as not to

*Paper presented to the Institute of Automobile Engineers—slightly condensed.

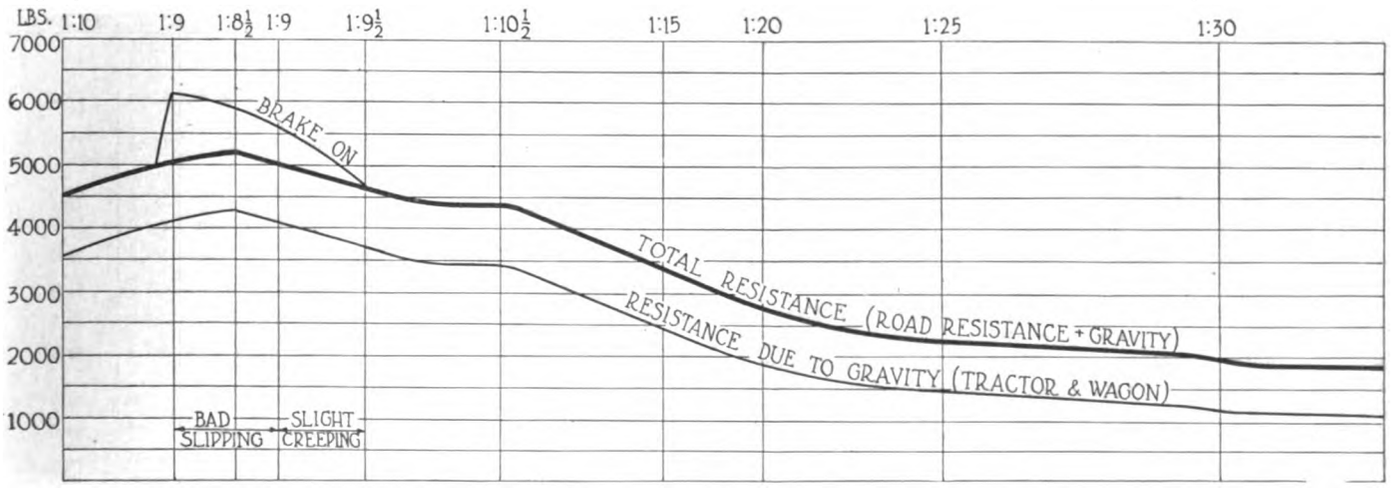


Fig. 1—Results of Road Resistance and Adhesion Tests (September 12, 1917)

Gross weight of tractor, 7.4 tons; gross weight of wagon, 8.7 tons; gross weight of complete train, 16.1 tons; weight on driving wheels (3 ft. 6 in. x 12 in.) 10,000 lb.; adhesion factor, without slip, 0.46. With slight creeping, 0.56, max., 0.62; road resistance per ton, av., 53 lb.; average speed, 1¾ m.p.h.; road surface, very good macadam, dry

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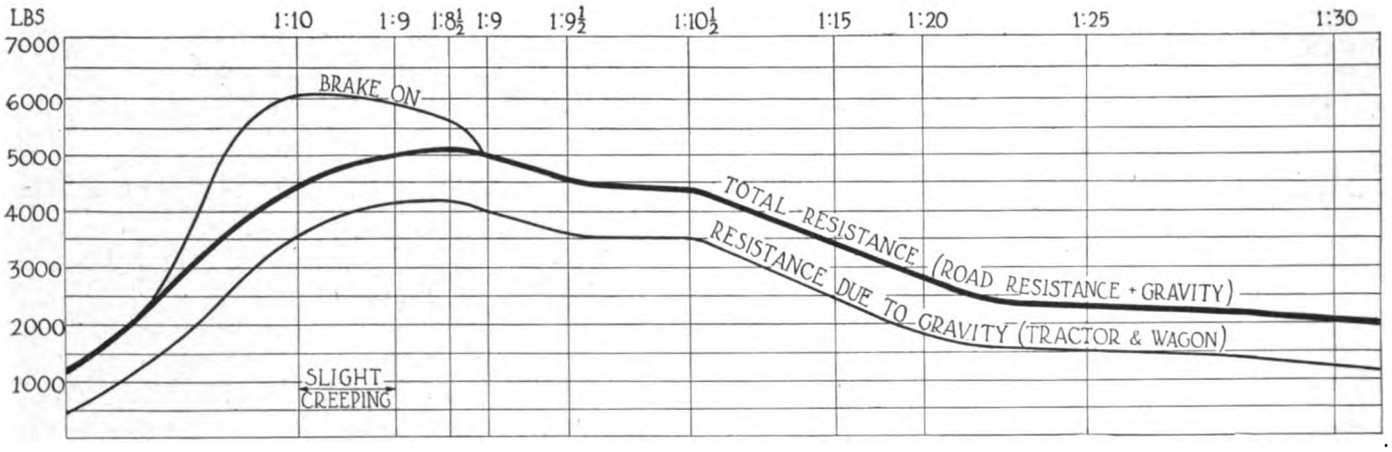


Fig. 2—Results of Road Resistance and Adhesion Tests (September 11, 1917)

Gross weight of tractor, 7.4 tons; gross weight of wagon, 8.7 tons; gross weight of complete train, 16.1 tons; weight on driving wheels (3 ft. 4 in. x 10 in.), 10,000 lb.; adhesion factor, without slip, 0.58; with slight creeping, 0.6; road resistance per ton, av., 53 lb.; average speed, 1½ m.p.h.; road surface, very good macadam, dry

conflict? That is to say, can the uses of such a power unit be reasonably well divided to cover the agricultural year with the help of horses which will be always available to a limited extent? It is held that they can, though each farmer must with his own conditions in front of him judge for himself. The requirements called for from a power unit during the agricultural year are:

(a) Plowing, dragging, rolling, drilling.
(b) Reaping, binding and leading.
(c) Threshing, pumping, pulping, chaff-cutting and grinding.
(d) Transport work to the station.

These duties are not likely to exceed 70 per cent of the total working days of the year.

It is not possible here to consider these operations in further detail, for we must confine our examination to the mechanical factors of the problem. The three principal uses which, by their requirements, govern the design of the tractor are:

(a) Road Work—Transport.
(b) Land Work—Plowing.
(c) Farmstead—Threshing, etc.

(a) governs the minimum axle loading, (b) governs the maximum axle loading, (c) governs the minimum power required.

Road Work

The basic factors governing the application of mechanical power for traction purposes are adhesion and resistance.

Tractive Adhesion.—The adhesion of the driving wheels on the road must be sufficient to utilize the power developed by the engine in overcoming the tractive resistance of the load and the tractor combined.

There exists a considerable amount of data relating to tractive resistance, but for tractive adhesion on common roads, little, if any, can be found. For traction on rails, the locomotive engineer has plenty of data obtained by the use of dynamometer cars, and from these have been developed recognized constants. The standard figure of adhesion is 0.25, *i.e.*, one quarter of the load on the driving axles can be used in drawbar-pull. It is stated that this figure rises to 0.35, but it is not advisable to use such a value in practice.

As no adhesion values were available for steel tires on common roads, experiments have been made to determine them. In these experiments a steam tractor was employed towing a loaded wagon by means of a recording dynamometer. In order to obtain maximum results the experiments were extended so as to traverse a steep hill, and even with this additional resistance it was still necessary to apply the brake to the wagon before the maximum value was exceeded, and slipping began.

It will be seen clearly that these experiments also afforded an opportunity of testing traction resistance constants, and this was done.

To make the results still more useful, the same tractor was fitted with rubber tired wheels and tested under similar conditions. The whole forms quite a useful combination of data for the designer of tractors for common roads, and the author is much indebted to Messrs. Ruston, Proctor & Co. for enabling the tests to be carried out. These results are shown in the Tables of experiments, Figs. 1 and 2.

From these it will be seen that the maximum value—*i.e.*, with slipping just beginning—is for steel tires 0.56, and for the rubber tires 0.6. It is suggested that in practice where country roads have to be taken into account, a safe value for steel tires would be 0.45, and for rubber tires 0.55, or if long life of tires is desired 0.5. This means, in effect, that in getting out the design of the tractor for road transport, which duty limits the minimum weight, the propulsive effort cannot be taken as exceeding 0.45 times the weight on the driving axle for steel tires. The high cost of rubber tires for road purposes with their special wheels seems hardly justifiable for the conditions obtaining on a farm.

Traction Resistance.—From the experiments, Figs. 1 and 2, the tractive resistance for a good macadam road comes out at just over 50 lb. per ton, the diameter of the hind wheels of the loaded wagon being 4 ft. by 9 in., that of the front 3 ft. 6 in. by 9 in., with steel tires. The values given in Table I are the results of experiments lately carried out over roads in California.

TABLE I—TYPICAL RESULTS FOR VARIOUS SURFACES

Test No.	Kind of Road	Condition of Road	Location	Traction Resistance	
				Total	Per Ton
29—30—31	Concrete (unsurfaced)	Smooth, excellent	Near Davis	83.0	27.6
*11—12	Concrete (unsurfaced)	Smooth, excellent	Near Davis	90.0	30.0
26—27—28	Concrete (⅜-in. surface asphaltic oil and screenings)	Smooth, excellent	Near Davis	147.6	49.2
13—14	Concrete (⅜-in. surface asphaltic oil and screenings)	Smooth, excellent	Near Davis	155.0	51.6
9—10	Macadam (water-bound)	Smooth, excellent	Near Davis	193.0	64.3
22—23	Topeka on concrete	Smooth, excellent	Near Davis	205.5	68.5
8	Gravel	Compact, good condition	Near Davis	225.0	75.0
†45—48	Oil macadam	Good, new	Near Sacramento	234.5	78.2
‡46—47	Oil macadam	Good, new	Near Sacramento	244.0	81.3
33	Gravel	Packed in good condition	Near Davis	247.0	82.3
18—19—20	Topeka on plank	Good condition, soft, wagon left marks	On Causeway near Davis	265.0	88.3
34	Earth road	Firm, 1½ in. fine loose dust	Near Davis	276.0	92.0
24—25	Topeka on plank	Good condition, but soft	Near Davis	278.0	92.6
1—2—3	Earth road	Dust ¾ to 2 in.	Near Davis	298.0	99.3
3—4	Earth	Mud, stiff, firm underneath	Near Davis	654.0	218.0
6—7	Gravel	Loose, not packed	Near Davis	789.0	263.0

*Graphic record indicates that the load was being accelerated when the test was started.
†Drawn with motor truck at 2½ miles per hour.
‡Drawn with motor truck at 5 miles per hour.

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For the purposes of this investigation a value of 60 lb. per ton has been taken.

Having now the values for adhesion and resistance, it is necessary to inquire as to the load a farmer will require for road transport. As it is desirable that the tractor should work on the land with practically the same efficiency as a special purpose machine, heavy axle loading is prohibited, and it becomes necessary to proportion the tractor weight to fulfil this condition, and yet permit of the requisite adhesion for hauling the load on the road.

When the tractor is hauling a wagon in ordinary service the load may be adjusted to any condition or gradient. Is there, however, any other governing condition in which this adjustment cannot be made? A load that is in one, so to speak—and here a full-sized 4 ft. 6 in. threshing machine may be taken as a guide—such a machine weighs 4¼ tons, as a safe maximum say 4½ tons.

The next consideration is the reasonable maximum gradient a tractor may be called upon to face. If a maximum gradient of 1 in 10, and a tractor weight of 50 cwt. is assumed, we have 224 + 60 = 284 lb. as the total resistance per ton. Then the total load of 4.5 tons plus 2½ tons equals 7 tons, or a total propulsive effort of 1988 lb., which gives us, with a 0.45 traction adhesion, a load of 4400 lb. on the driving-axle. Obviously with a tractor of a total weight of but 2½ tons (say 15 cwt. on the front axle and 35 cwt. on the back), this axle weight cannot well be provided. The increased loading on the axle due to the reaction of the drive, the values of which are shown in Fig. 3, provides however a means of meeting this difficulty. The alternative method is to adopt artificial loading on the axle. Resolving the drawbar-pull into engine power at 2 m.p.h., at 70 per cent gearing efficiency we got a brake horsepower of the engine of 15.2, and at 80 per cent efficiency the power would be 13.2 approximately.

For still heavier loads or steeper gradients a larger power is required, and it is desirable therefore that this be provided if not incompatible with the other factors.

Work on the Land

The governing factors of successful working on the land are not easily determined, and apart from the difficulty of carrying out experiments there are such intangible things as the varying opinion as to allowable pressure on the soil to be taken into account.

It may be said generally, however, that weight is a very important consideration, and must not exceed a certain maximum, while additional tractive effort in excess of that consistent with this weight must be obtained by other means, projections on the wheels, spuds, etc.

The pressure which worked land will bear without injurious effect upon the crops, varies of course according to the nature of the soil. From the mechanical point of view the limit of pressure is set by the necessity to prevent sinking into the ground, an occurrence which is seldom solely due to excessive weight.

What usually happens is that owing to inadequate gripping power the driving wheels rotate and act as milling cutters, scraping out the soil from beneath.

The relative values of weight and spud area are very difficult to allocate so as to be able to make comparisons: for instance, a machine with a 30 cwt. axle loading and short spuds pulls partly by adhesion and partly by grip, and the latter is rendered more effective by the weight of the wheel holding the ground down during this action. On the other hand, a lighter tractor with 15 cwt. axle loading must pull very largely by grip alone, and the effectiveness of the grip is modified and reduced by the lighter weight behind it, and the greater rolling resistance per ton set up by the spuds.

Hence it will be seen that the data to be ascertained are the proper relation of pressure on the land, the pressure against it, and the action of the rim projection, strake, spud or grouser.

We have thus three prime conditions to be met for the majority of cases—

(a) Driving axle loading,
(b) Pressure against grips or spuds,
(c) Effect of rolling resistance.

Considering first pressures that have been usual on land work, we have:

Man's Shoes	8½	lb. per sq. inch
Horse's Hoofs	20	" " "
Cart Tires—		
Load 2 tons	40	" " "
Oil Tractor in use—		
3 tons on axle	25	" " "
with extension	16	" " "
Steam Tractor—		
3½ tons on axle	17	" " "

Assuming from our previous figure a static axle loading of 3920 lb., then with the driving wheels of the tractor 48 in. diameter by 12 in. wide, we get with a contact area of 288 sq. in. (sinkage of wheel ¾) a pressure per square inch of 13.6 lb.

The second part of the problem is more difficult, owing to the absence of data, but concluding that the strength of the ground is represented by its resistance to ploughing, Fig. 4 is useful.

Considering first pulling by grip alone (light tractors in Fig. 5) the suggested allowable pressures against a spud are given, and for average land 50 to 75 lb. per square inch may be taken as corresponding to approximately a plough resistance of 9 lb. per square inch. If it is assumed that the drawbar-pull is 2000 lb., and the loading 50 lb. per square inch, the pull if taken by one spud in each wheel would be 1000 lb., so that for a 12 in. wide wheel the spud would be 1.67 in. long for average land.

For light lands when the strength of the soil is low, with the same drawbar-pull, this depth would have to be increased about four times, *i.e.*, the spud would be 6.7 in. based upon the relative resistance given in the above table. This cannot be considered as a proposition to be recommended, owing to the necessarily greatly increased rolling resistance of the tractor, and a special device becomes necessary, such as an

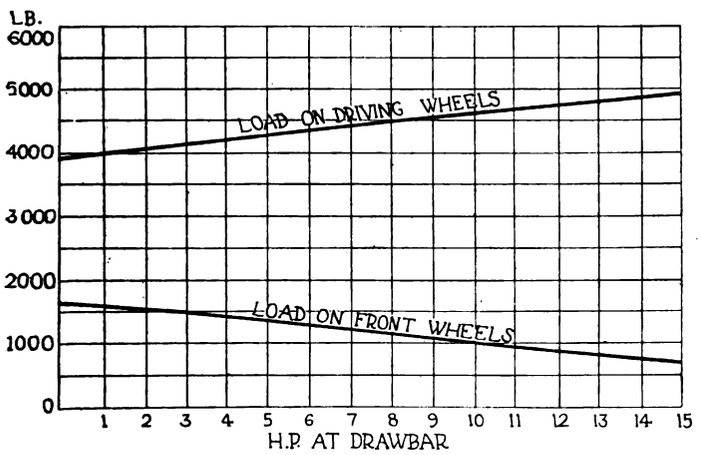


Fig. 3—Displacement of wheel loads due to turning moment and drawbar pull

Weight of tractor in working order, 2½ tons; wheelbase, 6 ft.; diameter of driving wheels, 4 ft.; height of drawbar from ground, 1 ft. 8 in.; power lost in rolling resistance taken as 20 per cent

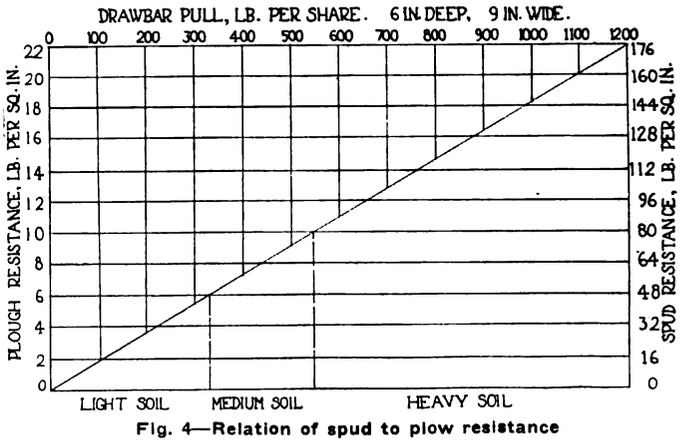
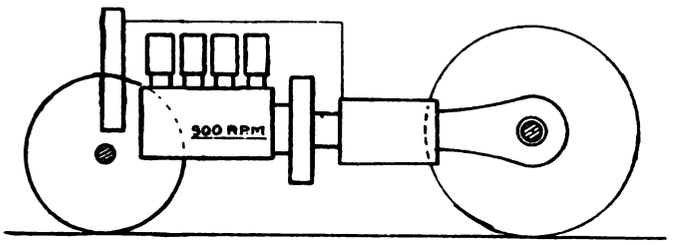
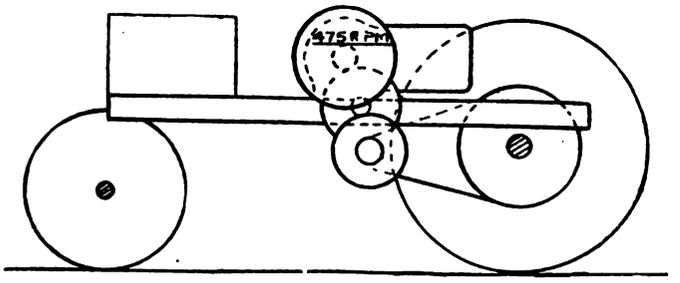


Fig. 4—Relation of spud to plow resistance

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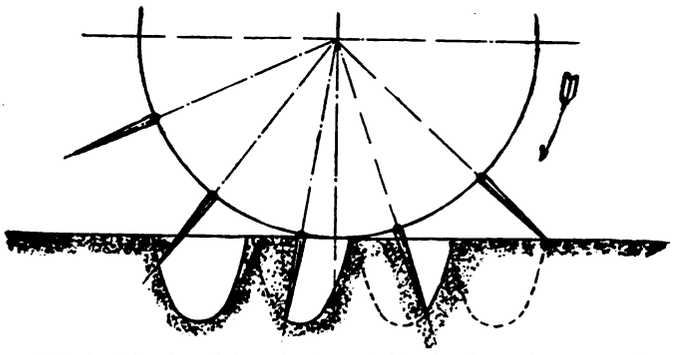


Reduction required for 2 m.p.h., 64:1 appr.

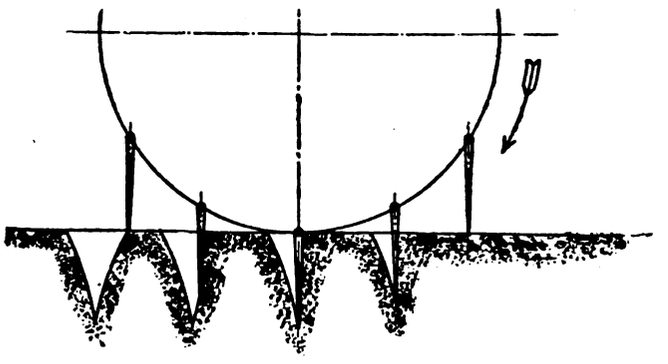


Reduction required for 2 m.p.h., 34:1 appr.

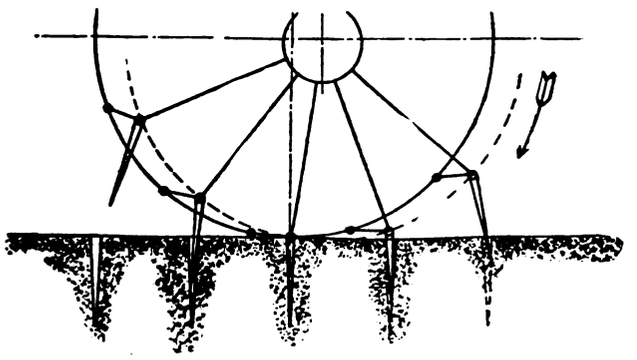
Fig. 5



Effect of fixed radial projections, indicating loss of power and increase of traction resistance



Actuated projections, parallel motion



Actuated projections, eccentric operation

Fig. 6

actuated spade, Fig. 6, fitted to the driving wheels, if efficiency is to be obtained. The mechanical complication and disadvantages of this method, even though they may be surmountable, are self-evident.

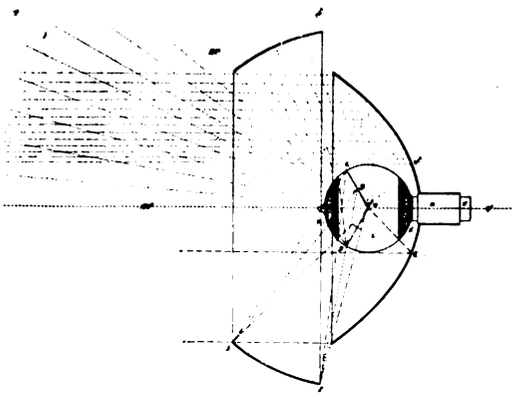
There is no doubt that many useful experiments can be carried out to determine the most efficient form of grip for varying conditions of soil and weight of tractor. On very soft land the wheeled tractor, either by reason of weight or spud pressure, is not suitable, and one of the track-laying type becomes essential. This, however, cannot be said to be at all necessary for the majority of English agricultural conditions.

(To be continued)

Some New Ideas Concerning Glare

THE subject of glare is still a mysterious one to many persons. The same as dirt has been defined as matter in the wrong place, so glare may be defined as light misdirected. When driving in an automobile at night we want plenty of light, but this light should fall on the road and not strike the eyes of pedestrians on the sidewalk or drivers of oncoming vehicles. Before the so-called glare can be eliminated it is necessary to locate the exact source of the rays that strike the driver and pedestrians.

Objectionable glare originates not only in powerful headlights, but also in the now so popular spotlights. Mr. Roffy of the Cellbeam Mfg. Co., Brooklyn, N. Y., who is probably one of the best authorities on this subject, having originated a number of headlamps and spotlamps now on the market, has a new theory regarding the cause of glare. He claims that it is entirely possible to produce a powerful projector



of compact dimension, and that the general glare emitted from bulb filaments can be reduced to a minimum by converting it into diffusive illumination.

This idea has been embodied in the Cellbeam projector recently placed on the market by the above mentioned firm. A spherical reflector corrected for aberation embraces the light source to a plane angle of 105 deg., and beyond the aperture of this main reflector there is an annulus of another reversed reflector whose focus is offset with respect to the focus of the main reflector. The result is that the light falling on this annulus is reflected onto the translucent frontal screen. The latter, receiving light from both front and rear, becomes a highly luminous surface, a surface of diffused illumination.

Italian Motor Car Industry

ITALY, in striking contrast to other European nations, has enormously increased her exports of motor lorries and cars during the last 3 years. This is shown by statistics issued by the Italian Ministry of Finance for the first five months of of 1917 (ended May 31), compared with the corresponding months of 1915 and 1916. During the first five months of 1915 Italy exported 2541 motor vehicles of all kinds. For the corresponding period of the present year the figures have been increased to 3647 automobiles.

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The FORUM

Use of Heavy Fuels

By Charles E. Duryea

YOUR most pertinent remarks on heavy fuels in the issue of Dec. 6 call attention to some defects of our present construction. Using thermostats and getting as nearly to hot engines and heated mixtures as we may is, of course, along the right line, but why do we not cut the Gordian knot by going to air cooling, which uses much hotter cylinders and gets much greater economy with less complexity? The hotter cylinders not only use more of the heat produced but they have far less need for mixture heaters, for any heavy fuel deposited on an air-cooled cylinder wall finds that wall hot enough to vaporize the fuel and allow it to be burned as it should be.

I would disagree with your opinion that the change from gasoline to crude or heavier fuels will be a gradual development. On the contrary, it will be a sudden jump, brought about by the abandonment of one method and the adoption of something so totally different that there is no common middle ground. We have to-day a number of stationary and boat engines operating on kerosene which use very high pressures and show great economy. They ignite by pressure and so never miss an ignition. Surely, they have a big future. Is any one adapting them to auto work? If not, can any of your readers tell us why not?

Why do we not use coal gas made from coal as needed? Coal yields about two-thirds as much power per pound as a liquid fuel, but in a small producer we should allow some waste, say 25 per cent, which would make a pound of coal half as efficient, but since it only costs one-tenth as much it should yield five times as much power for a given cost. Is any one developing along this line? I am looking for the capital that is willing to help.

That "the thermal efficiency is such a miserable figure" is also too true. Higher compressions as mentioned above, constant compressions as in two-cycle, air cooling, leaner mixtures and similar remedies are all waiting to be further applied to the auto. When will we get them?

Hot Spot Must Be Studied

By R. J. Broege

Chief Engineer Buda Motor Co.

THE importance of the hot spot manifold cannot be emphasized too much and worked out to as near perfection as possible any too soon as to the location and amount of heat required. In fact, it is the writer's opinion that this will be very apparent this winter in the older type of engines, which have no arrangement for applying the heat to the carbureter or gas intake manifold to help vaporize the present-day fuel, which is getting heavier right along.

It is the writer's opinion that the temperatures of the gas mixtures at the moment of entering the cylinder are considerably lower than the general opinion among engineers and are governed by the amount of vacuum caused by the intaking of the gases.

The writer has not yet checked the exact temperature at the moment of the inlet, but past experience with the combination of the exhaust and intake manifold has led the writer to the belief stated above. We have made up a combination exhaust and intake manifold, the intake being entirely exhaust jacketed with the exhaust gases flowing directly around it and out through the manifold to the muffler. In the first place, this combination of gas intake and exhaust manifold led the writer to believe that this intake manifold would receive too much heat from the exhaust gases, but upon tests we find that there does not seem to be any appreciable difference between using 68 gasoline or straight kerosene. In fact, the horsepower showed in favor of the kerosene with either using additional hot air or without any additional hot air. The horsepower curves seemed to drop off 6 lb. on a 21-in. arm when using the hot air, whereas the maximum power obtained by the same engine is less than 10 per cent off the power obtained from a similar sized engine with a cold intake manifold or when entirely water jacketed.

The writer has had no chance to have a cold manifold made up so as to get the extreme conditions between the cold manifold and an exceptionally hot manifold with the entirely cold manifold or one entirely exhaust jacketed. As soon as we have these manifolds we contemplate conducting further experiments.

The Roadtractor

By George T. Strite

FOR years the farmer has been using his farm tractor when he has one for hauling large quantities of grain and other farm produce to the railroad station. For years he has been trying to use the same farm tractor to build new roads and keep up the roads. The farm tractor was designed and built for farm work on generally soft fields and farm lands. Some of the larger tractors have been fairly successful for building new roads and heavy grading.

There should be a machine designed and built especially for this work. I see no reason why such a machine should not be successful for both road building or at least keeping up good roads and also be with possibly some slight changes satisfactory for farm transportation work.

The farm tractor is designed to trail or carry all its load behind itself at a speed of 2 to 2 1/3 m.p.h. The present tractor is generally equipped with two speeds and sometimes three in which there is a low speed about 1½ to 2 m.p.h. and a high speed of 3 to 4 m.p.h. The two-speed tractor always has the plowing speed, generally plowing and high speed; and sometimes plowing speed and low speed. The plowing speed is used 85 per cent of the time. The low is used on hills and hard strips of plowing, generally gumbo streaks, which pull very hard.

The farm wagon seems to be the most practical vehicle for carrying most of the farm produce. The farm wagon will trail and carry heavy loads behind a tractor on plowing speed loaded, and on high when empty. On fairly good roads the farm wagon loaded will stand a speed of about 2¾ to 3¼ m.p.h. On rough roads 2 to 2 1/3 m.p.h. Empty they will stand a speed of 4 to 5 m.p.h. on good roads and 3 m.p.h. on bad roads. The road drag can run at 2¾ to 3¼ m.p.h., but this is generally too fast in my experience for the light road grader, which should travel at a speed of about 2 to 2 1/3 m.p.h.

It would seem the proper speeds for the roadtractor would be low about 2¼ m.p.h. If there is any direct speed it should be intermediate speed, as 60 to 70 per cent of the work will be done on this speed.

The farm tractor or truck will not be a satisfactory roadtractor for the following reasons:

First: The farm tractor is too slow and even if geared up is not built to stand road work or hard road travel.

Second: It is not sufficiently spring mounted or flexible enough for road work.

Third: The wheels on the farm tractor will not stand the constant vibration of road travel on road work. For farm work and pulling a heavy load on soft ground the wheels must be much larger and wider than necessary for road work or travel.

Fourth: The driver on the farm tractor is in the wrong place for road work.

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Fifth: For either farm transportation or road making the truck is too fast and not capable of sufficient trailing capacity.

Sixth: For either farm transportation or road making the farm tractor lacks durability for the work, as it was not designed or built for this work and it is not speeded right for this work.

The successful roadtractor can never be a practical farm tractor and the successful farm tractor will never be a practical roadtractor.

The roadtractor must be capable of trailing.

It must be capable of trailing from two to five loaded wagons with 50 to 80 bu. of grain each or 1½ to 2½ tons per wagon. Also it should be capable of a small load on the roadtractor at a much slower travel than the ordinary truck and faster than the regular farm tractor.

Roadtractor Three Speeds

It must have three speeds. It must be designed to run on intermediate gear 85 per cent of the time when pulling or trailing loaded wagons. The low gear must be used for rough and bad portions of the road and climbing hills, the high speed only for returning to the farm empty. I have known of many of the farm tractors, especially the single-speed tractors, to be simply wrecked by the driver being in a hurry to get home and run the motor at a terrific speed going home empty and cause more damage to his motor and tractor than the field work.

Pneumatic Tires Necessary

The roadtractor must have rubber or pneumatic tired wheels and at the same time be so made that lugs or grounders can be put on. It would seem to me that a spring suspension could be used between the hub and the rim of the wheels. The automobile or truck would be simply impossible without the rubber or pneumatic suspension between the ground and the hub of wheel.

On the roadtractor the gears must be entirely inclosed, *final drive included.* The breaks must be many times as effective as the breaks used on the farm tractor.

The wheels could be smaller than used on the farm tractor and not so wide and larger than used on trucks. The wide wheel is a bad feature on hard roads. The wider the wheel on a farm tractor, the quicker it will go to pieces, especially on graded roads. It must also be kept in mind that if the wheels are too small and too narrow and there are only two drive wheels, then there will be trouble on soft and sandy roads where grounders must be used to increase drawbar pull to trail heavy loads.

On the roadtractor the driver's seat should be in front, as the entire attention of the driver should be on the road ahead, which is not the case with the farm tractor, as the farm tractor operator must see and control the plows and other implements behind him.

The roadtractor should be so arranged so a service or belt pulley could be quickly put on. There are times when the farm tractor is busy in the field and belt work should be done at the same time, thus promoting efficiency.

The roadtractor should be equipped with electric starter and must be equipped with electric lights or some kind of lights.

The crawler or creeper type has great advantages over the wheel type on sandy or soft muddy roads, but again it has many disadvantages on good or even ordinary roads. In the first place, I doubt if a road speed of more than 3 or 3½ m.p.h. would be practical for this type of machine. The upkeep of the tracks and parts of tracks would be great as compared with the wheel type. A satisfactory spring suspension suitable for road work would be almost out of question.

The four-wheel-drive roadtractor would be very desirable if the cost and the price it would have to sell for would not be prohibitive. The wheels could then be much smaller and narrower and still have the traction to pull the desired load.

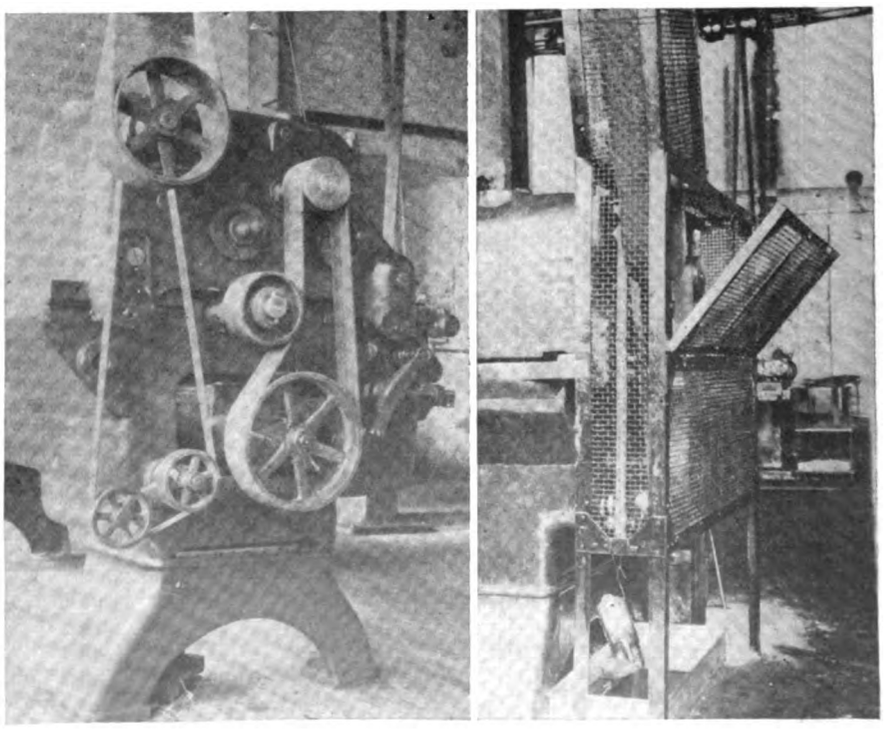
It has often occurred to me that the two rear wheels with axle and differential complete could be slipped out from under the ordinary 2½ to 3-ton truck and a set of tractor wheels with the axle and differential and proper reduction gears slipped in and coupled up to the regular standard drive shaft from transmission of the truck. This would make a three-speed outfit and this could be made to be a very satisfactory trailing outfit for road work and could also be used for pulling two plows or less in farm work in emergency.—GEORGE T. STRITE, *Tractor Engineer*, New York City.

Points in Design from a Driver-Engineer

By G. W. Bolus

THE motor base should be so designed as to permit the average driver renewing the oil in the crank base, or sump without making it necessary to drop the pan, crawl under the car and remove the drain plugs. A reasonably fool-proof valve could be arranged whereby the oil could be quickly drained from the crankcase by simply removing the motor hood. As we all know, crankcase dilution is becoming more and more of a factor in the operation of a motor car in cold weather, which makes it necessary to remove the oil more frequently, and unless the operation is made very simple, this point is very apt to be neglected or put off, to the detriment of the bearings of the motor.

I have noticed, from time to time, in the journals, comments on the slanting windshield and the hand accelerator. I submit that the slanting windshield is an advantage, not only in reducing wind resistance, but in that it entirely eliminates blinding of the driver from the headlights of a car in the rear being reflected against the windshield and into his eyes. On the hand versus foot throttle or accelerator, I think they are both necessary. We have decided use for the hand throttle when starting a car on a severe grade, as it is necessary to use one foot for the clutch and the other foot for the service brake, so here the hand throttle comes in very handy in bringing up the speed of the motor to a point where it will pick up the load.



Safety Engineering in Automotive Plants: An automatic lathe unguarded and properly guarded

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The 160-Hp. Benz Aircraft Engine

Design and Performance Data of One of Germany's Leading Aircraft Engines—Has Longer Stroke and Is Somewhat Lighter Than the Mercedes

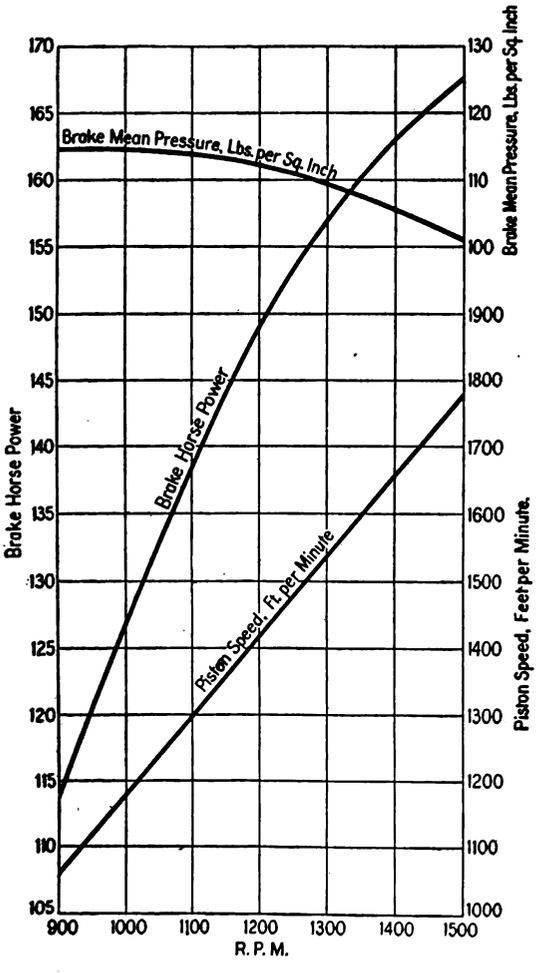
IN previous issues we have given detailed descriptions of the Mercedes 160 and 260 aircraft engines, and we are now in position to furnish rather complete data of the Benz 160-hp. engine. The data and drawings are reproduced from *The Automobile Engineer*, which published them with the permission of the British naval and military authorities.

Table I

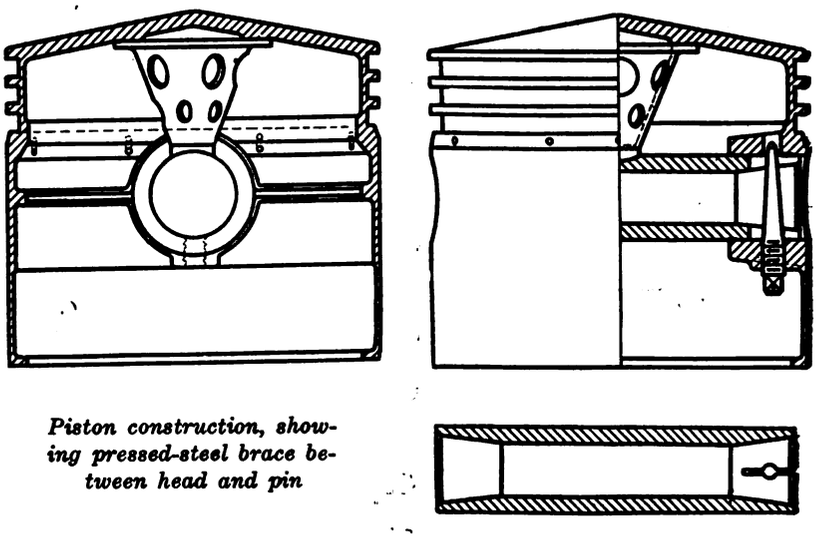
Number and arrangement of cylinders	Six, vertical
Bore, in.	5.12
Bore, min.	130.0
Stroke, in.	7.09
Stroke, min.	180.0
Stroke/bore ratio,	1.385 :1
Area of one piston, sq. in.	20.60
Total piston area of engine, sq. in.	123.60
Swept volume of one cylinder, cu. in.	146.05
Total swept volume of engine, cu. in.	876.30
Volume of clearance space, cu. in.	41.65
Compression ratio. Total volume/clearance volume.	4.50 :1
Normal b.h.p., b.h.p.	160
Normal speed, r.p.m.	1,400
Piston speed, ft. per min.	1,655
Brake mean pressure, lb. per sq. in.	103.00
Mechanical efficiency (calculated), per cent.	87.50
Indicated mean pressure (calculated), lb. per sq. in.	117.7
Fuel consumption per b.h.p. hour (s.g. 0.730), lb.	0.520
Brake thermal efficiency (18,600 B.t.u.'s/lb.), per cent.	26.32
Indicated thermal efficiency, per cent.	30.10
Air standard efficiency, per cent.	45.20
Relative efficiency, per cent.	66.60
Cu. in. of swept volume per b.h.p., cu. in.	5.48
Sq. in. of piston area per b.h.p., sq. in.	0.773
Hp. per cu. ft. of stroke volume, hp.	315.5
Hp. per sq. ft. of piston area, hp.	186.4
Direction of rotation of crank and propeller	Anticlock
Normal speed of propeller, r.p.m.	1,400
Oil consumption per hour (specific gravity, 0.900), lb.	4.93
Oil consumption per b.h.p. hour, lb	0.031
Number of carbureters	Two
Type of carbureters	Benz
Fuel consumption per hour (specific gravity, 0.730), lb.	83.2
Number and type of magnetos	Two ZH6 Bosch
Firing sequence of engine	1, 5, 3, 6, 2, 4
Ignition timing (degrees early, full advance)	32
Inlet valve opens	Top dead center
Inlet valve closes	60 deg. late
Exhaust valve opens	60 deg. early
Exhaust valve closes	18 deg. late

Table II—Calculated Friction Losses (Lb. per sq. in. of piston area)

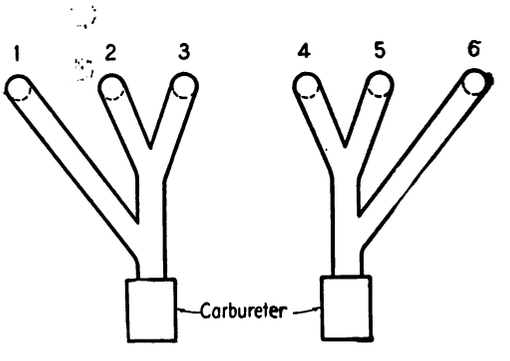
Bearings, valve gear and auxiliaries, lb. per sq. in.	2.00
Fluid pumping loss, lb. per sq. in.	4.50
Piston friction, lb. per sq. in.	8.20
Total losses, lb. per sq. in.	14.70
Brake mean pressure, lb. per sq. in.	103.00
Calculated indicated mean pressure, lb. per sq. in.	117.70
Calculated mechanical efficiency, per cent.	87.50



Left — Horsepower and b.m.e.p. curves. Right—Arrangement of inlet manifolds



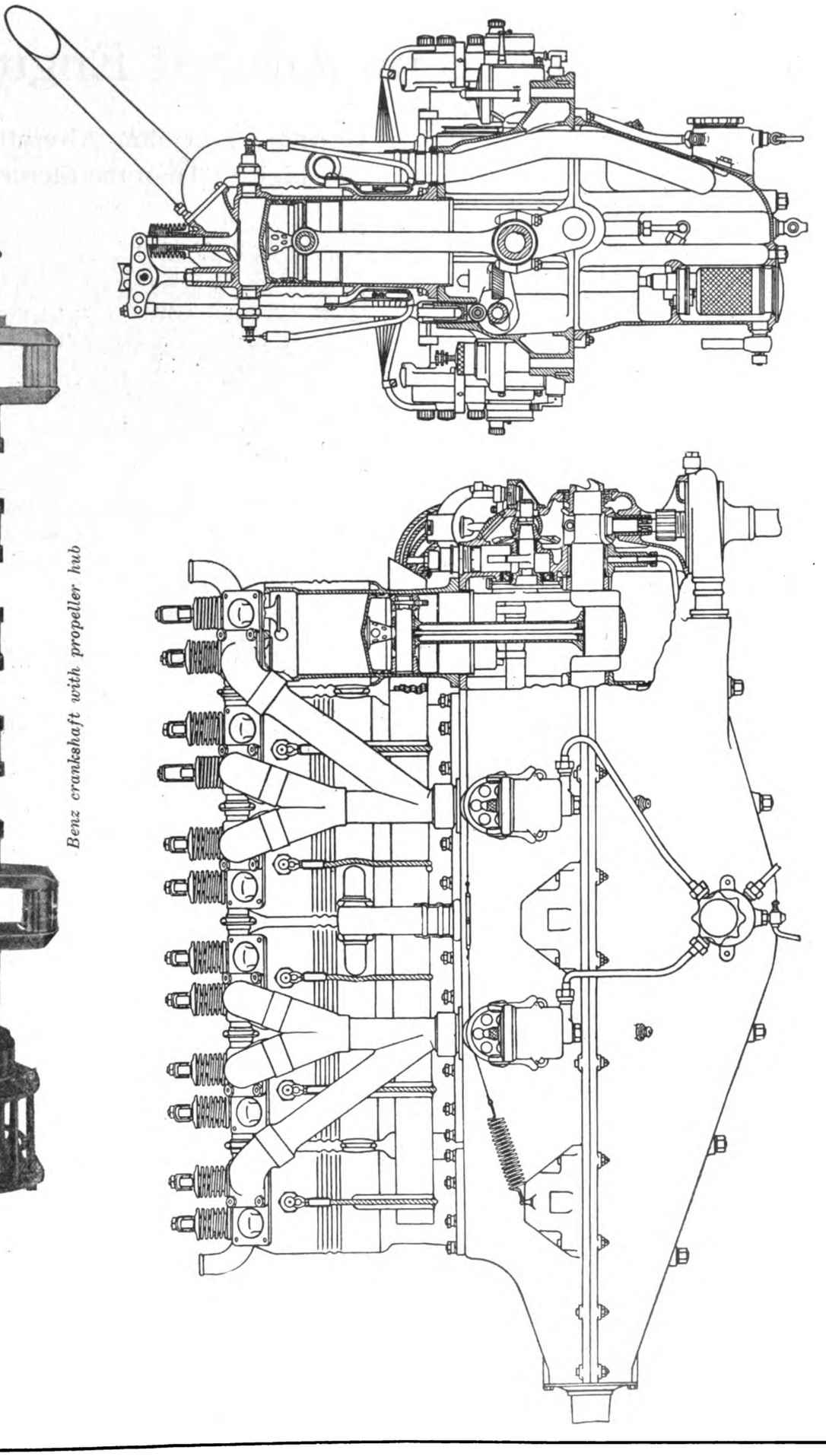
Piston construction, showing pressed-steel brace between head and pin



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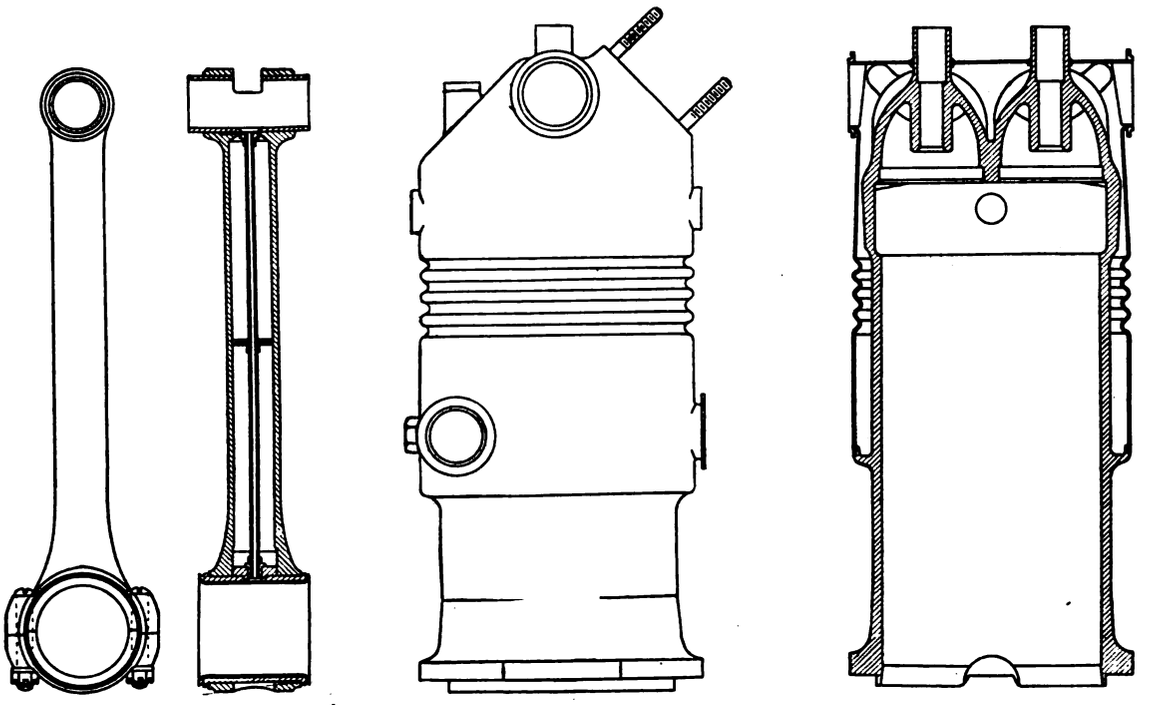


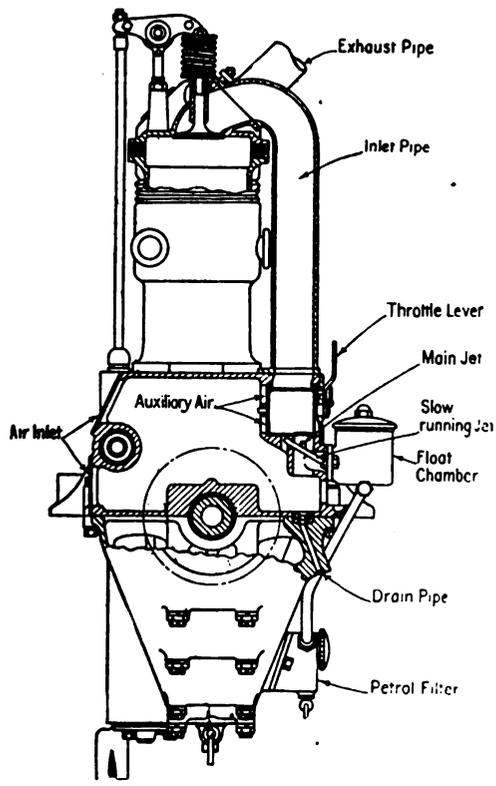
Benz crankshaft with propeller hub



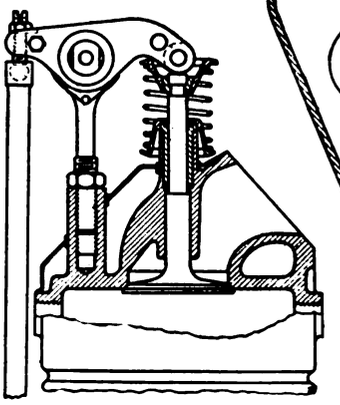
Longitudinal elevation, partly in section, and cross-section of the Benz engine

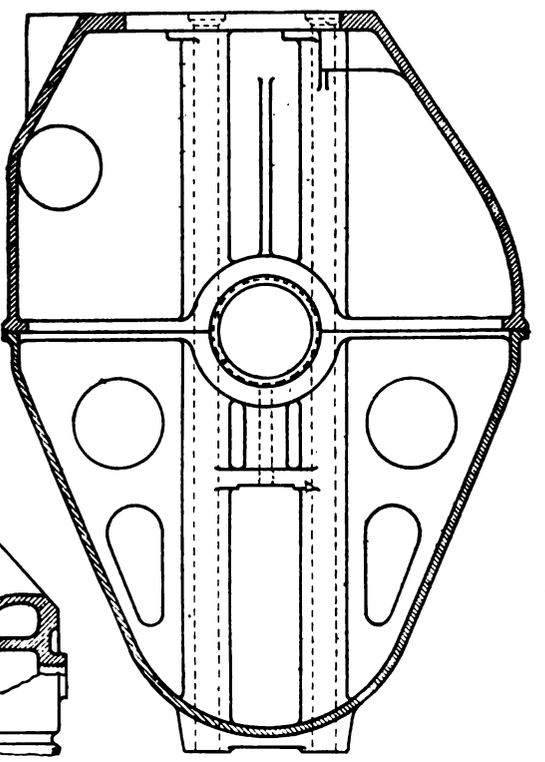
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Above—Tubular connecting-rod with central oil lead for piston pin; also cylinder unit. On left, induction system; on right, section through crankcase; below, valve mechanism





A characteristic feature of the Benz engine is the long through bolts by means of which the two halves of the crank chamber are held together. The length of these through bolts varies, those at the middle of the engine being longest and those at the ends shortest, owing to the slope of the crankcase bottom. The crankshaft is supported between the two halves. Apparently these through bolts also serve as cylinder holding down bolts, though this cannot be seen from the drawings. There are, of course, a good many additional holding down bolts

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Table III—Gas Velocities, Valve Areas

Gas velocity (feet per second)—	
Vertical induction pipe	192.0
Induction manifold (or branch pipes)	192.0
Inlet port	123.6
Inlet valve	172.8
Exhaust valve	172.8
Exhaust port	123.6
Exhaust branch pipe	192.0
Cross sectional area (sq. in.)—	
Vertical induction pipe	2.980
Induction manifold (or branch pipes)	2.980
Inlet port	4.600
Inlet valve (πdh.)	3.290
Exhaust valve (πdh.)	3.290
Exhaust port	4.600
Exhaust branch pipe	2.980
Diameter (in.)—	
Vertical induction pipe	1.950
Induction manifold (or branch pipes)	1.950
Inlet port	2.420
Exhaust port	2.420
Exhaust branch pipes	1.950

Table IV—Inertia Forces, Bearing Loads, Etc.

Weight of piston, complete with rings and gudgeon pin, lb.	5.00
Weight per sq. in. piston area, lb.	0.2428
Weight of connecting rod complete, lb.	5.00
Total reciprocating weight per cylinder, lb.	6.80
Weight per sq. in. piston area, lb.	0.330
Length of connecting rod, in.	12.37
Ratio. Connecting rod/crank throw	3.50:1
Inertia. Lb. sq. in. piston area. Top center, lb. sq. in.	83.60
Inertia. Lb. sq. in. piston area. Bottom center, lb. sq. in.	46.40
Inertia. Lb. sq. in. piston area. Mean, lb. sq. in.	65.00
Weight of rotating mass of connecting rod, lb.	3.20
Total centrifugal pressure, lb.	633
Centrifugal pressure, lb. sq. in. piston area, lb. sq. in.	30.70
Total loading due to inertia and centrifugal pressures, lb. sq. in.	95.70
Mean average fluid pressure, including compression, lb. sq. in.	42.50
Mean average loading on crank pin bearing, total from all sources in terms of lb. sq. in. piston area, lb. sq. in.	116.50
Diameter of crank pin, in.	2.165
Rubbing velocity, ft. per sec.	13.22
Effective projected area of big-end bearing, sq. in.	4.860
Ratio. Piston area/projected area of big-end bearing	4.18:1
Mean average loading on big-end bearing, lb. sq. in.	487.00

Table V—Cylinder Dimensions

Overall height of bare cylinder from top of base chamber	16.260"
Depth of spigot at base of cylinder	0.2756"
Diameter of cylinder over water jacket	6.417"
Valve centres	2.756"
Thickness of flange at base of cylinder	0.512"
Number of holding-down studs per cylinder	Eight.
Diameter of holding-down studs	0.394"
Steel water jacket	No. 19 S.W.G. (0.040")
Mean thickness of combustion chamber wall	0.2756"
Bursting stress*	3715 lb. sq. in.
Mean thickness of cylinder barrel	0.1968"
Tensile stress*	2604 lb. sq. in.

*Assumed maximum pressure following several consecutive misfires; 400 lb. per sq. in.

Table VI—Valve Detail

Outside diameter	2.677 in.
Port diameter	2.420 in.
Width of seating	0.0787 in.
Radius under valve head	0.3937 in.
Lift of valve	0.433 in.
Diameter of valve stem	0.5512 in.
Length of valve guide	2.953 in.
Overall length of valve	4.921 in.
Number of springs per valve	One
Free length of spring	2.913 in.
Length of spring in position, no lift	1.968 in.
Mean diameter of coils	1.535 in. (parallel)
Gauge of wire	7-8
Diameter of wire	0.168 in.
Ratio. Length of spring/lift of valve	4.55:1
Weight of valve, complete with spring, cap, etc.	0.9926 lb.
Weight of spring, bare	0.2405 lb.

The inlet and exhaust valves are interchangeable.

Table VII—Connecting Rod and Piston

Length between centres	12.37 in.
Ratio. Connecting rod/crank throw	3.50:1
Little-end bearing. Type	Phosphor bronze bush fixed in rod
Little-end bearing. Diameter	1.180 in.
Little-end bearing. Length	2.910 in.
Little-end bearing. Projected area	3.435 sq. in.
Ratio. Piston area/projected area of little-end bearing	6.00:1
Big-end bearing. Type	White metal direct in rod
Big-end bearing. Diameter	2.165 in.
Big-end bearing. Length (actual)	2.640 in.
Big-end bearing. Length (effective)	2.244 in.
Big-end bearing. Projected area (effective)	4.860 sq. in.
Ratio. Piston area/projected area of big-end bearing	4.18:1
Number of big-end bolts	Four
Full diameter of bolts	0.3937 in.
Total cross sectional area bottom of threads	0.372 sq. in.
Maximum load due to inertia at 1400 r.p.m.	1720 lb.
Maximum load due to inertia at 1600 r.p.m.	2242 lb.
Load due to centrifugal force at 1400 r.p.m.	434.5 lb.
Load due to centrifugal force at 1600 r.p.m.	567.5 lb.
Total load on bolts at 1400 r.p.m.	2154.5 lb.
Total load on bolts at 1600 r.p.m.	2809.5 lb.
Stress per sq. in. at 1400 r.p.m.	5790 lb. sq. in.
Stress per sq. in. at 1600 r.p.m.	7540 lb. sq. in.

Table VIII—Crankshaft

Cylinder centres	6.690 in.
Cylinder centres (centre pair)	6.690 in.
Outside diameter of crank pin	2.165 in.
Inside diameter of crank pin	1.1024 in.
Length of crank pin	2.716 in.
Outside diameter of journals	†2.165 in.
Inside diameter of journals	1.1024 in.
Number of journal bearings	Seven
Length of journal bearings. Propeller end	2.756 in.
Length of journal bearings. Rear end	1.968 in.
Length of journal bearings. Centre	2.2047 in.
Length of journal bearings. Intermediate	2.2047 in.
Width of crank webs	2.598 in.
Thickness of crank webs	0.945 in.
Radius at ends of journals and crank pins	0.197 in.
Diameter of drilled oilways in shaft	0.1575 in.
Weight of complete shaft	72.70 lb.

†Except rear journal, which is 1.889 in. diameter.

Table IX—Miscellaneous Weights

	Lbs.
One cylinder complete less valves	26.00
Connecting rod complete	5.00
Piston complete with rings and pin	5.00
Valve complete with spring	0.992
Valve complete less spring	0.758
Valve rocker complete	0.436
Valve tappet complete less guide	0.211
Valve push rod complete	0.535
Weight of engine complete less cooling system, fuel, oil and tanks	591.50
Weight per normal, ground level b. hp.	3.70
Weight of engine complete including cooling system at 0.65 lb. ground level b. hp.	695.50
Weight per normal ground level b. hp.	4.35
Weight of engine complete including cooling system, fuel, oil and tanks for 4 hr. (fuel and oil allowance at rate of ground level b. hp. and tanks at rate of 10 per cent of fuel and oil)	1083.30
Weight per normal ground level b. hp.	6.77

Table X—General Analysis of Weights

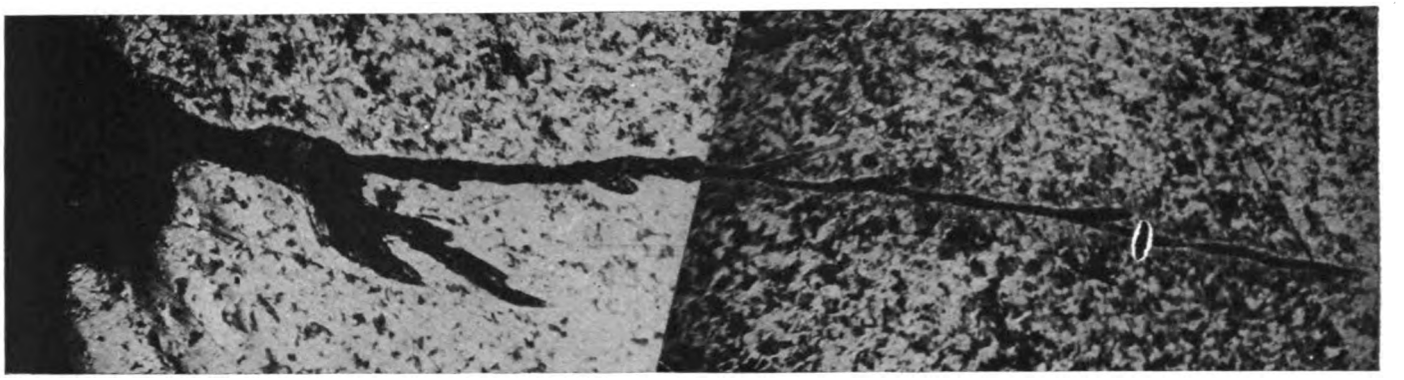
Description.	160 hp. Benz. Lb.	160 hp. Benz. Percentage of Total Weight	160 hp. Mercédés. Lb.	160 hp. Mercédés. Percentage of Total Weight.	Average. Percentage of Total Weight.
Cylinders	168.00	28.40	115.50	18.71	23.555
Base Chamber. Top half	100.00	16.92	118.59	19.21	18.065
Base Chamber. Bottom half	65.75	11.10	73.00	11.82	11.461
Crankshaft complete	72.70	12.28	70.00	11.33	11.806
Propeller hub, complete	12.00	2.06	13.00	2.10	2.080
Propeller thrust race, complete	3.81	0.64	2.56	0.42	0.530
Camshaft, complete	10.50	1.78	10.50	1.63	1.706
Pistons complete, including gudgeon pin	30.00	5.07	41.10	6.66	5.866
Connecting rods, complete	30.00	5.07	30.00	4.85	4.960
Valves, complete	11.91	2.01	13.68	2.21	2.110
Valve operating gear between cam and valve stem	14.20	2.40	5.94	0.96	1.680
Induction pipes, complete	8.125	1.37	11.75	1.90	1.635
Carbureters, complete	7.25	1.22	12.73	2.06	1.640
Magnetos, complete	29.00	4.91	30.00	4.86	4.886
Ignition wiring, complete with cable tubes	4.35	0.73	4.00	0.65	0.690
Water pump, complete	4.81	0.81	6.87	1.11	0.960
Water pipes	3.00	0.51	19.00	3.08	1.795
Oil pump, complete	4.55	0.77	12.00	1.94	1.355
Air pump, complete	1.125	0.19	1.50	0.24	0.215
Miscellaneous	10.42	1.76	26.28	4.26	3.005
Total	591.50	100.00	618.00	100.00	100.000

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Hurried Processes Developing Faults

Microphotographs, When Analyzed, Indicate Lack of Care in Inspection Department—Some Defects May Be Traced Back to the Billet—Others Originate in the Forge

By J. Edward Schipper

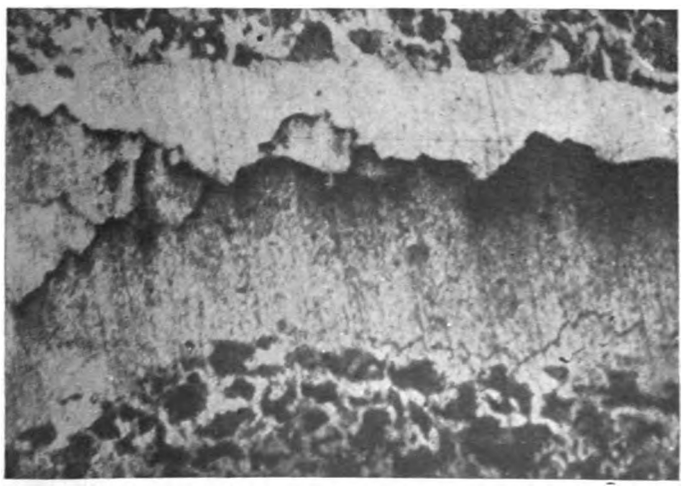


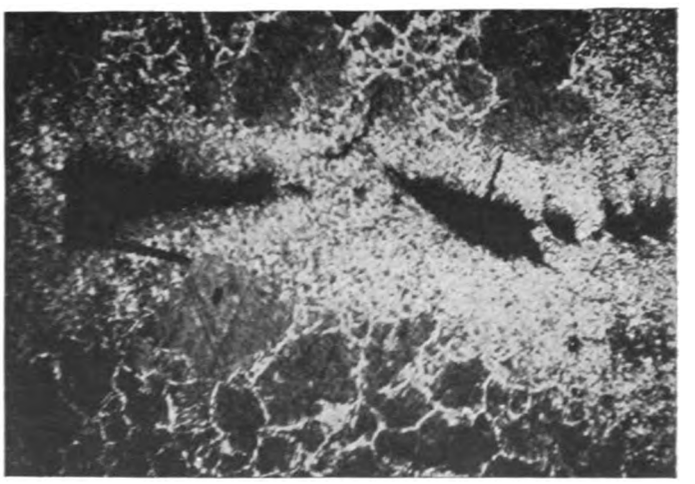
Figs. 1 and 2—Quenching crack which started from a surface crack. Probably due to shearing too closely. Nickel chrome steel, 0.40-0.50 carbon gear blank

MANUFACTURERS have lately noticed a tendency toward increased defectiveness in materials. Throughout the country there has been a general speeding up in the output of all kinds of products, and sometimes this has been accompanied by a decline in quality. This is a most serious matter where the material affected is used in the manufacture of vital parts.

Defects have been found in open-hearth high and low carbon steels, as well as in some of the highest grades of alloy steels. Some of these can be traced directly to the billet, while others, especially defects in gear blanks, originated in the forge. These defects, which were practically unknown when materials were not in such strong demand as they are now, are all evidences of haste, and sometimes the old proverb that "Haste makes waste" is borne out to a marked degree in that expensive parts and operations are wasted because of hurried handling during the early stages of manufacture.

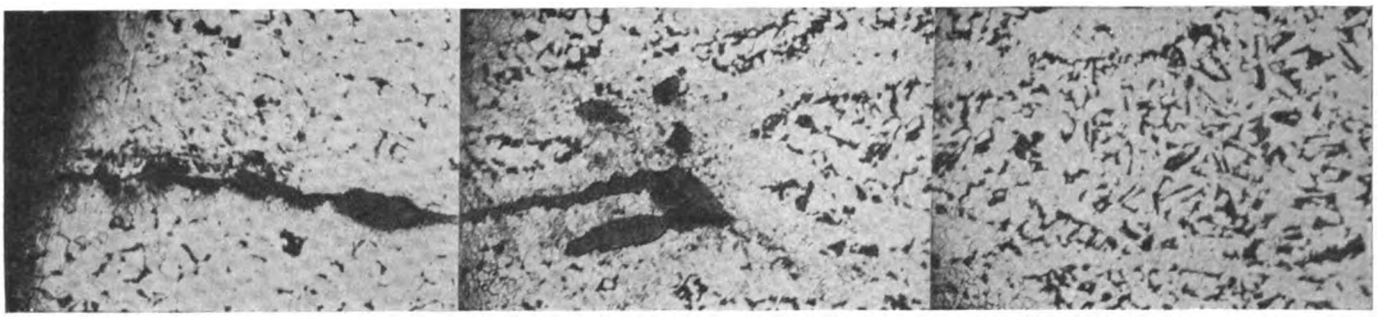
The above statements are not based on conjecture but are amply borne out by researches in the laboratory. The microphotographs shown herewith indicate defective material caused by faulty handling at different stages. Figs. 1 and 2 show a continuous crack in a gear blank of nickel chrome 0.40-0.50 carbon, heat-treated steel. We have here a case where a small crack in the surface was enlarged during heat-treating. This is what is known as a quenching crack, which started from a very small surface defect, probably caused from shearing too close under heat treatment. The line of weakness developed so that the continuous crack finally resulted. The original microphotograph is magnified 240 diameters, and the reproduction herewith reduces this to 100 diameters. The breaking area on the outside shows the edge of the blank with the crack extending inward, as indicated. Careful work in the inspection department would have caught the surface crack in the blank, and if this had been





LEFT—*Fig. 3—An example of poor material. Decarbonized area extending across center of micro due to bad mixing or insufficient cropping. This is a typical example of a pipe. Connecting-rod stock of 0.35-0.45 carbon.*
RIGHT—*Fig. 4—Crankshaft 0.37-0.47 carbon steel, showing an example of bad material*

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Figs. 5, 6 and 7—Seam in a 0.15-0.25 carbon steel gear blank which could have been avoided by proper inspection and chipping while in billet before rolling into bar form

chipped out the deep break illustrated would have been eliminated, or, rather, would never have been started. This is a defect of workmanship rather than of material.

A good illustration of faulty material is given in Fig. 3. The decarbonized area is clearly shown. This is a 0.35-0.45 carbon steel connecting-rod, and the trouble is probably due to insufficient cropping or to bad mixing in the first place. The cropping percentage has been reduced from 25 per cent to 15 per cent in some instances, and naturally this gives rise to an increased percentage of defective material. It is a much more difficult thing for the metallurgist to discover every defect than it is for the steel manufacturer to stop them. This shows what the parts and car companies have to contend with in order to secure good materials under present conditions.

Another example of bad material is given in Fig. 4, where a distinct pipe is shown. The material from which this was taken is 0.37-0.47 carbon steel crankshaft stock. The magnification is 240 diameters on the original micrograph. The line of weakness with the clearly defined pipe can readily be seen on the micro.

Figs. 5, 6 and 7 illustrate a seam in a low-carbon gear blank. The carbon content is 0.15-0.25 per cent, the three micros going together in the order named. The defect in the billet has been increased by rolling into bar form, and the result is the seam, which is clearly shown in the micro. The seam has been rolled back on itself, as shown in Fig. 6, where the break area of the seam is doubled over into U form.

This could be avoided by proper inspection of the billets. If the billets were properly inspected and chipped before rolling into bars, this would eliminate the possibility of a small crack in the billet being extended into a seam in the bar. Manufacturers are avoiding difficulties of this kind by carefully supervising the workmanship and materials which they are securing. Conditions have now arisen where greater care than ever must be used in this respect, not only that the best possible product may be obtained, but also to reduce losses resulting from having to scrap material which besides being expensive in itself may have had considerable machine work expended upon it.

Liberty Worm-Driven Truck Axles

Made in Four Sizes for Trucks Up to 5 Tons Capacity—Semi-Floating Type and Fitted with M. & S. Differential

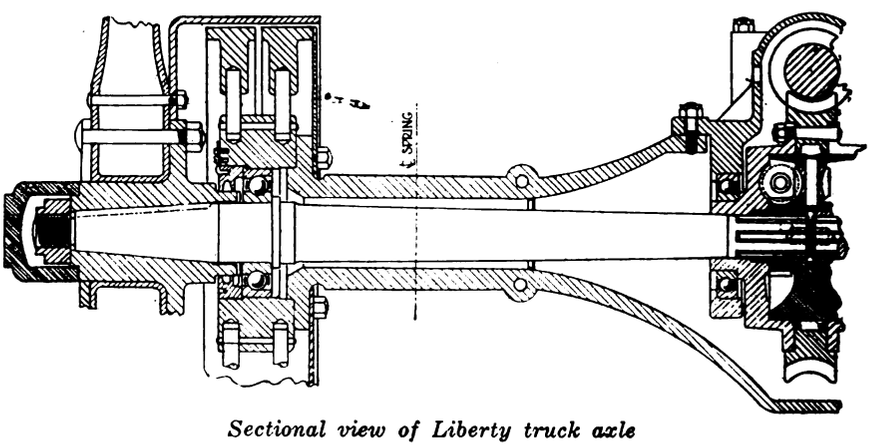
AN announcement has just been made regarding the product of the recently organized Wagner Axle Co., Anderson, Ind.—the Liberty axle. This axle is to be made in four sizes, adapted for use on trucks of 1½, 2, 3½ and 5 tons respectively. No radical features are embodied in the design, which is rather along conservative lines, incorporating only well-tried ideas. It is a worm gear axle of the semi-floating type, equipped with the M. & S. differential. The latter is of the type which makes it impossible for one drive wheel to spin, and a considerable saving in tires, as well as elimination of shaft breakage, is expected from this feature. The worm is of 3½ per cent nickel steel, the gear of special phosphor bronze and the differential case of cast steel. The differential gears rotate in an oil bath, insuring perfect lubrication.

An interesting feature is the worm carrier—a solid steel casting containing the worm gear and differential. This casting is provided with two ears so that, upon the removal of eight bolts, it can be taken out of the axle housing and any adjustment easily made.

Another feature which is thought to be a distinct advance in axle construction is the system of brakes. These brakes are of dual internal double expansion type and provide ample braking surface. They were designed for the Liberty axle.

The axle shafts are made of chrome-vanadium steel and heat-treated. They are of large proportions and built to withstand the most severe usage. The bearings are of the ball type, self-aligning and capable of sustaining end thrust.

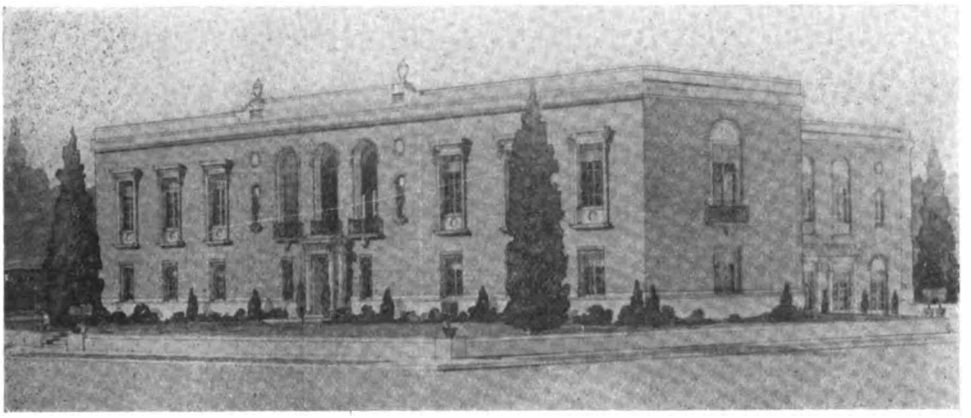
The Wagner Axle Co. was organized some time ago with a capital of $2,000,000 and has a plant at Anderson, Ind.



Sectional view of Liberty truck axle

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Dayton Engineers' Club to Dedicate Newly Built Home



New club house of the Engineers Club of Dayton

AS one of the great centers of industry of the country Dayton has its engineers club, a place where men connected with the manufacturing industries in a technical capacity may meet socially. It is a live organization, having at its head a number of men of national prominence, and the automotive industries are well represented in the membership. The president of the club, Col. E. A. Deeds, is chief of the Aircraft Production Board, and is devoting his entire time to the war program. Among the vice-presidents are C. F. Kettering, the new president of the S. A. E., and Orville Wright, co-inventor of the airplane.

The membership having grown to about 300, the club felt the need for a new home. Plans were drawn up for a modern clubhouse, and the structure has been completed and will be dedicated on Saturday afternoon and evening, Feb. 2, with fitting ceremonies. Following are some of features of the clubhouse, which is conveniently located at the southeast corner of Monument Avenue and Jefferson Street facing the river. In the design of the building classical lines have been followed. It is three stories high, facing 150 ft. on Monument Avenue and 125 ft. on Jefferson Street.

The exterior is built of Bedford, Ind., limestone, and soft-toned gray buff brick laid in Flemish pattern with wide white mortar joints. The design is a strong Georgian effect giving a dignity and refinement well adapted for an engineering building.

The main entrance fronts on Monument Avenue, although there is also an entrance on Jefferson Street as well as a porte cochere entrance on the east side. Passing through the main entrance one enters a simple vestibule, which opens into a very attractive first floor lobby.

Directly south of the lobby entrance is a broad English stair leading to the spacious second floor lobby, treated in Caen stone effects, with ornamented ceiling and frieze. To the right on entering are located the secretary's office and telephone booths, and beyond is a large billiard and game room, which is provided with a large stone fireplace, English ceiling and wainscoting and cork floor.

To the left of the lobby is a broad visiting gallery at the east end of which is the porte cochere entrance. Entrances from the gallery also open to the sunken garden to the south and the large ladies' reception room carried out in the Adam period. A ladies' retiring or dressing room adjoins the reception room, while check and toilet rooms are conveniently located.

South of the lobby and down fine marble steps is the dining-room foyer, with checking facilities, and entrance to the sunken garden to the east and Jefferson Street to the west.

Directly south of this foyer is the main dining-room, off which open eight private dining-rooms, all of which may be thrown together with the main room, making a large room for banquet purposes. South of the dining-room is a spotless white serving-room and kitchen, provided with the latest improved equipment for efficiently handling the service of the club.

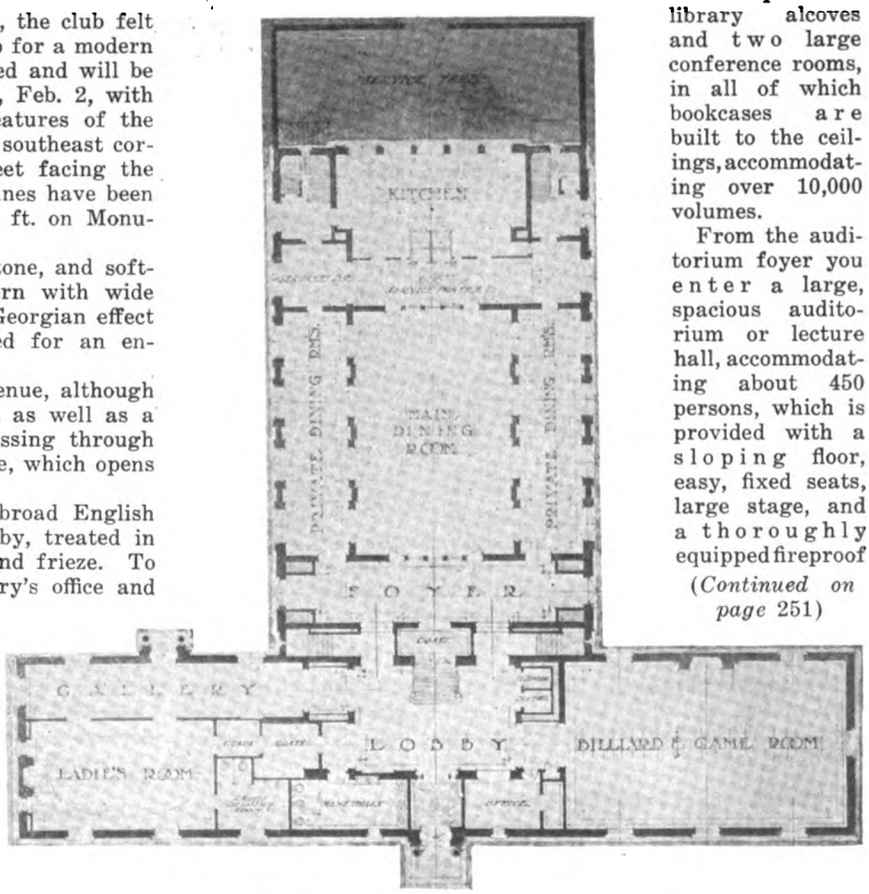
From the second floor lobby above referred to open a large loggia to the north, large lounging room to the west, library and conference rooms to the east, and an auditorium foyer to the south.

The lounging room, located directly over the billiard room, is 30 x 50 ft., with a large stone fireplace on the south side, high English wainscoting and heavy wood beamed ceiling, all kept in soft quiet coloring, making a restful atmosphere.

Just east of the lobby is located a large library and reading room, off which open two library alcoves and two large conference rooms, in all of which bookcases are built to the ceilings, accommodating over 10,000 volumes.

From the auditorium foyer you enter a large, spacious auditorium or lecture hall, accommodating about 450 persons, which is provided with a sloping floor, easy, fixed seats, large stage, and a thoroughly equipped fireproof

(*Continued on page* 251)



Floor plan of ground floor of the new club house of the Engineers' Club of Dayton

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Fuel for Automotive Apparatus*

Straight Refinery Gasoline, Cracking Process Products and Blended Fuels — Distillation Curves of the Different Fuels and Their Adaptability to Present Day Engines—Production Figures

By Dr. E. W. Dean
Petroleum Division, U. S. Bureau of Mines

THE present paper deals with certain mutual problems of the two industries of automotive engineering and petroleum refining. A brief preliminary discussion seems to be in order to explain why a chemist is elected to present information apparently not related to his normal field of work.

The Bureau of Mines has for several years been conducting scientific investigations in the field of petroleum technology. This work was begun through the establishment of a chemical laboratory for the testing of oils. It was, however, recognized at an early date that little of practical importance could be accomplished if activities were limited to such a narrow scope. When the present petroleum division of the Bureau was organized the chemical section of this division was made to include with its laboratory investigations studies in the fields of petroleum refining and utilization.

The Bureau was early impressed with the general failure of producers and users of petroleum products to work together in dealing with the many problems that are of mutual interest. It is now thought that no more important end can be accomplished than to interest refiners and automotive engineers in the advantages of co-operation.

The principal petroleum products in which automotive engineers are interested are gasoline and lubricating oil. At present the latter does not seem to demand as much attention as the former, and although there is little doubt as to the advantages to automotive engineers of a knowledge of the manufacture and properties of lubricants, it seems most desirable at present to concentrate efforts on the obtaining of a solution of the fuel problem.

Gasoline Problem of Chief Interest

During the past few years the demand for gasoline has increased far more rapidly than the supply of raw material from which it is produced. Consequently there has been a general change in refinery practice with the production of so-called heavy gasolines, which are actually of relatively low average volatility. Although this change in quality is not necessarily deterioration, it has brought to the attention of designers and users of internal combustion engines problems that did not exist in the past. Coincident with the change in quality there has been an increase in market price and a threatened condition of shortage in supply, so that the automotive engineering industry now has for solution the complex problem of devising equipment for the utilization of fuel of low volatility and at the same time getting a greater production of effective power from the quantity of gasoline used.

Properties and Production of Gasoline

Before beginning the most important part of this paper—that which discusses the possibilities of increasing the supply of fuel and the efficiency of its utilization—it is desirable to consider briefly the characteristic qualities of gasoline and the possibility of variation among these as influenced by refining methods. It is already understood by automotive engineers that the name gasoline is decidedly indefinite in its meaning and that it includes a heterogeneous class of petroleum products that have in common only the power of enabling automobilists to start and operate their engines. The following discussion is intended to show some of the characteristic differences among types and grades of gasoline and to explain and perhaps justify the changes in quality that have occurred recently.

Review of Refinery Methods

There are now three general methods by which gasoline is obtained from raw material. The oldest and still the most important is the ordinary refinery process of distillation from crude petroleum. A second method, also used in refineries, is the pressure-cracking process, in which, instead of crude petroleum, heavy distillates, such as gas oil or fuel oil, are used as raw material. The third method involves the extraction of gasoline from natural gas, either by the absorption or the compression process. The product thus obtained is commonly called casinghead gasoline.

An adequate discussion of the details of any one of these processes is beyond the scope of the present paper, and it is therefore necessary to pass this interesting field with a brief word of mention. It may be stated, however, that the straight distillation method is highly developed and that improvements in it offer only moderate possibility of increasing the supply of fuel. Some gasoline and naphtha still goes into the kerosene fractions, but wastes of this sort are not important in the present situation. The cracking process is as yet only partly developed, and in the future its use will undoubtedly be considerably increased. It is not to be expected, however, that there will be more than gradual development in this field even if the Standard Oil Company should decide to license the Burton process for general use at an early date.

Other cracking processes are being installed on a commercial scale, but as yet seem to be limited to the small unit stage. The extraction of gasoline from natural gas is likewise a method that is growing in use, and it is difficult to predict just what can be expected from it on the basis of data now at hand. The recently developed absorption process makes it profitable to extract gasoline from gas not sufficiently rich to be treated by the compression process, but resources in this direction probably cannot be expected to develop in more than gradual fashion.

Properties of Straight Refinery Gasoline

The most familiar type of fuel, that produced from crude oil by the distillation method, is commonly described as "straight refinery" gasoline. This type of gasoline, as ordinarily refined, is colorless and possesses an odor varying from actual sweetness to the slightly disagreeable quality characteristic of kerosene. The hydrocarbons of straight

*Paper read at the S. A. E. winter meeting.

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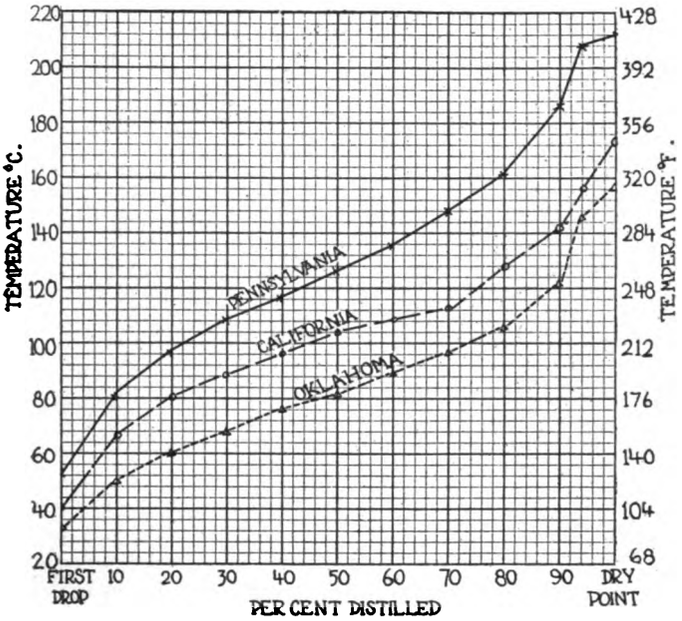


Fig. 1—Showing similarity in form of distillation curves of straight refinery gasolines of different degrees of volatility and from different parts of the country

refinery gasoline are of the so-called saturated class and are inactive when treated with such reagents as bromine, iodine and cold concentrated sulphuric acid. They are, however, slightly attacked by fuming sulphuric acid of moderate strength and by nitric-sulphuric acid mixture.

Straight refinery gasoline may vary within wide limits in the property of volatility, but the distillation curves obtained by plotting the results by the Engler test have a more or less characteristic form. Fig. 1 shows the distillation curves of three gasolines of various degrees of volatility obtained from different types of crude petroleum. The percentage marks are plotted as ordinates and temperatures as abscissas. The curves slope upward rather sharply from the initial boiling point to approximately the 20 per cent mark. From this point the graph proceeds as practically a straight line sloping gradually upward to about the 90 per cent mark. Here another steeper slope commences, which generally proceeds to about the 95 per cent mark, and then breaks sharply. This break is due to the fact that the dry point is not actually the 100 per cent mark.

Gasoline from Cracking Processes

The characteristic properties of cracked gasoline are odor and content of unsaturated or olefin hydrocarbons. Untreated cracked distillates have a particularly rank and unpleasant odor, which can, however, be practically eliminated by treatment with a small percentage of sulphuric acid. The odor of a well-refined cracked gasoline is not noticeably disagreeable, but has a definite quality and pungency that distinguishes it from gasoline of the straight refinery type. This odor is admitted to be somewhat undesirable, but is not a serious objection. The other characteristic property of cracked gasoline is a considerable content of unsaturated hydrocarbons, compounds that react with such chemicals as bromine, iodine or concentrated sulphuric acid.

The amount of material removable from the gasoline by treatment with an excess of cold concentrated sulphuric acid is generally called the percentage of unsaturation. The cracked gasolines usually marketed are acid refined and blended with straight run and casinghead products and generally do not contain over six per cent of hydrocarbons removable by sulphuric acid. The volatility curves of cracked gasolines are, like those of straight-run products, controlled by the method of refining, but the characteristic general form is the same as for the refinery distillates. Fig. 2 shows the distillation curve of an unblended cracked gasoline compared with that of a straight refinery product that happens to be of the same average volatility. The form of the two curves is almost identical.

Natural gas gasoline is of such a volatile nature that it is usually blended with a considerable proportion of heavier gasoline to reduce its vapor pressure so that it can be shipped and used safely. Its chemical and some of its physical properties are identical with those of the straight refinery type of product. It is colorless, of sweet odor, and inactive with sulphuric acid, bromine and iodine. The volatility of unblended casinghead gasoline is a property concerning which the Bureau has few data. This product is rarely used as such except perhaps in gasoline gas machines. It is usually marketed as a blend, either with a heavy naphtha produced by the ordinary refinery process or with straight refinery gasoline of high endpoint.

The term heavy naphtha is used to designate a distillate which does not contain the low boiling fractions included with ordinary gasoline. The blending of casinghead gasoline with the straight run product is generally done in refineries, many of which make a practice of buying all of the former they can obtain and adding it to the distillates produced from crude petroleum. The blending of casinghead gasoline with naphtha is generally done either by the companies that produce the former from natural gas or else by blending companies.

Desirable Properties of Gasoline

The desirable properties of gasoline and some laboratory tests and specifications for determining them have been discussed in a recent technical paper published by the Bureau of Mines. This paper was intended chiefly for the information of refineries and chemists but a brief review of some of the considerations mentioned may not be out of place here.

The requirements for a satisfactory fuel are as follows:

1—That it shall permit ready starting of a cold engine;

2—That it shall permit smooth and reliable operation of an engine at varied and rapidly changing loads and speeds;

3—That it shall not contain substances such as free acid which by corrosion or otherwise injure an engine;

4—That there shall be a minimum tendency for either solid or liquid residues to accumulate in the engine.

It is also desirable that gasoline shall not be of such nature as to be subject to excessive evaporation losses in storage or handling and that it shall not be too dangerous. These latter requirements are indefinite, however, and vary with climatic conditions. In addition they are likely to interfere with the starting qualities of gasoline if satisfied too thoroughly.

The second and third requirements are generally satisfied by present refinery practice. The Bureau has heard no complaints either of corrosive action due to free acid in gasoline or of lack of flexibility in engine operation. The first requirement, easy starting of cold engines, seems to be least generally met as the present tendency of refineries is to

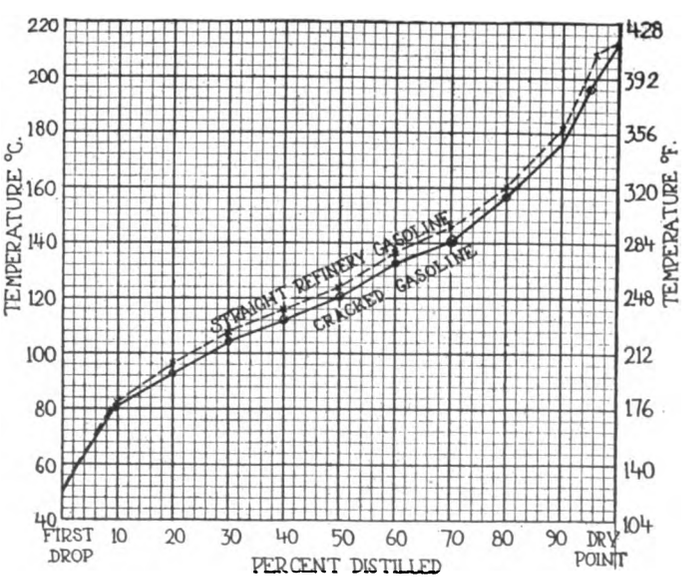


Fig. 2—Showing similarity in the distillation curves of cracked and straight refinery gasolines. Upper curve represents a straight refinery gasoline produced in Oklahoma—lower curve an unblended cracked gasoline produced by the Rittman process

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market gasoline of relatively low average volatility. There seems to be little possibility of improvement in this quality and the problem of easy starting will undoubtedly have to be solved by engine designers.

The requirement that gasoline shall not leave a solid or liquid residue in the engine is one that frequently is not satisfied, according to reports from many makers and users of engines. Complaints are heard to the effect that there are sometimes gummy deposits in carbureters and manifolds, that excessive carbon deposits collect in cylinders, and that heavy fractions of gasoline are unburned and forced past cylinder rings into the crankcase oil. Difficulties are without question frequently due to improper engine adjustment and operation, but the gasoline is undoubtedly to blame in some cases. The accumulation of gummy deposits in carbureters and manifolds is a type of trouble for which there does not at present seem to be any definitely established explanation. The Bureau is at present studying this problem but has not yet enough information at hand to make it desirable to attempt an adequate discussion. Fortunately this type of engine trouble does not seem to be of frequent occurrence.

The two most important types of residue are carbon, which collects in the explosion chamber, and heavy fractions of the gasoline that condense and escape past the piston rings into the crankcase. Carbon deposition is frequently due to improper carbureter adjustment and can generally be minimized if a sufficiently lean mixture is used. Such deposition is, however, in common with crankcase oil pollution, often due to the use of gasoline containing too great a proportion of heavy ends, which in everyday language means kerosene. The term used by the refiner and oil chemist is "high endpoint" and means that when the gasoline is subjected to a distillation test the presence of high-boiling fractions is indicated. These fractions undoubtedly are not vaporized even in cases when no fuel troubles are experienced but are burned while in the form of a fine spray, in the same way that coal dust or grain dust burns explosively.

Fuel trouble due to high endpoint occurs when heavy constituents are present in excessive proportion; so that instead of holding up in spray form drops of considerable size precipitate. These settle on cylinder walls and piston heads and cause trouble in a variety of ways. Lubrication is interfered with, there is deposition of carbon through cracking and liquid residues may be forced past the piston rings and mixed with the lubricating oil. There may be other ways in which trouble is caused but those already mentioned are sufficient to indicate the disadvantage attendant upon the use of gasoline of too high endpoint in the average engine.

Unfortunately it is a difficult matter to set any kind of a definite limit that serves to indicate when the danger line in endpoint is passed. There are on record cases that seem to indicate that trouble has been caused by the use of gasoline of endpoint lower than 400 deg. Fahr. On the other hand a tremendous quantity of gasoline is being used, generally without more than imaginary fuel trouble which has an endpoint as high as 450 deg. In some cases 500 deg. endpoint gasolines are satisfactorily employed and the author is acquainted with one man who during the summer months regularly mixed with his gasoline a fourth of its volume of kerosene and obtained satisfactory results.

There is no question upon which it is easier to start an argument than on the proper endpoint of gasoline. The Bureau of Mines has up to date taken the stand that the only evidence it could depend on is the general marketing practice of refiners and on this basis it appears that the maximum satisfactory endpoint for a properly balanced gasoline is between the limits of 400 deg. and 450 deg. Fahr.

Objections to Blended and Cracked Products

There is still a tendency on the part of some users to consider that the only desirable variety of gasoline is a highly volatile product obtained by the straight refinery method. Blended casinghead gasolines are claimed to be dangerous, to deposit carbon and to stratify or change their composition in different parts of a storage system. Cracked gasolines are believed to be of vile odor and to polymerize in carbureters and manifolds and to leave excessive carbon deposits in cylinders. Straight refinery gasolines of high endpoint are likewise condemned on the ground that they are bad in starting an engine and that they deposit carbon and pollute the crankcase oil.

These beliefs are not without some foundation of fact. There is little doubt that from the point of view of the average user the most satisfactory fuel ever produced was a straight refinery gasoline testing 70-deg Baume or higher. This type of product was relatively dangerous in handling and was subject to high evaporation losses; but these disadvantages were ones to which users of the past were educated and which were considered characteristic of gasoline. The fact that gasoline was treated with proper respect minimized in a large degree the first disadvantage and its relatively low cost minimized the second. Gasoline of this type worked satisfactorily under almost any sort of engine conditions and in any event was rarely blamed for trouble. In earlier days the custom when anything went wrong was to swear at the engine rather than at the fuel.

When the newer types of gasoline were first introduced the trouble and dissatisfaction that immediately arose was not without some just cause. In many cases the process of blending casinghead gasoline was not properly conducted and in any event 70-deg. Baume gasolines of this type could not help being dangerously volatile. Methods of refining cracked gasoline were not perfected when these distillates were first marketed and they certainly did not compare favorably with straight run products in the matter of odor. It is likewise possible that there may actually have been cases of polymerization with troublesome deposition of gummy resinous material. When heavy straight refinery gasolines were first used engines were not designed or adjusted for their consumption and difficulties naturally arose. At present the methods employed in production and refining have been so improved that the bulk of the gasoline now on the market is really of excellent quality.

Cracked and Natural Gas Gasolines

Both cracked and natural gas gasolines are put out in the form of blends that the average user cannot distinguish from straight refinery products and which have actual elements of superiority over the latter as now marketed. Heavy gasoline is, of course, deficient in the property of easy starting, but this objection is balanced by the fact that it actually contains more heat units per gallon and permits the development of more power. There are certain other admitted objections to relatively non-volatile gasolines, but these are chiefly of the sort that can be obviated by proper engine design and adjustment. The Bureau has yet to receive proof that a gasoline of 400 deg. Fahr. drypoint and a properly balanced range of volatility (which means that from 15 to 20 per cent of constituents distil below the boiling point of water and that the other fractions are reasonably evenly distributed) has failed to yield satisfactory results in a well adjusted automobile engine of up-to-date design. In many cases gasolines of as high endpoint as 450 deg. Fahr. are being used with satisfaction.

The main advantage of the present type of fuel is that its introduction has permitted the producers to keep pace with the demands made upon them. If the older standards of quality had been maintained prices would have soared far above their present high level and in addition there would have been to-day an actual shortage. Few users of automobiles would prefer limitation in their supply of fuel to the slight inconvenience of having to treat their engines with the care and respect these complicated mechanisms actually deserve.

It is a difficult matter to make accurate predictions for the future of a situation involving as many variables as does the automotive fuel market. The Bureau of Mines is able to obtain reliable information concerning gasoline production and quality but realizes its inability to foresee all factors governing market conditions. It is therefore necessary to be conservative in attempting to tell what is likely to happen in any limited region or at any given time.

The one definite prospect for the immediate future is that there will be a considerable withdrawal of fuel from the home market for use in military operations. The quantity needed

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can be conservatively estimated for the present calendar year at about a fifth of the total production of the country. There is a likelihood that the quality will also be changed in the direction of further decrease in volatility because gasoline for military purposes will necessarily be of higher test than the present average commercial grade. If the total production is to be kept up to the present market this will mean that domestic gasoline will be of lower volatility than now. In addition, refiners may be obliged to curtail their use of sulphuric acid, which will result in the marketing of gasoline of inferior color and odor.

The fuel situation is unfortunately one for which the ultimate successful termination of the war does not promise permanent relief. Estimates as to the number of years our resources of crude oil will last have been variously made and it is agreed that unless unexpected resources exist another generation will witness an actual shortage in the raw material from which gasoline is now produced. It is certain that the world cannot go on forever using up crude petroleum at the present rate of consumption and it is even now desirable to face this prospect squarely and make allowances for what the future is likely to bring. The possibilities of new supplies of fuel will therefore be discussed briefly, with the idea of showing the relative importance of the sources of relief mentioned.

Use of Alcohol

When looking for a future supply of any product it is natural to consider raw material that can be continuously produced instead of taken from a stored-up deposit. Alcohol is a volatile liquid fuel that is known to be satisfactory for use in internal combustion engines and which can be produced by the simple process of fermentation from any source of sugar. Unfortunately, however, evidence is still lacking that alcohol can be produced sufficiently cheaply enough to compete with various other forms of fuel that come to us as it were ready made. Just at present alcohol sells at a price that almost prohibits its use even as an anti-freeze compound. This situation is of course abnormal and there is every prospect that in the future alcohol may be on the market at a lower price than ever in the past.

The economical utilization of alcohol requires, however, engines that operate at compression pressures far greater than now employed for gasoline, which fact introduces complications that relegate alcohol to the far distant future as a potential substitute for gasoline. For the present it seems that alcohol is only of academic interest as an engine fuel except perhaps in localities where gasoline is expensive and scarce and the most promising raw material for alcohol manufacture is cheap. Such a situation already promises to develop in the Hawaiian Islands; gasoline is obtained there only after shipment over sea, but low grade unrefinable molasses is produced in large quantities.

Use of Coal-Tar Distillates

Another source of fuel that has received much attention is the by-product coking industry. The light oil constituents obtained by this process, such as benzol, toluol and xylol, are known to be satisfactory fuel, and although during the war the demand for them will continue to be greater than the supply, they will undoubtedly be marketed as fuel after the present abnormal production of explosives decreases. The use of these hydrocarbons either as such or blended with petroleum gasoline may increase the supply of fuel to a certain degree, but unfortunately the total available supply is relatively small. The following statistical information is interesting: The gasoline production of the United States for the calendar year 1916 has been variously given at from 2 to 2¼ billion gallons. The U. S. Bureau of Mines report on refinery operations for the year 1916 gives 2,058,880,596 gal. This includes a portion of the production of casinghead gasoline, which has been given as 104,212,809 gal. by J. D. Northrup, U. S. Geological Survey press bulletin No. 332 (August, 1917).

The production of coal-tar light oils for the same year was 36,600,000 gal. (C. E. Lesher, *Iron Age*, Vol. 99, Feb. 22, 1917), and it has been estimated that during the year 1917 this production will have been increased to from 40 to 60 million gallons. These figures indicate that if the total production of coal-tar light oils of the country were added to the engine fuel supply the increase would be about 2 per cent. These figures represent coking operations already conducted by the byproduct method. Figures based upon the total coke production of the country and even the total coal production of the country are not much more promising. The total coke produced in 1916 by both beehive and by-product ovens is given as 54,533,585 short tons and the total bituminous coal as 502,519,682 tons. (United States Geological Survey press bulletin No. 343, November, 1917). It is likewise recorded that the average yield of coke from a ton of coal is 1440 lb. and the average yield of light oil is 1.54 gal. (C. E. Lesher, Mineral Resources of the United States (1916) part 2, pp. 515-558).

Calculations from these figures indicate that if all the coke produced in the country in 1916 had been made by the by-product process the 75,741,053 tons of coal used would have yielded 117,641,232 gal. of light oil, which if entirely devoted to use in internal combustion engines would have increased the available supply of fuel by a little more than 5 per cent. If all the bituminous coal produced had been coked and had yielded the same average quantity of light oil as the grade of coal now used for coking the light oil produced would have amounted to 753,779,523 gal., which proves to be

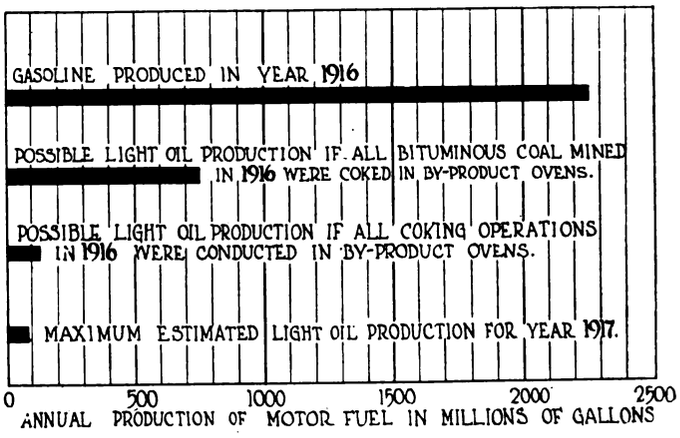


Fig. 3—Showing relative magnitude of present annual gasoline production of the United States and the additional quantities of motor fuel available from the distillation products of coal

less than 34 per cent of the gasoline production. These statistics show the limitations of the coking industry as a source of engine fuel. Fig. 3 represents graphically the theoretical quantities of fuels produceable from coal as compared with the gasoline actually produced. The use of coal-tar light oils as fuel will undoubtedly aid to increase the supply at some time in the future but they by no means promise to meet the total need for more gasoline.

It is by no means certain that tremendous quantities of crude petroleum exist that are not at present counted on, and producers are hopeful that such fields as the Mexican and even the Central American and South American fields may ultimately develop to a considerable degree of importance. The discovery of more crude would seem to be the easiest and most pleasant way of meeting the threatening fuel shortage, but this is a possibility that is so uncertain that it is hardly wise to place dependence on it.

Gasoline from Oil Shale

Vast deposits of oil bearing shale are known to exist in certain parts of this country and engine fuel can undoubtedly be obtained from this source. Here, however, as in the case of alcohol, the factor of expense in producing puts these products in the class of a resource that may be utilized in the future. Scientists are already giving attention to the problem of working up these shales and it is hoped that satisfactory methods for obtaining engine fuel in maximum quantity and of the best possible quality will be developed by

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the time it becomes commercially practicable to use these shales. Many problems in the fields both of distillation of the shales and treatment and refining of the oils remain yet to be solved, but these problems are considered to be comparatively simple of solution and are now being studied.

From the point of view of the oil refiner the most desirable way of increasing the supply is to get more of it from the same quantity of crude oil now refined. This can be accomplished either by extending the range of volatility acceptable for fuels or by the employment of methods that increase the quantity of volatile products obtainable from the crude. The latter possibility is that which the use of the cracking process covers. The development of these processes is to-day the most important field of experimentation in the industry and considerable progress has already been made. The Burton process, owned and controlled by the Standard Oil Company of Indiana, and operated by various of the companies of the Standard group, has been developed to a high degree of efficiency and is regularly converting large quantities of heavy petroleum distillates into satisfactory fuel.

The Hall process, which is said to be operated on a large scale in England and to some degree in the United States, is also apparently in the stage of successful commercial operation. The Rittman process, with which the Bureau of Mines has been largely concerned, seems now to be thoroughly developed for the large scale production of gasoline and should soon be a commercial factor in the market. Other processes now operating are the Greenstreet and the Cosden.

Burton Process

At present it appears that the Burton process and others of the pressure distillation type can operate successfully using as raw material fairly heavy petroleum distillates, such as the fuel and gas oil types. The Burton process cracks a limited amount of kerosene also but it is not adapted in its present stage of mechanical development to the treatment of oils of this type. The Rittman and Hall processes are said to operate equally well with kerosene and the heavier distillates. The Greenstreet process seems to operate entirely with kerosene distillate. It is not known that any pressure cracking process is successfully utilizing oils of the residuum type in large-scale apparatus. These crack readily enough, but the mechanical difficulties incident to the deposition of large quantities of carbon have so far interfered with commercial success.

The general consensus of opinion of those qualified to judge is that the production of volatile hydrocarbons, satisfactory for use as engine fuel, can be brought about by many modifications of the principle of applying heat and pressure but that the cracking process in general cannot be made a commercial success unless handled with a high degree of scientific and technical skill and under carefully regulated economic conditions. In other words, although oil is easy to crack it is not easy to crack profitably. The oil cracking art is in many ways like the poultry business. Any amateur can convert grain and meat scraps into chickens and eggs but it takes more than interest and ambition to accompany this process by the accumulation of financial profit. Likewise, it is tolerably easy to make gasoline out of heavy oil but a totally different matter to keep the cost of the finished product satisfactorily below its market price.

It appears therefore that although the cracking process offers great possibilities of increase in the supply of fuel, this increase is bound to be in the way of a gradual development and in no way revolutionary. It is possible that if cracking processes were used to the full extent of their applicability the total production of gasoline from the quantity of crude oil now produced might be doubled. This increase cannot however be expected on the basis of reasonable possibility in less than ten years.

An adequate discussion of cracking processes would require more time than automotive engineers would wish to devote to even this vital subject and for the present the situation can be summarized by stating that this method of increasing the fuel supply seems just at present to be considerably more important than any or all of the possibilities discussed.

The possibilities of increasing our future supply of fuel have already been discussed from the points of views of several industrial divisions. It has been shown that the men in the producing end of the oil industry may help solve the problem by making available new supplies of crude petroleum. Scientists have the problem of making available the supply obtainable from oil shales.

The coal distillation and the fermentation industries may in the future supply greater or less quantities, and the refiners by the improvement of their present methods and the development of cracking processes can contribute enormously to the country's production. There remains for discussion the part that designers and builders of internal combustion engines have to play in increasing the potential supplies.

Increase in Engine Efficiency

It may seem presumptuous for a rank outsider in the gasoline engine business to suggest that one of the most important lines of activity for automotive engineers is to increase the potential efficiency of the engines they turn out. It actually seems, however, that there are tremendous possibilities in this line, not necessarily through increases in mechanical efficiency but by educating the public to demand and use automobiles that are essentially economical in consumption of fuel. There are now on the market types of cars that on average roads and grades can travel about 20 miles on a gallon of gasoline. Most of these cars are of low and moderate price and it appears that the majority of higher-priced cars get notably less mileage, this in some cases being as low as 6 or 8 miles per gallon.

Such a condition should not continue because if fuel, at any price, is not going to be available, the automobile business is bound to suffer. For this reason it seems that the designers and manufacturers ought to take this matter in their own hands, regardless of the present demands of buyers, and work out a reasonable standard of performance for all cars. For instance, cars might be built with the basic assumption that a two- or three-passenger car must travel 22 miles on a gallon of gasoline, a five-passenger car 18 miles and a seven-passenger car 16 miles. Some such standard of efficiency as this should be regarded as ironclad and all automobile design based upon it. Such considerations as speed and hill-climbing power should not be allowed to interfere with this matter of efficiency and the users will soon get over the idea that it is necessary to have 80-hp. engines in their cars when 30 hp. is sufficient to carry them at adequate speed anywhere they want to go.

Use of Less Volatile Fuels

Perhaps no phase of the fuel situation has so interested automotive engineers as the use of kerosene in place of gasoline. Present market conditions are such that kerosene is one of the cheaper petroleum products, and as it has already been demonstrated to work satisfactorily in internal combustion engines under certain conditions there has been a great desire to render it available for general use in automobiles. The Bureau of Mines has had called to its attention many devices for the utilization of kerosene but believes that mechanical development in this particular line is a mistake. The logical and reasonable way to utilize kerosene is not as such but as a mixture with the gasoline produced with it in the refining of crude oil. In other words, attention should not be given to the utilization of kerosene but to the utilization of petroleum distillates containing both the gasoline and kerosene fractions of crude oil.

In terms of the testing laboratory this means fuel of high endpoint and correspondingly lowered average volatility. Such fuels could be produced by the refiners with slight modification of their present methods and equipment, and their price should be somewhat less than the average price of gasoline and kerosene now marketed separately. The gain would be the simplification resulting from the production and handling of one instead of two products. The Bureau is not attempting to tell just how the problem of designing engines that can handle fuel of from 550 to 600 deg. Fahr. endpoint can be solved, but accomplishment of such an end ought not to be beyond the skill and ingenuity of engine designers, especially as they have already seriously undertaken the infinitely more difficult task of using straight kerosene.

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No Spares on French War Trucks

Taxi System of Spares as Repairs in Truck Convoys Considered Best

By W. F. Bradley
Special Automotive Industries Correspondent

PARIS, Dec. 27—Even in technical quarters the impression prevails that army automobiles should be sent forth equipped with a stock of spares calculated on the basis of the requirements of an isolated car going on a trans-continental trip. Thus the suggestion is frequently made that the standard equipments should include spare valves and springs, brake liners, magneto and carbureter parts, gaskets, fan belt, etc. When the first taxicab services were started the cars were sent out with a very complete collection of parts. It was discovered that these parts were lost, broken, or ruined by rust; or if they were kept in condition the drivers did not possess the knowledge necessary to use them.

War Truck Drivers No Experts

War conditions have been similar. The average truck driver in the European armies is no better than the average taxicab driver. Although America has good raw material at her disposal, and has not actually had to train drivers on a big scale as it is done in England and France, the average technical ability of the men she is putting, or will have to put, on her trucks is not very much higher than that of her European allies.

At first sight the suggestion to send trucks forth on war service without any spare parts appears drastic: it is a suggestion which invariably meets with the opposition of skilled and experienced drivers, who being themselves capable of carrying out repairs consider that other men can do so also. The case is being considered of trucks working in convoy formation, or, if running isolated, being attached to some permanent group, and not of staff cars which are always more or less independent and away from a permanent base. On truck service, then, it may be taken that 80 per cent of the spare parts given out to be carried on the vehicles will either be lost or rendered useless at the end of 6 months.

Lists of parts are made upon the assumption that these particular parts will either break or wear out and will be needed to enable the car to finish its journey. Thus the most commonly accepted lists comprise fan belt, carbureter float, magneto carbons, brake liners, valves with springs and cotters, driving chains, gaskets, etc. Some makers and some military authorities have proposed the inclusion of ball bearings and clutch plates. Not one enlisted driver in a hundred is capable of replacing a ball bearing or taking down the clutch on the roadside. Even if they could do this it is more economical to get a tow home and carry out the job with the conveniences of a field workshop. Assuming that the list of parts is selected with the greatest care, it is probable that the greater percentage of the cars will be held up by the failure of some part which is not included in the equipment. The more complete the collection the greater the risk of loss and damage and

It has been proved entirely practical to send fleets of trucks into the field with no other parts than four plugs and gaskets, a few split pins, wire and adhesive tape. Indeed, carefully considered, this is all that any car or truck working with a group really needs for active service. The tool kit should be complete and should include all special wrenches for dismounting and adjusting any part of the car. There should be oil cans, syringes, funnel, a reserve of gasoline, oil, grease and kerosene; a collapsible water bucket should be on hand, but on most portions of the European front water is so plentiful that it is useless to carry it around. In making this recommendation it is being assumed, of course, that the motor is reasonably well cooled.

There are on war service in Europe thousands of trucks which individually do not carry any spare parts. They give good and reliable service without parts, and their operating cost is lower than if these parts were supplied. Such a system is only possible, however, with a really competent and energetic officer at the head of the column. It is a more difficult matter than is generally imagined to make automobile drivers give to their cars and trucks the attention necessary to keep them in good running condition. Unless kept under strict control the average army driver will not clean out oil filters, screw down grease cups, watch for loose nuts, take care of his battery, lubricate his universals, and do the other minor duties which are not repairs, but are essential if the car is to give continued satisfactory service. Responsibility for all this devolves on the officer in charge of the column or section; if he watches these points carefully the service will be good; if he neglects them the service is bound to be poor.

Supplies in Charge of Column Mechanic

Truck columns working on the principle of no spare parts aboard the individual trucks carry a stock of supplies in charge of the column mechanic. This stock comprises details such as bolts and nuts, split pins, spark plugs, gaskets, rubber hose, and the following:

- 1 magneto
- 2 radiators
- 8 valves complete with springs
- 16 valve cap gaskets
- 8 piston rings
- 2 connecting-rod bolts
- 2 carbureter jets
- 1 carbureter float
- 1 fan belt
- 2 fan belt fasteners
- 1 fan bearing
- 1 rear spring
- 1 front spring
- 2 rear-spring shackle bolts
- 2 front-spring shackle bolts
- Greasers

The parts are carried aboard a covered two-wheel trailer which travels with the column and remains at the column headquarters. Thus this trailer only covers a fraction of the mileage of any of the trucks, for it merely changes its quarters when the column moves its base. The mechanic attached to the column is personally responsible for this stock of spare parts and can be called on at any time to show what he has done

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with them. The mechanic renews his supply from a park which is responsible for the maintenance of approximately 12 columns, or 240 trucks. The park gets its renewals from the base.

It has been found possible to considerably reduce the total number of truck and car parts kept in stock for vehicles on war service without any loss in efficiency. Thus a certain high-class American truck is composed of 1205 individual parts, according to the maker's parts catalog. One of the European forces has reduced these parts to 402 by refusing to stock such parts as are never known to break, or which are of such a nature that they can be made cheaper than they can be imported.

To give a few examples: Running-board brackets are eliminated; fenders, running boards, tops, subframe members, lamp brackets, are all considered unnecessary. Many bolts, nuts, washers, etc., common to all makes are cut off the list. Minor controls are eliminated. If any unit in the field sends in a request for one of the 603 parts not stocked because considered unnecessary, the applicant is informed that the part can be obtained on special order from America, and that delivery will be made in 6 months' time; under the circumstances it is intimated that an attempt should be made to make this part in the field workshop. Invariably the applicant discovers that he can make the part.

If true economy is to be studied, it is impossible to draw up a general list of parts to be stock and apply that list to all makes. Under European experience the parts stocked in the military bases, these parts, as already stated, comprising only about one-third of the parts figuring on the makers' catalog, are carefully studied for each make of truck and differ considerably in their details. To give a few instances without mentioning any names:

One truck is liable to fractures of the water collector on the head of the cylinders, while on another these are never known to break.

Truck A burns up valves occasionally and breaks springs.

Truck B, which is equipped with spare valves, hardly ever breaks or burns one.

Truck C has poorly designed water spaces around the valve seats and cracks cylinder from time to time.

Truck D—no cylinder ever has cracked except from frost.

Truck E, by reason of a peculiarity of its oil system, is liable to burn out one of the connecting-rod bearings. This never happens on Truck F.

Truck G has a very powerful transmission brake and under its influence unskilled drivers sometimes strip gears.

Truck H breaks driveshafts from time to time.

A certain model touring car is liable to fractures of the steering knuckle.

These are local weaknesses which have to be provided for in drawing up the lists of parts to be stocked, and are only given to show that uniform proportions throughout the automobile service will lead on the one hand to accumulations of dead stock, and on the other to vehicles tied up for lack of parts.

Another situation which has been found necessary to guard against very closely is the accumulation of stocks at various points in the service. The mechanics working on a column have need of one crown wheel. Unless controlled they will put in a requisition for six, using one and stocking the other five. A new cylinder being required, they will ask for a group complete with pet cocks, valves, springs, valve caps, fan bearing and brackets, etc., although all these parts may be available for use on the discarded cylinder. One American maker always ships his power plants complete in every respect, carbureter, magneto, fan, bolts for attaching to frame, etc. Whenever these are sent direct to repair units at the front the accessories are taken off and replaced by old ones withdrawn from the damaged engine, the new parts going to augment the stock, but without figuring on the stock list.

In order to avoid, as far as possible, all such accumulations of stock, the French service stipulates the parts and the quantities of such parts which can be kept, as follows:

1—On the truck.
2—In the hands of the column mechanics.
3—At the advanced workshop.
4—At the supply base.

Generally, before a new part is issued the old part must be returned, thus proving that the part is not being ordered needlessly with the object of getting together a little reserve stock. The same rule applies to tires: before a new shoe or casing is issued the old one must be presented. This has put a stop to the practice of leaving old tires by the roadside, and also prevents unscrupulous persons giving army tires away to friends.

Chromium Steels for Permanent Magnets

ALL high-grade permanent magnets used for industrial purposes have in the past been made of tungsten steel. This same steel is also used as tool steel, the well-known high-speed steel being a tungsten-alloy steel. In Germany, all tungsten was commandeered shortly after the outbreak of the war, by the government, and the electrical industries were then hard put to it in finding a substitute for their conventional magnet steel.

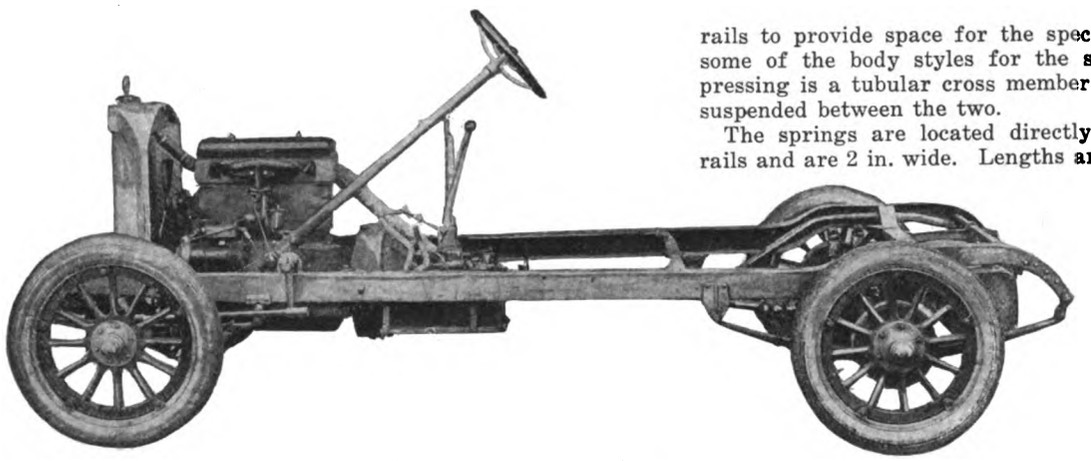
Experiments on the use of chromium in the place of tungsten, which had already been projected before the war, were accelerated. The research has been conducted in the Reichsanstalt on behalf of the Verband Deutscher Elektrotechniker. The preliminary report, published by the Reichsanstalt in 1917, did not give particulars, which were, however, to be communicated to members of the Verband on inquiry. Krupp's works supplied 37 specimens of steel containing varying percentages of chromium and of carbon; they had been turned into rods and hardened in various ways in the works, and were then aged, after the method of Strouhal and Barus, by repeated heating, cooling, and mechanical stress, while being tested at intervals in the Reichsanstalt.

The unfinished investigation concerns also the temperature coefficient of magnetization and the durability of the steels. It results that on an average chromium steels which have undergone suitable heat treatment do not rank below tungsten steels; the very best magnetic chromium steels, however, are not equal to tungsten steels. Technically, chromium steels would thus appear to be quite satisfactory, while for special researches their further improvement is desirable. These researches will probably be made in the near future.

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Mercury a Semi-Custom Car with Stock Chassis

Employs Weidely Overhead Four Cylinder Engine—Has Transmission Brake—Bodies Are Built to Suit Purchaser



Side view of Mercury chassis

MERCURY CARS, INC., at Hollis, L. I., are producing a car designed to meet the demand for a small automobile of high quality in chassis and body. The result is a semi-custom-made job in which the bodies are intended to fit the particular needs of the purchaser and to conform to his taste in color and style, while the chassis is a stock product. The price of the car, of course, will vary with the body selected, but may be judged by the fact that the four-passenger job, which is practically a stock model, sells for $2,950. The chassis has a 114-in. wheelbase and is mounted on 31 by 4-in. tires. With the small wheels the relatively short chassis fits well into the custom body scheme.

The frame is made of 4½-in. channel and tapers uniformly from front to rear. Being wide in the rear, it allows the weight of the body to be carried close to the wheels. It is provided with three pressed-steel cross members, the front member having a deep drop to support the forward end of the engine. The rear cross member is located below the side rails to provide space for the special mounting provided in some of the body styles for the spare tire. Back of this pressing is a tubular cross member and the gasoline tank is suspended between the two.

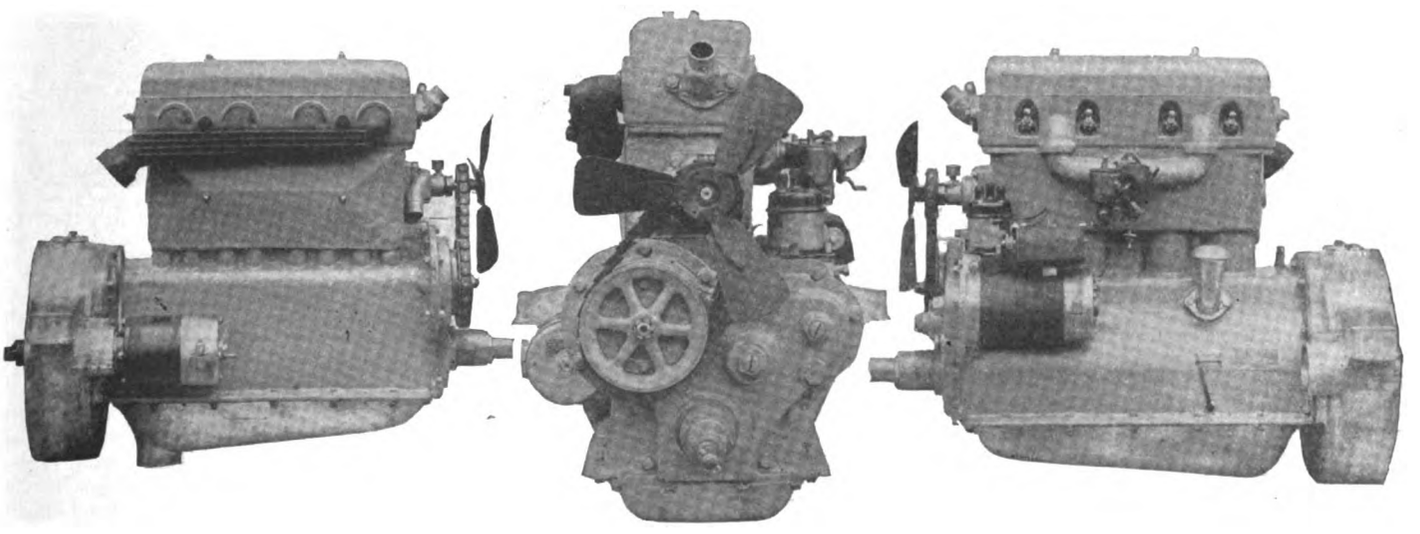
The springs are located directly beneath the frame side rails and are 2 in. wide. Lengths are 36 and 52 in. front and rear respectively. The rear springs are underslung. The springs are designed to be practically flat under load and are of chrome vanadium steel. Hotchkiss drive is employed and the spring eyes and bolts are provided with self-lubricating bushings, thus eliminating several grease cups, leaving 7 on the chassis.

The Weidely overhead, 3½ by 5½ in. four-cylinder engine is used in conjunction with a unit powerplant mounted with three-point suspension. The front spigot bearing rests in a pillow block bolted on the front cross member by a long U bolt and is provided with a self-lubricated bushing of impregnated wood. The two rear supports are cast on the bell housing in the form of arms which are bolted to the frame side members.

Brief Specifications

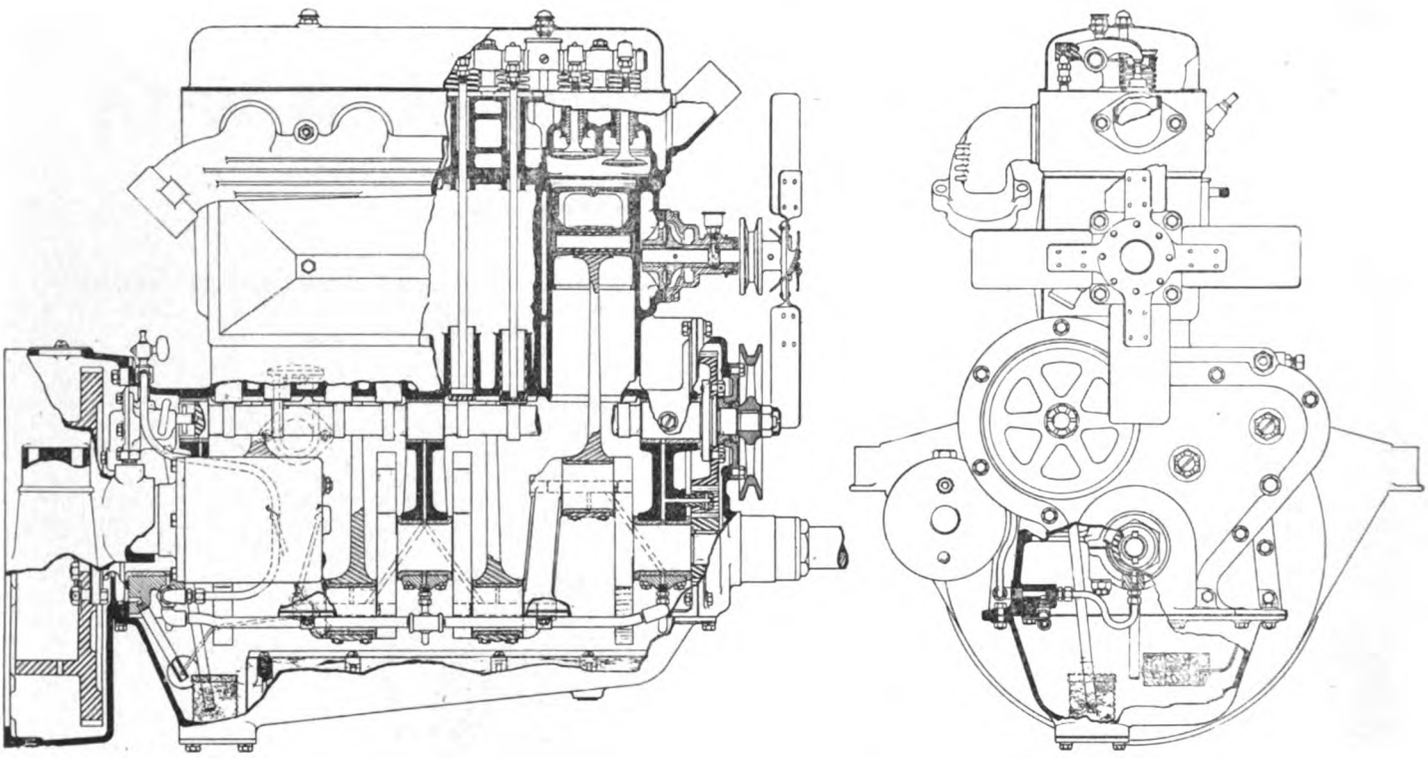
Cylinder number	4
Cylinder dimensions	3¾ x 5½ in.
Piston displacement	243 cu. in.
Clear valve diameter	1⅞ in.
Valve lift	5/16 in.
Crankshaft diameter	2⅛ in.

Lubrication, pressure feed to all engine bearings.



Three views of the Weidely four engine used on the Mercury car

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Sectional view of the Weidely engine

Elliptic section connecting-rods are used and at the lower ends there are four bolts. The crankshaft has three bearings; it is of the counterbalanced type and is drilled for pressure oiling. The camshaft is driven through helical gears actuating the overhead rocker mechanism and the valves, which latter are 1⅞ in. diameter in the clear.

A feature of the engine is the unit casting employed for the cylinder block which also includes the intake manifold. With this arrangement the carbureter connections need not be disturbed when the cylinder head is removed. The exhaust-manifold is provided with integral cooling fins. The extension of the pump shaft carries the fan, which is driven by a V-belt. The radiator is a removable core type and has 5 gal. capacity; it is supported on a large sheet of cork within a shell of patented design. The shell is built up on a pressed-steel base so designed as to rigidly support the radiator construction and at the same time to provide the necessary flexibility to take care of weaving of the frame.

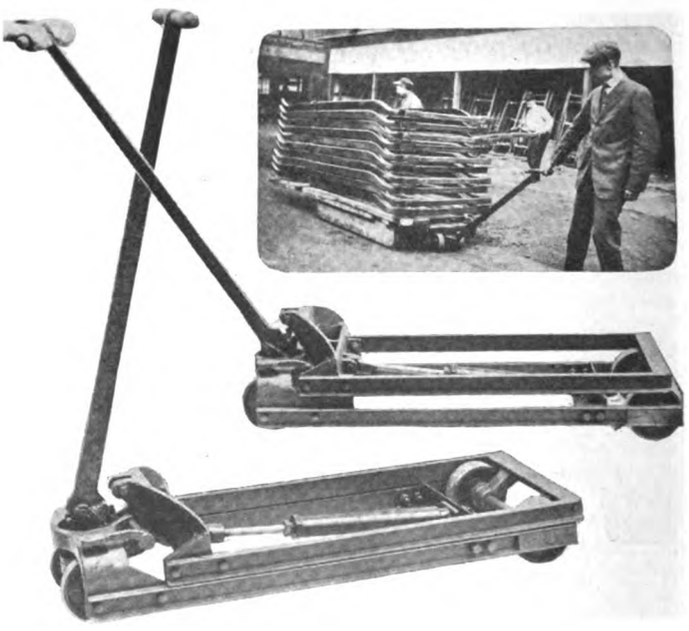
The electric system is a two-unit Delco with flange-supported motor and generator. The starting engagement is provided by a Bendix gear drive. Carburetion is by the new Stromberg Type M instrument and oiling is by a full pressure feed system through a hollow shaft. The drive is taken through an eleven-disk dry clutch faced with Raybestos, a three-speed gearset and a three-quarter floating spiral bevel rear axle with annular ball bearings throughout. There is only one set of brakes on the rear wheels, the service brake being a transmission unit of the external contracting type acting on an 8¼-in. drum mounted on the front universal joint. Adjustment of this is made easy by locating the thumb nut which controls it beneath a small trap door in the front floorboard through which the driver can control the application without leaving his seat. The rear brake connection consists of a single cable, and this simplification of the brake linkage has resulted in an exceptionally clean chassis.

Another feature of accessibility is the use of a second trap door providing access to the storage battery which is located beside the gearset on the opposite side from the exhaust pipe. The gasoline tank is of pressed steel, of 16 gal. capacity and is fitted with a 2 gal. reserve for emergency. Standard fittings on the car are a Boyce Moto-Meter, oil pressure gage, ammeter, 8-day clock, magnetic gasoline gage, Van Sicklen speedometer, combination lighting and ignition switch with Yale lock on hood and on dash compartment, all being operated by a master key.

The bodies are practically custom built, as stated, although of semi-stock design, the purchaser's ideas being carried out in regard to details. In the small four-passenger touring model which was exhibited at the Astor Salon, the space under the cowl is lighted and ventilated, three ventilators being provided for the latter purpose, two on the side and one above, this upper one, having a curved glass panel. The front seats are divided and adjustable to accommodate the driver. This body has two doors and has a locker at the rear which completely conceals the spare tire without producing the objectionable bulging back.

Industrial Trucks

In our Jan. 17 issue appeared a brief description of the Barrett multi-truck for moving material and products in industrial works. Below are shown several views of this truck.



Barrett multi-truck and its method of use

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Chevrolet Company Adds Light Truck

Sold Either as a Chassis or with an Open or Covered Body—Has Worm Gear Drive

MORE and more of the companies manufacturing popular-priced passenger cars are turning their attention to the light truck field and bringing out models of commercial vehicles embodying the same power plant as their passenger cars. The latest concern to take this step is the Chevrolet Motor Co. of New York and Flint, Mich., which has just announced a 1-ton truck chassis to sell at $1,125. This same chassis equipped with an open delivery body sells at $1,245 and with an eight-post top and body at $1,320, all prices being f.o.b. Flint.

An interesting feature of the new car is that it has a full electric equipment, including both a starter and a lighting system. The frame is sufficiently long to carry a standard body with a clear loading space of 9 ft. 6½ in. and a clear inside width of 3 ft. 9¾ in. The large loading space of the body enables the vehicles to be used in almost every conceivable kind of business.

The truck is fitted with a valve-in-the-head type engine with a piston displacement of 224.3 cu. in. It is mounted under a conventional hood forward of the dash and is carried on arms extending to each side of the frame. The rear end is carried on two heavy malleable iron castings hot riveted to the frame and held in place by two drop-forged U-bolts. The front is hung in shackles bolted to the motor arms and to two substantial brackets hot riveted to the frame. The cylinders are cast in block and are provided with a removable cylinder head. Lynite pistons with three rings are employed and the crankshaft is carried on three main bearings.

The engine is water cooled by means of a centrifugal pump circulating the water through a cellular type radiator with a heavy brass core and a pressed steel casting. The radiator is mounted on two V-shaped slotted steel springs bolted to the front cross member and resting on two steel washers. A 15-in. pressed steel fan is employed and is driven by a V-shaped leather link belt.

A Zenith carbureter is used with a hot-air-jacketed intake manifold. The carbureter is fed by gravity from a 13-gal. tank located under the driver's seat. All the air enters the carbureter through a combined strangler and temperature regulator which provides a cold-air opening during warm weather. A Monarch suction governor is installed between the carbureter and the intake manifold to limit the speed of the truck to 25 miles an hour.

Ignition is by a Remy distributer. An Auto-Lite generator is employed and begins to produce a charging current at a vehicle speed of about 6 miles per hour. The electric starter is also an Auto-Lite product. It is mounted on the rear motor arm and operated through a Bendix drive.

From the engine the drive is taken through a cone clutch with a leather facing and thence to a three-speed selective gearset. The gearset is carried on a frame bolted to the flywheel housing, and can be quickly and easily removed, being located directly under the driver's floorboards.

From the gearset the drive is taken through a seamless steel tube propeller shaft with three universal joints to the worm-driven rear axle, of which the worm and worm gear are made by the Cleveland Worm & Gear Co. The rear axle housings are of malleable iron and the axle shafts are of the semi-floating type.

Hotchkiss drive is employed, both the torque and propulsion being taken through the springs. Two separate sets of brakes of the internal-expanding type are located on the rear wheels. Each brakeshoe is 14 in. in diameter and 2 in. wide. Both sets of brake rods are provided with turnbuckles conveniently located to take up all brake wear. The frame is of open-hearth rolled steel channel 4 in. deep, and is provided with three cross members.

The wheels are of the artillery type and have 12 hickory spokes, front and rear. The front wheels are fitted with Timken roller bearings and are provided with malleable iron hubs with flanges of pressed steel. For greater speed, pneumatic tires are employed in front and solids in the rear. Left steer and center control are employed.

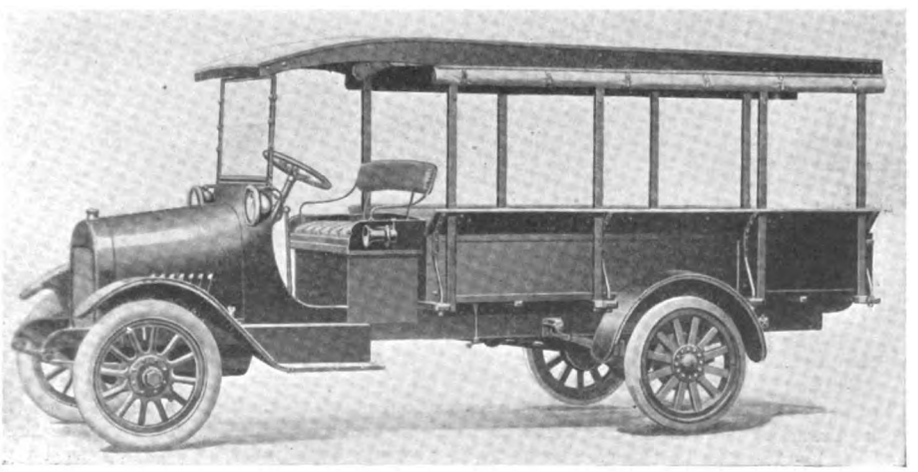
The engine hood is of heavy sheet steel with three hinge rods. An anti-squeak is used on both ends of the hood to prevent rattling, and the sides each have seven louvres for better air circulation. The cowl is also of heavy sheet steel riveted in place and carrying the instrument board, on which are mounted the speedometer, carbureter choke, ammeter, oil pressure gage and the lighting and ignition switch. Passenger type front and rear fenders are used. They are of pressed steel in one piece and are crowned and attached to the frame side members by a heavy pressed steel V-section iron with a heavy sheet steel apron extending to the frame and completely inclosing the sides and protecting the runningboards from mud and water.

BRIEF SPECIFICATIONS

Load capacity	*1 ton*
Wheel base	*125 in.*
Cylinder number	*4*
Cylinder dimensions	*3 11/16 x 5¼ in.*
Piston displacement	*224 cu. in.*
Final drive	*Worm*
Torque and thrust on springs.	
Price of chassis	*$1,125*

Cost of Plowing in England

In the House of Commons recently, in reply to a question by Colonel Faber, Mr. Prothero stated that the average gross expenditure throughout England and Wales on motor plowing from spring to August last was 28s. 6d. ($6.92) per acre. This cost included work on the farm, traveling from place to place, labor, repairs and maintenance.



Chevrolet truck with covered body

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More S. A. E. Aircraft Practices

Specifications for Flexible Steel Wire Cable, Tachometer Drive from the Engine, Rubber Hose for Gasoline and Reels for Cable

The following table forms part of the specifications of flexible 6 x 7 steel wire cable printed in last week's issue of AUTOMOTIVE INDUSTRIES:

TABLE OF WEIGHTS, SIZES AND STRENGTH OF CABLE

Diameter, Inches	Minimum Breaking Strength, Pounds	Approximate Weight, Pounds per 100 Ft.
0.312 (5/16)	7,900	15.00
.250 (¼)	5,000	9.50
.218 (7/32)	4,000	7.43
.187 (3/16)	2,750	5.30
.156 (5/32)	2,200	4.20
.125 (⅛)	1,150	2.20
.109 (7/64)	830	1.50
.094 (3/32)	780	1.30
.078 (5/64)	480	.83
.062 (1/16)	400	.73

Flexible 7 x 7 Steel Wire Cable

S. A. E. Recommended Aeronautic Practice

This specification covers high strength 7 x 7 flexible steel wire cable used in the construction of aircraft where flexibility is important.

Manufacture—The steel wires composing the individual strands of the cable shall be laid concentrically around the center wire in one layer of six wires with a left-hand (counter-clockwise) pitch or lay. The cable itself shall be constructed by twisting six of these strands composed of seven wires each around a seventh strand of the same construction and material with a right-hand (clockwise) pitch and with a length of lay of six to eight times the diameter of the whole.

Wires composing the cable shall be uniformly coated with pure tin to solder readily.

Joints in wires in cable having a diameter of 0.156 (5/32) in. and larger shall be brazed in a gas fire. In cable having a diameter of 0.125 (⅛) in. or less, wires may be joined either by brazing or twisting, at the manufacturer's convenience. Tucked-in or welded joints are not permitted. No two joints in individual wires shall be closer to one another in the completed cable than 30 ft. All brazed joints shall be tinned. Exposed brass at joints shall not constitute cause for rejection.

Workmanship and Finish—Each length of cable is to be evenly laid, and free from kinks, loose wires, or other irregularities. The cable shall remain in this condition when unwound from the reel or bent around a standard thimble, proper precautions being taken to secure the ends.

Physical Properties and Tests—Tensile test—A tensile test shall be made upon each individual reel of cable purchased of a size.

Samples of cable for testing for tensile strength shall be no less than 24 in. in length. In making tests the distance between jaws of testing machine with sample in place and before test shall be not less than 10 in.

Samples for tensile test may be clamped in the jaws of the testing machine in the usual manner to facilitate testing; but in case of failure or dispute on individual tests and at the request of the manufacturer, check tests shall be made by socketing the samples with pure zinc.

Cable for use in the construction of aircraft shall meet the required breaking strength specified in the table.

Bend Test—One bend test is to be made on a sample cut from each reel of cable of a given size. Each sample must be bent once around its own diameter and straightened again at least 20 times in succession in the same direction of bending without any of the wires breaking.

Torsion Test—A torsion test is to be made on one wire from each sample of cable for tensile test. The wire is to be gripped by two vises 8 in. apart. One vise shall be turned uniformly at as high a rate of speed as possible without perceptibly heating the wire. One vise shall have free axial movement in either direction.

The number of complete turns which the wire shall stand is determined by the formula:

$$\text{Number of turns} = \frac{2.2}{\text{diameter in inches}}$$

Failure of one piece of wire to show full number of turns specified in the above torsion test shall not be considered cause for rejection, but in such case two additional tests shall be made on two more wires from the same sample of cable, and if both samples meet the requirements of the specifications the cable shall be accepted in this respect.

Dimensions and Tolerances—There shall be no permissible variation in gage below size. Cable having a diameter of 1/16 to 3/32 in. inclusive, shall have a permissible variation of 12 per cent above size; cable having a diameter of ⅛ to 3/16 in. inclusive, shall have a permissible variation of 10 per cent above size, and cable having a diameter of 7/32 to ⅜ in. inclusive, shall have a permissible variation of 7 per cent above size.

TABLE OF WEIGHTS, SIZES AND STRENGTH OF CABLE

Diameter, Inches	Minimum Breaking Strength, Pounds	Approximate Weight, Pounds per 100 Ft.
0.312 (5/16)	9,200	16.70
.250 (¼)	5,800	10.50
.218 (7/32)	4,600	8.30
.187 (3/16)	3,200	5.80
.156 (5/32)	2,600	4.67
.125 (⅛)	1,350	2.45
.094 (3/32)	920	1.45
.078 (5/64)	550	.93
.062 (1/16)	480	.81

Extra Flexible 7 x 19 Steel Wire Cable

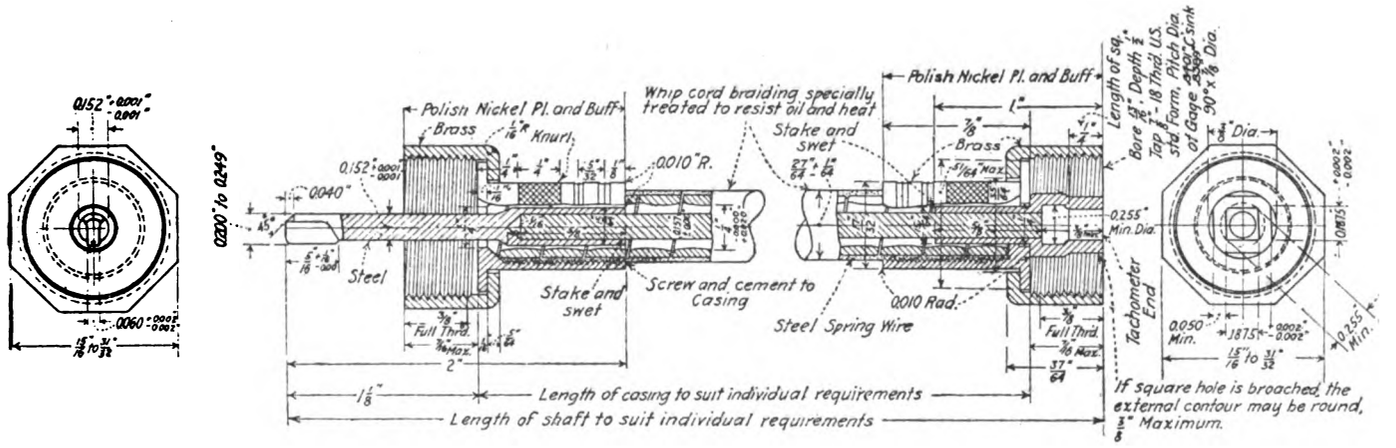
S. A. E. Recommended Aeronautic Practice

This specification covers high strength 7 x 19 extra flexible steel wire used in the construction of aircraft where extra flexibility is important.

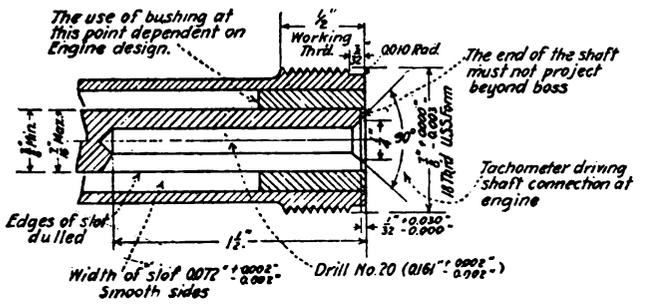
Manufacture—The steel wires composing the individual strands of cable shall be laid concentrically around the center wire in one layer of 6 wires and another, or outer layer, of 12 wires with a left-hand (counter-clockwise) pitch, the lay or pitch of both layers being of the same length; the cable itself shall be constructed by twisting 6 of these strands composed of 19 wires each around a seventh strand of the same construction and material with a right-hand (clockwise) pitch or lay of 6 to 8 times the diameter of the whole.

It is to be understood that the strand composing this cable must not necessarily be composed of wires all of the same diameter.

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Tachometer Drive



Wires composing the cable shall be uniformly coated with pure tin to solder readily.

Joints in wires in cable having a diameter of 0.187 (3/16) in. and larger shall be brazed in a gas fire. In cable having a diameter of 0.156 (5/32) in. or less, wires may be joined either by brazing or twisting at the manufacturer's convenience. Tucked in or welded joints are not permitted. No two joints in individual wires shall be closer to one another in the completed cable than 30 ft.

Workmanship and Finish—Each length of cable is to be evenly laid, and free from kinks, loose wires, or other irregularities. The cable shall remain in this condition when unwound from the reel or bent around a standard thimble, proper precautions being taken to secure the ends.

Physical Properties and Tests—Tensile test—A tensile test shall be made upon each individual reel of cable purchased of a size.

Samples of cable for testing for tensile strength shall be no less than 24 in. in length. In making tensile tests the distance between jaws of testing machine with sample in place and before test shall be not less than 10 in.

Samples for tensile test may be clamped in the jaws of the testing machine in the usual manner to facilitate testing, but in case of failure or dispute on individual tests, and at the request of the manufacturer, check tests shall be made by socketing the samples with pure zinc.

Cable for use in the construction of aircraft shall meet the required breaking strength specified in the table.

Bend Test—One bend test is to be made on a sample cut from each reel of cable of a given size. Each sample must be bent once around its own diameter and straightened again at least 20 times in succession in the same direction of bending without any of the wires breaking.

Torsion Test—A torsion test is to be made on one wire from each sample of cable taken for tensile test. The wire is to be gripped by two vises 8 in. apart; one vise shall be turned uniformly at as high a rate of speed as possible without perceptibly heating the wire. One vise shall have free axial movement in either direction.

The number of complete turns which the wire shall stand is determined by the formula:

$$\text{Number of turns} = \frac{2.2}{\text{diameter in inches}}$$

Failure of one piece of wire to show full number of turns specified in the above torsion test shall not be considered cause for rejection, but in such case two additional tests shall be made on two more wires from the same sample of cable, and if both samples meet the requirements of the specification the cable shall be accepted in this respect.

Dimensions and Tolerances—There shall be no permissible variation in diameter below size. Cable having a diameter of 0.125 (⅛) to 0.187 (3/16) in., inclusive, shall have a permissible variation of 10 per cent above size, and cable having a diameter of 0.218 (7/32) to 0.375 (⅜) in., inclusive, shall have a permissible variation of 7 per cent above size.

Tachometer Drive

S. A. E. Recommended Aeronautic Practice

Instrument End—The upper or instrument end of the shaft has a squared socket, made integral with a shoulder which forms a thrust bearing.

Engine End—The lower or engine end is finished with a cylindrical end with a single integral key.

Casing—The casing is to be of flexible metallic tubing, covered with whipcord braid and impregnated to prevent oil leakage; similar to sample, or covered with other material which will be equally flexible, oil tight and free from stretching and of no greater weight than the whipcord braid covering casing. The outside diameter of casing to be over braid to be approximately 7/16 in.; the inside diameter of casing to be approximately ¼ in. The ends of the casing are finished alike, as shown in detailed sketches. The screw-threaded sockets covering the whipcord braid are screwed in place and set with shellac or other suitable material to form an oil-tight and permanent connection.

Shaft End—The shaft end at the engine is drilled and slotted to fit the tachometer shaft end, allowing for end-play of at least 1 in. More play than this may be required where the drive shaft is more than 6 ft. in length, the amount to be determined experimentally.

Drive Shaft—Drive shaft to be of helical wire wound construction, with core wires.

Spindle—The tachometer spindle is finished square to fit the square socket on the drive shaft.

Drive Shaft—Drive shaft will rotate at one-half crank shaft speed.

End Nuts—Size and contour of exterior circumference of end nuts optional, but 15/16 octagon recommended.

Rubber Hose for Gasoline

S. A. E. Recommended Aeronautic Practice

COTTON PLY—TYPE No. 1

PART 1. TECHNICAL

A.—Description

Construction—The gasoline hose must consist of rubber and cotton constructed in the following manner, and the quality of the finished hose must be uniformly good throughout.

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Inner Tube—The inner tube is to be made of rubber free from flaws or cracks and of a quality conforming to the conditions laid down in this specification.

When of an internal diameter of ¾ in. or less, this inner tube must be seamless. Tubes of larger internal diameter may be made from rubber sheet, in which case they must consist of at least two complete turns and be formed into a complete tube in the further process of manufacture.

Cotton Plies—The cotton shall consist of either braided or canvas plies and shall comply with the following table:

Internal Dia. of Hose	Up to and Including ⅝ In.	11/16 In. to 1½ In.	Greater than 1½ In.
Number of plies	Not less than two	Not less than three	Not less than four

Outer Cover—The outer cover is to be made of rubber of the same quality as that used for the inner tube, and of good workmanship and finish.

Dimension Limit—The internal diameter of the hose must not vary more than plus or minus 3 per cent of the internal diameter stated on the order.

Length of Hose—The contractor, when quoting or when acknowledging an order for this class of hose, must state the lengths in which it can be supplied. The hose should be supplied in the maximum lengths possible.

B.—Physical Properties

Flexibility—By "Flexibility" is meant ability to bend without kinking.

When hose of internal diameter (y) is bent around a cylinder having a diameter equal to x times the external diameter of the hose, as shown in the following table, the external diameter of the hose must not increase or diminish by more than 10 per cent.

Internal Diameter of Hose (y)	x
Less than ½ in.	8
½ in. to ¾ in.	12
13/16 in. to 1⅛ in.	14
Above 1⅛ in.	16

The hose, after having been filled with gasoline for two hours, must withstand a minimum internal hydraulic pressure of P pounds per square inch, depending upon the internal diameter (D) of the hose without showing defects.

D—Internal Dia. in Inches	Min. Pressure in Lbs. per Sq. In. (P)
Up to ½ inclusive	160
9/16 to 1 inclusive	140
1 1/16 to 1⅛ inclusive	120
1 9/16 to 2 inclusive	100
Above 2	80

C.—Chemical Properties

Rubber—The percentage of rubber shall not be less than 25. The amount of free sulphur in either the tube or the cover must not exceed 1 per cent.

Dry Heat Test—A 3-in. piece of the hose after having been placed in an air oven at 132 deg. C. for 2 hours, must show, when cool, no tendency to crack, and must not be tacky.

Permeability to Gasoline—The specific gravity of the gasoline used in this test should be between 0.710 and 0.725 at 60 deg. F.; 65 per cent of it must distill at over 100 deg. C. from a distillation flask when the bulb of the thermometer is just below the side tube. A 14-in. length of the hose is held vertically and plugged at the bottom. The upper end is fitted with a glass tube about 18 in. long. The hose so arranged is filled with gasoline to a head of 12 in. above the top of the acting length of the hose. The acting length of the rubber hose is 12 in. The upper end of the glass tube is loosely closed with a cork.

During the first 24 hours the level of the gasoline will fall comparatively rapidly. The loss of gasoline is made good by frequent additions from a known volume of gasoline, care being taken that the level of the gasoline in the glass tube does not fall at any time by more than 3 in. The test is to last for 72 hours, and the loss of gasoline during the third 24 hours must not exceed 100 cc. per square foot of the original internal surface of the hose.

Immersion in Gasoline—A 3-in. piece of the hose is boiled for one hour (using a reflex condenser) in gasoline similar to that used for the permeability test. The gasoline is allowed to cool down. Twenty-four hours later the test piece is removed from the gasoline and examined without delay, as follows:

The internal diameter at the point of greatest constriction is measured by means of rod gages. From this measurement the area of the bore is calculated. It must not differ from the original by more than 25 per cent.

The test piece is then cut longitudinally into halves, and the adhesion between rubber and cotton carefully examined. The adhesion must be of such a character that the rubber can only be stripped from the cotton by hand with difficulty.

Immersion in Oil—A 3-in. piece of the hose is immersed in an oil approved by purchasing office at a temperature of 100 deg. C. for 8 hours, and for a further period of 24 hours at ordinary temperature. The oil is then wiped from the surface of the hose. The decrease of internal diameter shall be less than 10 per cent.

The flexibility and elasticity of the rubber must not be diminished and there must be no tendency of the rubber to separate from the cotton.

PART II. INSPECTION

Test Pieces—The purchaser will decide where the tests are to be carried out. All test specimens are to be cut in the presence of the inspector and they are to be marked as he may direct.

For the purpose of testing, a representative sample will be cut from each 1000 ft. of hose or fraction thereof, and the tests will proceed in accordance with the purchasing office's instructions.

Rejections—If any sample fails to comply with any of the above tests, the hose represented thereby will be rejected.

Marking—Accepted and rejected material must be marked as directed by the inspector.

PART III. SPECIAL CONDITIONS

Depreciation—The contractor must bear the cost of the depreciation in value of any rejected material due to test pieces being cut therefrom.

Rejected Material—The contractor must not supply any material which has previously been rejected by any Government department, without giving full written particulars of the previous rejection to the inspector who is inspecting to this specification.

Rubber Hose for Gasoline

S. A. E. Recommended Aeronautic Practice

COTTON PLY REINFORCED WITH WIRE

TYPE No. 2

PART I. TECHNICAL

A. Description

Construction—The gasoline hose must consist of rubber and cotton constructed in the following manner, and the quality of the finished hose must be uniformly good throughout.

Inner Tube—The inner tube shall consist of a canvas tube supported by a helix of oil tempered steel wire of not less than .020-in. diameter, spaced not less than five turns per inch. The rubber tube shall be placed between this inner cotton tube and the cotton plies specified below.

Cotton Plies—The cotton shall consist of either braided or canvas plies and shall comply with the following table. The inner cotton tube shall not be considered one of the plies specified.

Internal Dia. of Hose	Up to and Including ⅝ In.	11/16 In. to 1½ In.	Greater than 1½ In.
Number of plies	Not less than two	Not less than three	Not less than four

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Outer Cover—The outer cover is to be made of rubber of the same quality as that used for the inner tube, and of good workmanship and finish.

Dimension Limit—The internal diameter of the hose must not vary more than plus or minus 3 per cent of the internal diameter stated on the order.

Length of Hose—The contractor, when quoting or when acknowledging an order for this class of hose, must state the lengths in which it can be supplied. The hose should be supplied in the maximum lengths possible.

B. Physical Properties

Flexibility—By "Flexibility" is meant ability to bend without kinking.

When hose of internal diameter (y) is bent around a cylinder having a diameter equal to x times the external diameter of the hose, as shown in the following table, the external diameter of the hose must not increase or diminish by more than 10 per cent.

Internal Diameter of Hose (y)	x
Less than ½ in.	8
½ in. to ¾ in.	12
13/16 in. to 1⅛ in.	14
Above 1⅛ in.	16

The hose, after having been filled with gasoline for two hours, must withstand a minimum internal hydraulic pressure of P pounds per square inch, depending upon the internal diameter (D) of the hose, without showing defects.

D—Internal Dia. in Inches	Min. Pressure in Lbs. per Sq. In. (P)
Up to ½ inclusive	160
9/16 to 1 inclusive	140
1 1/16 to 1½ inclusive	120
1 9/16 to 2 inclusive	100
Above 2	80

C. Chemical Properties

Rubber—No organic matter other than Para or plantation rubber shall be used in the preparation of this hose. The percentage of rubber shall not be less than 25.

The amount of free sulphur in either the tube or the cover shall not exceed 1 per cent.

Dry Heat Test—A 3-in. piece of the hose after having been placed in an air oven at 132 deg. C. for 2 hours must show, when cool, no tendency to crack, and must not be tacky.

Permeability to Gasoline—The specific gravity of the gasoline used in this test should be between 0.710 and 0.725 at 60 deg. F.; 65 per cent of it must distill over at 100 deg. C. from a distillation flask when the bulb of the thermometer is just below the side tube. A 14-in. length of hose is held vertically and plugged at the bottom The upper end is fitted with a glass tube about 18 in. long. The hose so arranged is filled with gasoline to a head of 12 in. above the top of the acting length of the hose. The acting length of the rubber hose is 12 in. The upper end of the glass tube is loosely closed with a cork.

During the first 24 hours the level of the gasoline will fall comparatively rapidly. The loss of gasoline is made good by frequent additions from a known volume of gasoline, care being taken that the level of the gasoline in the glass tube does not fall at any time by more than 3 in. The test is to last for 72 hours, and the loss of gasoline during the third 24 hours must not exceed 100 cc. per square foot of the original internal surface of the hose.

Immersion in Gasoline—A 3-in. piece of the hose is boiled for one hour (using a reflex condenser) in gasoline similar to that used for the permeability test. The gasoline is allowed to cool down. Twenty-four hours later the test piece is removed from the gasoline and examined without delay, as follows:

The internal diameter at the point of greatest constriction is measured by means of rod gages. From this measurement the area of the bore is calculated. It must not differ from the original by more than 25 per cent.

The test piece is then cut longitudinally into halves, and the adhesion between rubber and cotton carefully examined. The adhesion must be of such a character that the rubber can only be stripped from the cotton by hand with difficulty.

Immersion in Oil—A 3-in. piece of the hose is immersed in an oil approved by purchasing office at a temperature of 100 deg. C. for 8 hours, and for a further period of 24 hours at ordinary temperature. The oil is then wiped from the surface of the hose. The decrease of internal diameter shall be less than 10 per cent.

The flexibility and elasticity of the rubber must not be diminished and there must be no tendency of the rubber to separate from the cotton.

PART II. INSPECTION

Test Pieces—The purchaser will decide where the tests are to be carried out. All test specimens are to be cut in the presence of the inspector and they are to be marked as he may direct.

For the purpose of testing, a representative sample will be cut from each 1000 ft. of hose or fraction thereof, and the tests will proceed in accordance with the purchasing office's instructions.

Rejections—If any sample fails to comply with any of the above tests, the hose represented thereby will be rejected.

Marking—Accepted and rejected material must be marked as directed by the inspector.

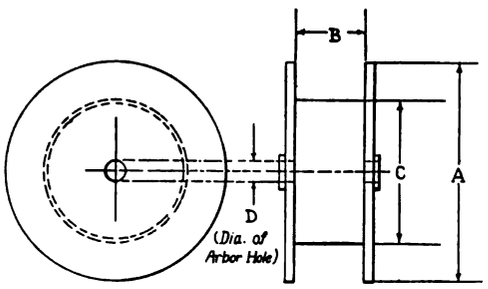
PART III. SPECIAL CONDITIONS

Depreciation—The contractor must bear the cost of the depreciation in value of any rejected material due to test pieces being cut therefrom.

Rejected Material—The contractor must not supply any material which has previously been rejected by any Government department, without giving full written particulars of the previous rejection to the inspector who is inspecting to this specification.

Reels for Cable

S. A. E. Recommended Aeronautic Practice



Diameter of Cable	1,000 Feet				3,000 Feet				5,000 Feet				10,000 Feet			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
1/32	12	4	8	1⅛	12	4	8	1⅛	12	4	8	1⅛	16	4	10	1⅛
1/16	12	4	8	1⅛	12	4	8	1⅛	16	4	10	1⅛	16	7	12	1⅛
5/64	12	4	8	1⅛	16	4	10	1⅛	16	7	12	1⅛	16	10	8	1⅛
3/32	12	4	8	1⅛	16	4	10	1⅛	16	7	12	1⅛	16	10	8	1⅛
7/64	16	4	10	1⅛	16	7	12	1⅛	16	10	8	1⅛	18	10	8	1⅛
1/8	16	4	10	1⅛	16	7	12	1⅛	16	10	8	1⅛	24	10	10	1⅛
9/64	16	7	12	1⅛	16	10	8	1⅛	24	10	10	1⅛	24	16	10	2⅛
5/32	16	7	12	1⅛	16	10	8	1⅛	24	10	10	1⅛	24	16	10	2⅛
3/16	18	7	12	2⅛	18	10	8	2⅛	24	10	10	2⅛	24	16	10	2⅛
7/32	18	7	12	2⅛	18	10	8	2⅛	24	10	10	2⅛	32	20	16	3⅛
1/4	18	10	10	2⅛	24	10	10	2⅛	32	18	16	2⅛	36	22	18	3⅛
5/16	18	10	10	2⅛	24	10	10	2⅛	32	18	16	2⅛	36	22	18	3⅛
11/32	18	10	8	2⅛	32	16	16	2⅛	32	20	16	3⅛	50	16	26	3⅛
3/8	18	10	8	2⅛	32	16	16	2⅛	32	20	16	3⅛	50	16	26	3⅛

Dimensions given in inches.

Round solid high strength steel wire is to be shipped in coils or bundles protected with waterproof wrapping of paper.

In making racks for the above reels allow 4 in. greater width than the traverse specified above.

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

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Gasoline and the Coal Shortage

MOST of the country's present difficulties are traceable to insufficient transport facilities. The coal shortage is due to the lack of a sufficient number of cars and of locomotives to haul them, and the scarcity of coal is at the bottom of many other troubles.

Owing to the limitations of our transport facilities it is plain that no obstacles should be placed in the way of producers of means of transport, including both passenger and commercial cars. In speaking of means of transport in a national sense we generally have in mind only the railroads, but the automobile and motor truck are coming to be a very large factor in interurban transportation. According to the N. A. C. C. the passenger-miles of automobile travel last year was equal to the passenger-miles of railroad travel, which permits of the conclusion that the automobile relieved the railroad of a great amount of passenger traffic.

Similarly the motor truck. Previous to the war its field outside of urban haulage was limited to transportation between neighboring cities but under the stress of war conditions and as a result of the unprecedented congestion in freight traffic practically all distance limits have been removed, as indicated by the fact that trucks are used regularly for transporting tires from Akron to Boston. It is not claimed that the motor truck can compete with the railroad in this work on an economic basis. The question in this instance is not how to get the goods to their destination at the least expense, but how to get them there, and the motor truck furnishes the answer.

With the great demand for transport facilities motor trucks will undoubtedly be more and more impressed into long-distance service, and passenger cars will be limited to strictly utilitarian and necessary uses. Suggestions have repeatedly been made that automobile traffic should be limited legally in this country, the same as it has been in England and France, but such proposals entirely disregard the difference in conditions here and abroad. England and France cannot keep their automobiles going because they have no native fuel; all of their motor fuel must come from the United States or other countries still farther away, and as the shipping tonnage is taxed to the utmost by the more direct essentials, food and munitions, fuel cannot be brought across in sufficient quantity.

In this country there is no present motor fuel famine. All our oil wells are running and the refineries producing gasoline at a rate never attained before. Owing to the lack of storage facilities the gasoline must be used practically as produced. The widespread use of gasoline as motor fuel helps to greatly reduce the demand for coal and thus to relieve the coal shortage. Our civilization requires the use of great amounts of power. Millions upon millions of horsepower are produced in gasoline engines, and if we could not use these engines we should have to require a great deal more coal-consuming steam plant. Therefore, there must be no restriction on the production of motor fuel and on the rational use of same.

The Motor Boat Show

ANOTHER one of the automotive industries is this week holding its annual national show—the motor boat industry—in Grand Central Palace. Some pride is taken in the fact that in spite of the war a very creditable exhibition has been staged. True, the show is not as representative of the industry as were its immediate predecessors, but there are very good reasons for the absence of some well-known firms, which are so loaded up with Government orders that they had absolutely no inducements to bid for private business. Then, the list of small engine makers seems to be getting shorter year by year, probably because competition by the real manufacturers is proving too much for them.

Large engines of the six and eight cylinder types are becoming more numerous each year. The marine 8-cylinder engine is different from the "automobile eight" in that it is of the vertical type with all cylinders in line. There is not sufficient room in a boat for a 90 deg. Vee engine, while there is plenty of room in a lengthwise direction. All of these large engines are now provided with electric

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starters and with an electric lighting system, the starters and generators being of exactly the same type as carried on automobiles, but in most instances of larger dimensions. The air starter of former years seems to have been entirely abandoned. The newness of this electrical equipment in marine practice is painfully evident in the makeshift mountings found on many engines. Undoubtedly a few years hence the electric starter and generator will be fully provided for in the crankcase design and not bear evidence of their installation having been an afterthought.

In engine design there is a tendency toward smoother exteriors and the complete enclosure of all moving parts. Enclosed flywheels are not new in marine practice, but this year they are more numerous than ever before. The lowering in the grade of fuel has confronted marine motor designers with the same problem as automobile designers and combination manifolds are beginning to make their appearance. In this respect marine engine practice seems to lag far behind automobile practice, which may possibly be explained by the fact that the average motor boat is used only in warm weather and its engine never needs to be started in a zero atmosphere.

Magnetos Retain Their Hold

In spite of the widespread adoption of electrical equipment marine engine builders faithfully adhere to the magneto for ignition. When battery systems are used they are merely auxiliaries for starting and for emergencies. Many large engines are provided with two point ignition and one even has four-point ignition, there being two two-spark magnetos and each cylinder carrying four spark plugs.

The unit power plant idea has secured a very firm hold in the marine engine industry. That is to say, the engine and reverse gear are now built into a single unit so that all chance of disalignment of bearings is eliminated. With the usual practice of having the flywheel in front this can be done without wasting material in a bell-housing, though, as stated above, flywheel housings are also coming into use.

Marine engine designers are also working toward more silent operation of their engines. To this end they are adopting helical gears for camshaft and accessories drives, enclosing the valve mechanism, reducing tappet clearances, lightening valve reciprocating parts, enlarging camshafts and giving them a better support by using larger or more advantageously located bearings. Owners of racing boats do not mind the noise, but on cruisers silent operation is as much appreciated as on a touring car.

It is a gratifying experience at each succeeding motor boat show to note how the obsolete, poorly designed and crudely built engines are gradually disappearing, and engines of better design and more workman-like finish are taking their place. The marine engine industry is in a state of evolution; real engineering is taking the place of rule-of-thumb methods and real manufacturing methods are superseding jobbing shop standards.

The Garabed

A MYSTERIOUS invention or discovery has been occupying the attention of Congress for some time now. Pursuant to a joint resolution adopted by both houses of Congress a demonstration is to be made by the inventor before a committee of five scientists, and in case the latter are convinced of the merits of the invention, the Secretary of the Interior will secure an assignment from the inventor for its exclusive use by the Government.

In the resolution the new device is referred to as a free energy generator. This term is entirely new. The law of the conservation of energy teaches us that energy, like matter, is indestructible—that it can neither be generated nor destroyed—and "energy generator" therefore is a rather radical term. Of course, we have power generators, but this is an entirely different thing, as power is merely a manifestation of energy.

"Free energy" is somewhat confusing; we suppose it is intended to mean energy without cost. As a matter of fact, all sources of energy at present in use are free in one sense or another. The wind that turns windmills and propels sailing vessels is absolutely free; the water of our great falls, from which so much power is derived, finds its way to the falls without human guidance and therefore occasions no expense. Coal and oil are stored away in the Earth's crust and need only to be brought to the surface.

It is in adapting these sources of energy to our particular needs that expense arises, and it then often turns out that what at first sight seems to be the least expensive of all powers is the most expensive when everything is considered. Take, for instance, the case of wind power, which on casual consideration seems absolutely free. Yet ships propelled by wind power have found it impossible to compete with steamers consuming coal that at the wharf usually has to be well paid for. Evidently, therefore, though the wind itself is absolutely free, wind power has not proved the most economical in this case, simply because with it not the same results are obtainable as with steam.

Just what claims the inventor makes for the Garabed we do not know—they are not disclosed in the house resolution—but unless the new source of energy at least equals coal and petroleum in its economical possibilities it will hardly play an important role in the engineering world.

Usually Congress is rather lethargic in giving recognition to scientists and inventors. Now that it has decided to give a special hearing to an inventor, who apparently claims to be able to supply power more cheaply than is possible by any known method, it is no wonder that the curiosity of the business world is roused to a high pitch, though those who have had extensive experience with inventors are still inclined to be skeptical. No one at all familiar with mechanical science looks for a solution of the so-called perpetual motion problem, a phantom that has been chased by inventors for centuries, and for which "free energy" seems to be only another less discredited name.

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□ Latest News of the

No Interference With Chicago Show

Neither Weather, Freight nor Fuel Will Seriously Affect Coliseum Exhibit

CHICAGO, Jan. 23—By telegram—The unprecedented weather conditions and the closing regulations of the Fuel Administrator are not going to interfere seriously with the annual Coliseum automobile show. It is probable that the show will be closed on Monday in accordance with the fuel regulations, although nothing has been definitely decided even at this date. It is probable that the building will be closed completely on Monday as well as on Sunday. There is a possibility, however, that the doors may be opened on Monday to dealers only, although the building will not be heated and possibly will not be lighted. Manager Miles intends to live up to the spirit and letter of the order and probably will not even burn the lights on Monday whether the doors are open or not. Inasmuch as the windows are completely obscured by decorations he feels little advantage is to be gained by opening the doors even to the dealer. The show therefore will be open to the public Saturday and from Tuesday to the following Saturday.

The tie-up of transportation is not seriously affecting exhibits, as a larger percentage of exhibits is now on hand than at this period of week before the opening in previous years. Manufacturers instead of sending all their cars from the New York exhibit to a greater extent have dispatched them from home factories, thus saving time and railroad charge.

Despite the traffic congestion, the fuel conservation order, and other abnormal situations, prospects for a good show from a business standpoint are bright. As usual the Chicago show will be the business show of the year and it is almost certain that it will exceed the recent exhibition in New York from the standpoint of business done and possibly also from the standpoint of attendance.

Decorations have a distinctly patriotic note, the feature of which is an art glass American flag 50 by 20 feet and flags of America and her allies from the main part of scheme of embellishment of the Coliseum. Of the 350 exhibitors 258 are displaying accessories and parts and 92 manufacturers are showing 400 cars and chassis. Three cars not shown at the New York exhibition will be on display—Comet, Pan-American and Maibohm. The Deering-Magnetic will be at the Salon. There will be more dealers' meetings and conventions than at New York, the most important of which is the war dinner at the Society of Automotive Engineers, at which 1500 people will be present.

—

Urge Use of Trade Acceptance on Government Work

NEW YORK, Jan. 22—The American Trade Acceptance Council, of which Lewis E. Pierson is chairman, is urging that authorities in Washington insist upon the use of Trade Acceptance by manufacturers doing government work. The council would like the government to adopt the policy of refusing to approve advance payments until the applicant has availed himself of his own credit possibilities by using the Trade Acceptance in the purchase of raw materials. It is pointed out that the government cannot itself pay for goods on the Trade Acceptance plan because of legal obstacles.

—

Government Help for Small Makers

DETROIT, Jan. 22—Small manufacturers in this vicinity who have been willing to go into war work but have not been able to finance themselves in changing over from their customary lines, have been informed that they will be financed by the U. S. Treasury. Lieut.-Col. Edward Clifford, one of the three members of the War Credits Board, is now here to describe such credit arrangements.

When a concern that has a contract for war supplies has shown the board that it needs financial assistance it will receive the money without delay, although the board does not act in any sense as a bank. Colonel Clifford states that it is only when the manufacturer has reached the point where financial assistance is needed in addition to his banking lines, that application for advance payment for his goods should be made to the board.

—

Detroit Will Recruit Motor Mechanics

DETROIT, Jan. 21—It is expected that a considerable percentage of the two regiments of motor mechanics needed by General Pershing will be recruited from Detroit. The Detroit Automobile Club is co-operating in securing the right kind of men for this work. The two regiments must be filled by Feb. 1. The request for these men was forwarded to H. G. Batchelder, executive chairman of the A. A. A.

Automobille mechanics capable of working on high grade gas engines are desired. About 60 per cent of the men will be made non-commissioned officers.

Fuel Situation Not Improved

Five-Day Shut-Down Fails to Relieve Shortage—Labor Problem is Serious

NEW YORK, Jan. 24—Following the general closing down of industries following Fuel Administrator Garfield's order, conditions are quieting somewhat and a canvass reveals that the order has not resulted in the increase in fuel that was hoped for and that freight conditions have not materially improved. Following are a number of telegrams which give the situation at the present moment:

DETROIT, Jan. 23—Net result of 5-day shutdown was diversion to domestic users of 105 cars of coal. In spite of this, unfilled domestic orders are 60 per cent more to-day than they were at the beginning of shutdown period. Besides this no headway has been made toward opening free passages for empty coal cars over roads south of Toledo, and all indications point toward a continuance and even an intensifyig of existig shortage.

Daily average of coal for 5 fuel holidays arriving in Detroit was 563 cars. This is about equal to normal conditions and showed that shutdown did not increase coal receipts as expected. Eighty per cent of coal coming through Toledo gateway is consumed in Detroit, remainder going to other sections of Michigan, so that all sections suffered proportionately. Needs of city are 700 cars daily, so that receipts have been 36 per cent below requirements. Detroit Edison Company, which furnishes most of plants with power, reported a saving of 40 per cent or 850 tons on Monday, as compared with normal days.

One of the biggest problems here has been to get the men engaged in war work back to their places. It was feared for a considerable time by plants which have been forced to close that the companies engaged in war work would hire the men who had been temporarily thrown out of employment by the edict, thus making them short in lines where there is an active demand for labor. This has not been done, however, to any extent.

Manufacturers are making every effort to speed up production in an effort to make up in some degree for the curtailment of the last 5 days, and it is very probable that big shifts of men will be employed on overtime work.

INDIANAPOLIS, Jan. 23—Conservative estimates to-day placed the number of men laid off from work in atomobile factories at from 2500 to 3000. As a result of exemptions from the order to companies engaged in manufacturing motors and trucks for army about 4000 men were kept working; about 3000 men engaged in work subsidiary to the manufacture of cars were laid off. The Weidley Motor Co., engaged in manufacturing motors for the Cleveland Tractor Co., and the Lyons-Atlas Co., engaged in manufacturing trac-

(*Continued on page* 246)

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Automotive Industries

May Concentrate on Liberty Engine

Plane Building May Be Done Abroad—Doubt Efficiency of Drastic Fuel Order

WASHINGTON, Jan. 24—Howard E. Coffin, head of the Aircraft Production Board, in an interview yesterday stated that in the event of scarcity of tonnage the United States would manufacture only Liberty engines and parts, leaving to foreign governments the production of planes, for which they are well equipped. He also stated that the aviation departments of the United States Government which, only 3 months ago contained but 330 men, now include 90,000 men. Coffin states that excellent progress is being made with aircraft work and that planes are being supplied our men in France and England on foreign contracts.

The fuel order has aroused considerable speculation and several high officials who favored the order are now in doubt as to whether it has accomplished the hoped-for result. There are rumors that a similar order may be issued again in the near future for another five-day heatless, workless period. It is stated also that the single heatless Monday for the next 9 weeks may be curtailed by March 1.

—

Industry Calls Washington Conference

WASHINGTON, Jan. 24—There is to be a special meeting of the directorate of the National Automobile Chamber of Commerce and the Motor and Accessory Manufacturers' Association here to-day. The exact purposes of the meeting are unknown but it is understood that there will be conferences between representatives of the automobile industries with Director of Railroads McAdoo and Fuel Administrator Garfield.

—

Class AA Truck Nearly Ready

TOLEDO, Jan. 23—Special Telegram—The Class AA Quartermaster's truck which is being assembled here at the plant of the Willys-Overland Co. is completed except for the front and rear axles which are due to arrive from the American Ball Bearing Co., Cleveland, tomorrow. The engine and gearset are in and the frame is up on wood horses. Assembly was started two weeks ago and all parts are going together nicely.

—

Continue Copper Price at 23½ Cents

WASHINGTON, Jan. 24—The President has approved the recommendation of the War Industries Board that the maximum price for copper, which was fixed on Sept. 21 at 23½ cents per lb., be continued under the same conditions until June 1, when another revision may be made. Following the action of the War Industries Board on Sept. 21, copper producers met in New York on Sept. 28 and formed the Copper Producers' Committee on which is represented all copper producers. This committee is at present handling the entire distribution of copper, both foreign and domestic. In 1916 the amount of smelter copper produced was 1,942,776,309 lb. as against 1,888,395,945 in 1917, which is a decrease of 54,380,364 lb. Refined copper, on the other hand, increased in 1917 by 50,240,606 lb., the 1917 figure being 2,350,240,606 lb. as against 2,300,000,000 in 1916. Prior to the fixation of the price at 23½ cents copper had been selling at from 26 to 27 cents.

—

Joy to Retire from Lincoln Highway Presidency

DETROIT, Jan. 23—Henry B. Joy will retire from the presidency of the Lincoln Highway Assn., and it is rumored that F. A. Seiberling is slated as his successor. A meeting of the association will be held Saturday, at which the members will talk over the advisability of continuing road work in Utah and Nevada. Seiberling contributed $100,000 for this work, John N. Willys $50,000 and Carl Fisher $25,000.

—

N. A. C. C. Wants Better Export Service

WASHINGTON, D. C., Jan. 18—The National Automobile Chamber of Commerce through its general manager, Alfred N. Reeves, has asked for improved export service from the Department of Commerce. C. P. Carter, Assistant Director of Foreign and Domestic Commerce, in consequence, is arranging to provide more complete business information of all foreign countries to the automobile industry. Mr. Reeves is preparing a list of the kind of information required, including road conditions, financial conditions, gasoline supply, motor supplies markets, kind of people who may be secured as agents, methods of business as regards cash or credit, and so forth. As soon as this list is compiled Mr. Carter will secure the desired information and will endeavor in the future to frequently supply the industry with additional data along the same lines.

—

Church-Ward Leaves A-B-C Starter

DETROIT, Jan. 23—Alexander Church-Ward has relinquished his interest in the A-B-C Starter Co. and is no longer connected with that concern. At present he is engaged in consulting work of an electrical engineering nature.

Trucks Might Carry Ship Parts

Thousands of Vehicles Driven Overland Could Take Parts from 1600 Makers

WASHINGTON, Jan. 22—The thousands of war trucks to be manufactured in the great manufacturing zone of the Great Lakes might be utilized to advantage when being driven overland from that region to seaport to carry smaller parts needed in our ship building program. The original plan of carrying only spare parts in these trucks can readily be modified to embrace the urgent shipbuilding program.

For example: There are 200 companies in Detroit manufacturing parts of one kind or another that find a place in our ship-building program. In Michigan there are 400 such companies. There are more than 1600 in the five states of Michigan, Ohio, Indiana, Illinois and Wisconsin, all manufacturing small parts for shipping, and many of which might be transported overland in our war trucks.

It will be an example of that necessary war efficiency and co-ordination of efforts if co-operation along the following lines might be had.

The Quartermaster Corps instructs all its truck builders to direct the trucks en route to load and carry the parts needed by the shipbuilders.

The Highway Transport Committee creates routes so that the Quartermaster trucks can leave the various factories in which they are made, travel to the factories making ship parts and thence to the eastern seaboards with the least delay.

The trucks being manufactured for other divisions of the army exclusive of the Quartermaster Corps and including such as the Signal Corps trucks could also be used in such a plan as this.

The Shipping Board arranges with its manufacturers to deliver parts to Quartermaster trucks.

—

No New Liberty Engine

WASHINGTON, D. C., Jan. 22—The Aircraft Production Board declares that the story of a new Liberty motor which is being designed to surpass the present Liberty motor is entirely without foundation. The story has appeared in the general press throughout the United States and was to the effect that new mechanical innovations were to be used and that the present Liberty engine would be inferior to the new one. Howard E. Coffin says that the report is to be entirely discredited and has no foundation.

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490,000 Vehicles in Great Britain

Scarcity of Fuel Puts 80% Out of Commission—Motorcycles Number 200,000

LONDON, Jan. 23—*By Cable*—There are approximately 490,000 motor vehicles in Great Britain to-day made up as follows:

Trucks, including delivery wagons	40,000
Automobiles	250,000
Motorcycles	200,000

These figures include vehicles in government use as well as those in private service. A considerable percentage of these vehicles are not in operation, due to the scarcity of fuel as well as legal restrictions. It is estimated that the percentages of these vehicles not in use, due to these causes, are:

Trucks, including delivery wagons	10% idle
Automobiles	80% "
Motorcycles	80% "

These figures are not official, but are the best estimates obtainable. It is difficult getting the exact figures because annual registration of vehicles is not required and hence there may be many so-called dead vehicles included in these figures. The percentages of vehicles not permitted to operate are substantially correct.

—

Detroit Sees Sales Boom

DETROIT, Jan. 19—Detroit's Seventeenth Annual Automobile Show, and in many respects the best ever held here, opened to-day in the new Overland building. Three floors have been utilized to display a very representative line of automobiles, trucks and accessories. There are 100 exhibitors, fifty of whom are showing passenger cars, twenty are showing trucks, and the remaining thirty, accessories. There are 230 cars on the floor. The show is held under the direction of the Detroit Automobile Dealers' Association and the exhibit space totals 75,000 sq. ft.

Detroit and the territory surrounding it is going to be one of the greatest buying centers in the United States during the coming year. It is estimated that due to war work the amount of money spent in local industrial establishments will be 300 per cent greater in 1918 than it was in 1917. Michigan, the automobile manufacturing center, has already taken a prominent place in the airplane industry, and under the spur of government needs for the prosecution of the war, great plans have already been established to manufacture airplanes and airplane parts, so that this state is well on its way to rank first in the United States in airplane production.

The Lincoln Motor Co. rapidly nearing completion, promises to be the largest plant in the country for the making of Liberty engines. The Ford Motor Co. is not only making in excess of 100,000 airplane cylinders, but is also making the Liberty engine complete. The furniture factories of Grand Rapids have recently pooled their facilities for the manufacture of airplane frames, and propellers. The Fisher Body Co. of Detroit is rushing to completion a 10-acre plant for the manufacture of airplanes and has already finished its first complete production plane. The Anderson Forge & Machine Co. is making crankshafts for the Liberty engine.

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Factory Efficiency Discussed

CHICAGO, Jan. 19—The fundamental principles underlying factory reproduction and motion pictures illustrating the rigorous tests to which the Holt caterpillar tractor was subjected to by the various departments of the army, constituted last evening's program of the Mid-West section of the Society of Automotive Engineers.

F. A. Carlisle in his paper on "Efficiency in Factory Reproduction" contrasted the present-day methods and workmen with those of former years in regard to accuracy, speed, etc., concluding that the present-day workman was made more efficient than the old craftsman by reduction of waste motion, proper tools, less fatigue and in some instances even his social well-being was considered, all of which tend to promote speed and accuracy in production. In closing, the necessity of the planning department to facilitate production in the correct amount and at the correct time was discussed.

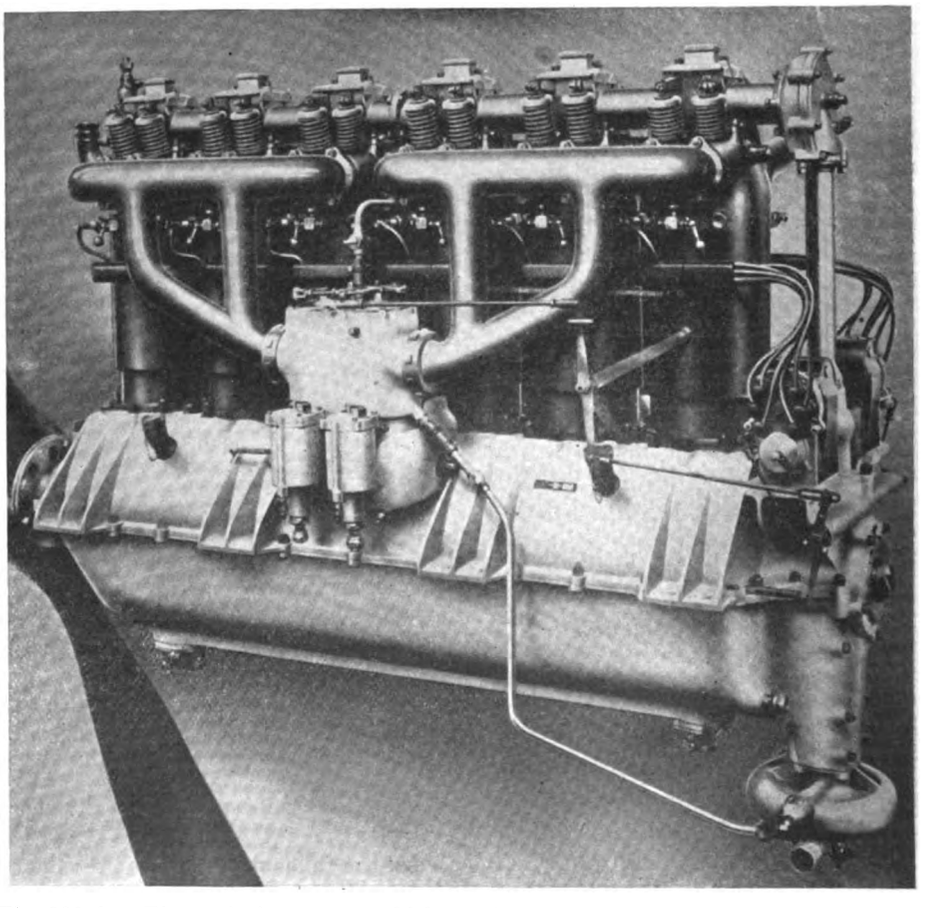
New Altitude Record Made by Italian

Lieut. Brak-Papa in Sia-Fiat Biplane Climbs to Height of 23,048 Feet

TURIN, ITALY, Dec. 22—On the military aerodrome in this city Flight Lieutenant Francesco Brak-Papa has established a world's height record with one passenger by climbing to an altitude of 23,048 ft. in 1 hr. 3 min. The machine, a Sia-Fiat biplane built in the shops of the Fiat Automobile Co., carried a useful load of 792 lb.

The climb was made at the following rate: 3280 ft. in 2 min. 30 sec.; 6562 ft. in 5 min.; 8942 ft. in 9 min.; 13,123 ft. in 15 min.; 16,400 ft. in 24 min.; 19,685 ft. in 37 min. 30 sec.; 21,325 ft. in 45 min., and the maximum height of 23,048 ft., as stated, in 1 hr. 3 min. The previous record, which was also held by Lieutenant Brak-Papa, was 21,161 ft.

The motor with which the record flight was made is a standard six-cylinder vertical Fiat with a cylindrical capacity of 1324 cu. in. and developing 300 hp. The motor has four valves per cylinder and direct mounted propeller. Cylinders are of steel with welded-on sheet steel water jackets. The same type of motor is used by the American army in France.



The 300 hp. Fiat aviation motor which established the passenger-carrying height record of 23,048 ft. in 1 hr. 3 min.

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French War Trucks Aid Business

Army Convoys Carry Troops in One Direction and Merchandise in Opposite

By W. F. Bradley

PARIS, Dec. 22—In order to assist as far as possible to relieve the shortage of freight, the French army transport service undertakes the haulage of privately owned goods under certain circumstances. As examples, the town of Lyons, 300 miles southeast of Paris, receives large numbers of trucks and automobiles from the Lyons and Italian factories, and has to equip these vehicles and send them out to the front or to the neighborhood of the capital. It is now the general plan to send these truck convoys to Paris by road and to accept general freight for them. The public is informed from one to two weeks in advance of the departure of a convoy, the available tonnage, and the date of reception of the goods to be hauled. The price charged is 6 cents per kilometric-ton, packages not to exceed 141 cu. ft. each, and load to be not less than half a ton for any one destination or consignee. Goods are accepted for three towns en route, Chalon-sur-Saone, Auxerre and Fontainebleau. On reaching Paris the trucks go direct to the state aviation factory, where goods are unloaded. They must be called for at this place by the persons to whom they are consigned.

A similar system of public haulage by army trucks has been in force for some time between Havre and Paris and St. Nazaire and Paris, the respective distances being 120 and 250 miles. American trucks are used for this work. Formerly all these trucks were brought up by rail, then by road empty, for the army rarely had any freight to give them. By accepting commercial freight the railroads are relieved and goods are brought up with the least possible delay.

Modern Marine Engines at Motor Boat Show

NEW YORK, Jan. 22—The fourteenth annual motor boat show was opened here on Saturday last at the Grand Central Palace by the National Assn. of Engine & Boat Mfrs., of which John J. Amory is president. The exhibition occupies the ground floor and second floor.

Among the engines shown may be found all types from the small single cylinder outboard motor designed to be attached to canoes, to racing engines of over 300 hp., examples of the latter type being shown by the Duesenberg Motors Corp. and by the Murray & Tregurtha Co. In the Duesenberg exhibit is an eight-cylinder patrol model 360 hp. marine engine and a six-cylinder patrol model 260 hp. marine engine; the Murray & Tregurtha Co. exhibit a 300-400 hp. six-cylinder engine with double valves in the head. The latter has a bore of 7¼ and a stroke of 9 in. and is fitted with two two-spark magnetos and with four spark plugs in each cylinder.

A considerable number of marine engine manufacturers and motor boat builders are engaged in Government work on submarine chasers, motors and equipment of various sorts, and some of the engine builders also are manufacturing aircraft engines. The Duesenberg Co. shows two types of airplane engines, the four-cylinder type already described in these columns and a twelve-cylinder 300 hp. type.

French Engineers Plan Congress

To Be Held at the Sorbonne, Paris—Paper on Industrial Questions to Be Read by Lumet

PARIS, Jan 3—The civil engineers of France are to hold a congress at the Sorbonne, Paris, in March. The third section, which covers the entire question of transportation, has one sub-section dealing with the automobile industry. M. Lumet, who before the war was engineer of the laboratory of the Automobile Club of France, and who will be remembered as the first officer sent to America to purchase army trucks for the French forces, will present a paper dealing with "Industrial Questions: Manufacturing, Standardization, Methods of Work and of Production." Henri Cezanne, who in peace days was general manager of the Paris Automobile Salons, and is still general secretary of the French Automobile Manufacturers' Association, has been scheduled to read a paper entitled "Commercial Questions: Sale, Exchange, Customs Duties, Taxes, Production Combines."

Other papers will be read as follows:

"Best Methods of Developing the Use of Internal Combustion Motors in the Merchant Marine Service," by M. Lumet.

"Formation of Engineers and Technical Employees for the Aviation Industry," by Colonel Roche.

"Aviation Motors," to be dealt with by a commission of which M. Soreau will be the president.

"The Possibilities of Aviation After the War," by Colonel Espitallier.



French automobile column traveling by road from the French to the Italian front. Note that each truck has a trailer. In every convoy of 20 trucks one trailer is a workshop and another a kitchen

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Canada Has 199,302 Cars and Trucks

1917 Figures Show Great Increase in Registration, Trade and Capital

MONTREAL, Jan. 21—There are now registered in the Dominion of Canada 199,302 cars and trucks. In several of the Provinces registrations are closed on Oct. 1, and in others the figures will be somewhat increased when full returns are available. There is owned and operated in Canada one car for less than 40 of population, as compared with a ratio of one to 60 shown by last year's figures.

The sale of cars in Canada during 1917 has been marked by a more general distribution throughout the country than in any previous year. Particularly in the West has this been noticeable, but it is apparent that all rural communities have been large buyers, whether due to the increasing measure of prosperity enjoyed by the farming classes, by the intensified good roads propaganda or by the general campaign of motor car education.

There were brought into Canada during the first 6 months of the present fiscal year, April to September, 1917, inclusive, motor vehicles, parts and tires, to the value of $13,144,405. This compares with a total of $17,056,685 for the fiscal year ending with March, 1917, but it will be seen that the imports of passenger cars in the 6 months almost equalled those of the entire preceding year, while the value of commercial vehicles brought in almost doubled, and that of tires imported showed a marked increase.

The record of exports shows a more uneven tendency, the volume for the first 6 months of the fiscal year ending March, 1917, being but slightly in excess of that for the year ending March, 1915. The 12 months ending March, 1916, showed the greatest activity in the Canadian export trade, the figures then going over the $10,000,000 mark, and very closely approximating the value of imports during the same period. The increasing difficulties of transportation, however, seriously interfered with the development of this branch of the business with the result that the succeeding years show a pronounced falling off in the volume of trade.

AUTOMOBILE REGISTRATIONS IN CANADA

Year	Ont.	Que.	N. S	N. B.	P.E.I.	Man.	Sask	Alta.	B. C.	Total
1903	220	.....	....	....	...	.....	.....	.....	.....	220
1904	535	.....	....	....	...	.....	.....	.....	.....	535
1905	553	.....	....	....	...	.....	.....	.....	.....	553
1906	1,176	.....	....	....	...	.....	.....	41	.....	1,217
1907	1,500	254	62	....	...	.....	54	55	175	2,100
1908	1,700	296	45	104	...	412	36	45	263	2,901
1909	2,400	485	69	167	...	662	149	275	504	4,711
1910	4,200	786	148	299	...	1,524	531	423	1,026	8,937
1911	11,339	1,878	228	483	...	2,599	1,304	1,631	2,220	21,682
1912	16,266	3,535	456	700	...	4,770	2,268	2,505	4,289	34,789
1913	23,700	5,452	511	824	26	5,406	4,659	3,773	6,138	50,489
1914	31,724	7,413	544	1,260	30	7,001	8,027	4,728	6,688	67,415
1915	42,346	10,112	971	1,900	35	8,812	10,225	5,832	7,440	87,673
1916	54,375	15,347	1,728	2,986	50	11,953	15,600	9,703	8,576	120,318
1917	84,353	21,702	5,678	5,249	301	17,333	32,500	20,800	11,386	199,302

Definite figures as to the value of the product of Canadian automobile factories are not available since 1915, but an interesting comparison illustrating their growth may be had from the statistics of the Government census of 1910 and the special business census taken in 1916 for the preceding year. This is given in the following table:

Factories.	1910	1915
Establishments	8	8
Capital	$361,272	$3,540,441
Salaries, wages, etc.	903,349	3,427,146
Cost of materials...	3,808,139	16,739,643
Value of product...	6,251,885	24,357,627
Repairs, Accessories, Etc.		
Establishments	11	120
Capital	361,272	3,540,441
Salaries and wages.	76,060	1,152,585
Cost of materials ..	40,893	2,434,197
Value of product....	170,930	4,329,938

There are now 12 automobile factories in operation in the Dominion, and while the number of accessory manufacturers can only be estimated, it is worthy of note that their growth has been most marked during the past three years, and they are now believed to be supplying 20 per cent of the total demand for automobile supplies and equipment within the Dominion. This is, of course, outside of the tire business, which is now almost controlled in Canada for the Canadian trade.

Few Separate Records

Consideration of the manner in which the motor truck business has grown in Canada is rendered difficult by reason of the fact that few of the Provinces have, in the past, kept separate records of the passenger and commercial car registrations. The first record in Ontario is for the year 1916, when 2786 trucks were reported, but this has been increased in the present year to 4590, showing a percentage of increase almost identical with that in the case of passenger cars. Quebec also shows a steady growth in the number of commercial cars registered, having had 384 in 1914, 528 in 1915, 729 in 1916, and 1080 in 1917, so far as has been reported. As in the case of Ontario, the truck registrations are in the neighborhood of 5 per cent of the total, so that it may be assumed that Canada has no less than 10,000 trucks in operation.

The commanding position occupied by the Province of Ontario in the motor car trade is evidenced by the fact that almost one-half of the total registrations are credited to this Province. Perhaps a pronounced factor in this situation is that all of the twelve companies now engaged in the manufacture of automobiles in Canada are located in the Province, and this fact has also served to attract by far the greater proportion of accessory manufacturers. The progress of the good roads movement has also rendered Ontario a very fertile field for the automobile agent, and rural communities have of late become very liberal purchasers.

The City of Toronto is credited with having 17,500 cars in operation, Hamilton with 5000, Ottawa and London with 3000 each, and Windsor with 2500. Outside of these large centers, the distribution is considered to be very even throughout the Province.

In the matter of percentage of increase for the year, the little Province of Prince Edward Island has the lead, having six times the number of cars it had in 1916, when only fifty were registered. This was, of course, due to the oppressive regulations, it being permissible to use cars only on certain days of the week and only on certain roads. But the breaking down of prejudices has been working gradually, and there are now 301 cars on the island, including six motor trucks.

The prairie provinces have also showed up remarkably well, the prosperity of the farmers being responsible for doubling the number of cars in Alberta and Saskatchewan. Manitoba has made almost a 50 per cent increase, while British Columbia has added about 35 per cent to its quota.—*Toronto Globe.*

CANADIAN MOTOR VEHICLE IMPORTS AND EXPORTS

IMPORTS.

	1915	Fiscal years ending 1916	1917
Automobiles	$	$	$ 7,981,177
Motor trucks	.....	.....	423,824
Motor vehicles, all kinds	4,888,704	5,089,349	177,624
Parts	2,166,193	4,550,480	7,200,017
Tires	1,204,457	1,418,279	1,274,043
	$8,259,354	$11,058,108	$17,056,685

EXPORTS.

	1915	Fiscal years ending 1916	1917
Motor vehicles, all kinds	$3,290,234	$ 9,223,813	$ 5,637,465
Parts	607,331	745,015	1,418,299
Tires	278,442	568,274	773,259
	$4,176,007	$10,537,102	$7,829,023

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Receiver Named for Bijur

Assets Exceed Liabilities by $1,100,000—Expect Quick End of Receivership

NEW YORK CITY, Jan. 18—A receiver was appointed to-day for the Bijur Motor Lighting Co., manufacturer of Bijur starting and lighting apparatus, this action being taken by Jos. Bijur, president of the company, after discussing the affairs of the organization with the major creditors. A committee of three receivers has been appointed, and the factory is being operated under this committee. Before the receivership action was taken, a meeting of the creditors, representing merchandise interests, was held, and this committee was of the opinion that the best interests of the creditors would be served by continuing the business, because the balance sheet shows that the company is solvent. The present difficulty, in the opinion of the creditors, has arisen from a large expansion of business, and a lack of working capital.

During the last 4 or 5 months the company has made heavy purchases of machinery, all of which is installed, being operated, and largely paid for. Perhaps the heaviest handicap the Bijur company has had to contend with is the merchandise account, which, in the condensed statement issued by the committee, is placed at $840,652. A year ago the merchandise on hand did not represent one-half this amount, or was $440,000 less than at present. The heavy merchandise account at present is due to reduced shipments of starting and lighting apparatus due to the slack in automobile manufacture. The Bijur company, while accommodating its customers by slowing up shipments in response to their requests, had contracted for its materials at advantageous prices and received them on regular schedule.

Besides several million dollars' worth of back orders for their regular equipment for automobile manufacturers, the Bijur company has orders for thousands of generators for the U. S. war trucks, and large contracts for miscellaneous articles for the Navy and Ordnance Departments. The factory is being continued at normal production on all of its domestic and Government orders. Inasmuch as the present assets of the company exceed the liabilities by $1,100,000 and at the time of its receivership the company had over $200,000 in the bank, and as the business has shown an increasing profit every quarter since its beginning in 1910, the last quarter of 1917 showing the largest profit in the history of the company, it is expected that the receivership will be of short duration.

The receivers appointed by the Court are: Joseph Bijur; Louis V. Hubbard, president of the Taft Pierce Co., Woonsocket, R. I., a director in several banks, and representing the banking interests; and E. B. Wilson, attorney, New York City, representing the creditors.

The Bijur plans for expansion were started in November and December, 1916, and included a new factory, which tripled the previous capacity, new machinery, which was four times greater than the previous amount used, and corresponding increases in organization to care for this expansion, and which was justified by the ability of the concern to execute orders offered to it. The factory was finished March 1, 1917, and is now operating with a force of 1100 to 1200 men as compared with 300 to 400 a year ago.

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Stutz Earns $1,074,778

NEW YORK, Jan. 24—Stutz Motor Car Co. in the year ended December 31 earned net profits of $1,074,778, an increase of 65.6 per cent over 1916.

Output of cars in 1917 was 2207, compared with 1535 in 1916, 1079 in 1915, and 649 in 1914.

Output in 1917 increased 43 per cent, and it is officially stated that the entire maximum output for 1918 has already been sold.

Balance sheet as of Dec. 31 shows current assets of $1,455,098, compared with current liabilities of but $352,912, or a net working capital of $1,102,186. Net quick assets alone, excluding plants, equipment and good will are equal to $14.70 a share. Total selling, administrative and general expenses for the year were but $77,637.

Comparison is made below of the results for the calendar year 1917, with the seven months period ended Dec. 31, 1916:

	1917	1916 7 months
Net sales	$4,483,315	$1,771,328
Cost of manufacture	3,375,980	1,374,066
Gross profit	1,107,334	397,261
Selling and gen'l exp.	77,637	44,747
Balance	1,029,697	352,513
Int. and dis. earned	45,081	28,547
Net profit	1,074,778	381,061

Comparison of the balance sheet as of Dec. 31, 1917, with that of Dec. 31, 1916, follows:

ASSETS

	1917	1916
Fixed assets	$2,560,731	$2,431,603
Cash	252,811	74,059
Receivables	53,816	145,530
Inventory	1,148,470	577,248
Total	$4,015,829	$3,228,441

LIABILITIES

Payables	$317,462	$356,980
Deposits on cars	35,450	17,700
Taxes	6,000	8,500
Reserves	*59,491	31,329
Surplus	3,222,425	2,439,021
Capital at $5	375,000	375,000
Total	$4,015,829	$3,228,441

*Reserve to meet Federal taxation not included, as the amount has not yet been definitely determined.

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Seigle Vice-President of Johns-Manville

NEW YORK, Jan. 22—At the annual stockholders' meeting of the Johns-Manville Co. yesterday, William T. Klauss was elected a director. Other directors were re-elected. At a subsequent meeting of the board of directors W. R. Seigle was elected vice-president. Other officers remain the same.

War Committee for Rubber Trade

To Be Point of Contact Between Government and Industry—B. G. Work, Chairman

NEW YORK, Jan. 22—The Rubber Assn. of America, Inc., has appointed a War Service Committee, representing the entire industry, with the following members: B. G. Work, president of the B. F. Goodrich Co., Akron, chairman; H. S. Firestone, president of the Firestone Tire & Rubber Co., Akron; James N. Gunn, president of the United States Tire Co., New York; G. B. Hodgman, president of the Hodgman Rubber Co., New York; and P. W. Litchfield, vice-president of the Goodyear Tire & Rubber Co., Akron.

Some of the functions of the war service committee will be to act as a point of contact between the industry and the Government; to supply information as to the ability of the industry to serve the needs of the Government in carrying on the war; to supply statistics regarding rubber; to co-operate in the standardization of specifications and products for Government use; to assist in the speedy and efficient production of Government requirements, and to put before the Government the needs of the industry at all times.

To help carry out these functions subcommittees will be formed to represent the various branches of the industry. Among these will be committees on pneumatic tires, solid tires, mechanical goods, medical goods, boots, aircraft, gas defense, reclaimed rubber, hard rubber goods, crude rubber and kindred products, foreign trade, statistics, supplies and reports. There will be technical as well as commercial committees on the various sub-divisions, to insure a balance of attention.

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Bosch Must Pay Rushmore $100,000

NEW YORK, Jan. 21—The Bosch Magneto Co. has been directed to pay Samuel W. Rushmore, inventor of the Rushmore starter, $100,000 for breach of contract in that the Bosch company failed to use the name "Rushmore" in its advertisements of Rushmore starters. According to the contract, the Bosch company was to describe the starter sold as the "Rushmore Starter" or the "Bosch-Rushmore" starter or "System Rushmore," failure to do so involving a penalty of $100,000. Judge Hand has decided that the Bosch company broke its contract and ordered it to pay Rushmore the $100,000. The Bosch Co. will appeal the case.

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Dayton-Wright to Build

DAYTON, OHIO, Jan. 23—The Dayton-Wright Aeroplane Co. will start work shortly on a factory 300 by 600. The structure will be 2 stories and will cost $200,000.

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Boston Would Solve Freight Tangle

Propose 2 Weekly Trains to New England — Discuss Show Postponement

BOSTON, Jan. 19—The possibility of putting the Boston Motor Show back to the last week in March instead of the first, and a plan to have a committee of The Boston Automobile Dealers' Association handle two trains weekly from the motor centers carrying cars and trucks, were discussed at a meeting of the Board of Directors of the organization yesterday. After a full discussion of the matter it was voted that unless something extraordinary happened the present dates would be adhered to, but provision was made for a change if it seemed advisable.

The other matter was outlined by President MacAlman. He stated that he had been informed that there was a possibility of the government shutting down on all shipments of motor cars and trucks from factories to dealers. In addition to that there was talk of a transportation chief being placed in the motor centers to see that every motor vehicle leaving a factory carried something along in the way of parts, tires, etc. In other words, nothing would be allowed to move unloaded. As the government talked of taking over the express companies that avenue would be shut off.

Therefore he offered for discussion the suggestion that the organization consider a plan whereby it would appoint a committee to work with the transportation committee of the Boston Chamber of Commerce and try to have two trains weekly brought to Boston carrying motor cars and trucks. The committee would pledge the government to unload the vehicles on arrival so the freight cars would be available for return shipment immediately.

To Help Government

It was pointed out that this would be a means of aiding the government. If the trains could not be brought to Boston the committee would be satisfied to have them stop at Albany, and men would be there to take care of the unloading. Under the plan the dealers wanting cars would have to deposit with the motor committee the money to release the cars on arrival. No attempt would be made to play favorites, and the requests for space in the trains would be granted according to the receipt of application. The dealers would be given such space as would allow the greatest number to get some cars regularly instead of any one company to get a large number in one shipment.

As Albany is like the neck of the bottle leading to New England, it was felt that perhaps the government would be willing to go as far as that city with trains. By getting at least two a week through it would be possible to take care of a large number of dealers all through the territory.

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Haynes Prices Increased

KOKOMO, IND., Jan. 19—Factory prices of all Haynes models have been increased as follows:

Model	New Price	Old Price
39—4-pass. roadster (formerly Model 37)	$1,825	$1,725
38—5-pass. touring (formerly Model 36)	1,725	1,595
39—7-pass. touring (formerly Model 36)	1,825	1,725
39—Sedan (formerly Model 37)	2,585	2,390
44—7-pass. touring (formerly Model 41)	2,785	2,295

In addition, the following new models are being built:

Model	Price
44—Sedan (12 cyl.)	$3,385
44—Coupe (12 cyl.)	3,335
44—Town car (12 cyl.)	3,985
39—Coupe (6 cyl.)	2.535
39—Town car (6 cyl.)	3.250

The prices of all touring models will be increased an additional $125 on March 1. Cars leaving the factory up to that date will be charged for at the present rate, but after March 1 even if ordered in advance, the new price will hold.

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Fuel Situation Not Improved

(*Continued from page* 240)

tors, received notice of exemptions from the closing orders late Monday.

KANSAS CITY, Jan. 24—Ford assembling plant shut down Tuesday and Wednesday for lack of material. Two hundred and fifty men idle without pay; no shutdown through coal shortage or Administrator's orders.

ST. LOUIS, Jan. 23—St. Louis was not in 5-day suspension district and only one motor factory on the east side was affected. Men here strongly favored shutdown, as their business has been seriously affected by failuse to get supplies from the East.

MINNEAPOLIS, Jan. 24—General resumption of industries to-day. No such shortage of fuel here as in East, and Great Falls, Mont., to-day offered 2000 tons daily. Farm machinery for spring use now exempted and Fuel Administrator wired Washington to know if tractor plants are included.

CHICAGO, Jan. 24—Plants in this territory affected by Monday closing as follows: Stromberg, Elgin and Case closed; Root & Vandervoort closed, but has 80 per cent Government work; Nash, Velie, Nordyke & Marmon open on Government work; Parrett and Waukesha engine all open, former on tractors for spring deliveries, latter on Government work; Diamond T closed, but has Liberty truck orders; Findeisen & Kropf, indirect Government orders, closed; Old Reliable, closed; Wisconsin Motors, Government orders, open; National, closed, except departments on Government orders; Mitchell, Government truck plant open; Emerson-Brantingham, same as Parrett; Hayes Machinery Co., closed; Kissel open on Government work; Haynes closed, but just started on Government work that may exempt them; Four-Wheel-Drive shut down Friday, but resumed operations Monday on Government orders; Holt did not shut down because of Government work; Stutz, closed; Wheeler & Schebler, closed; Prest-O-Lite, open for Government work.

England Protests at Curtailment

Motor Trade Assn. Gives Reasons Why Handicaps Should be Removed by Government

LONDON, ENGLAND, Jan. 1—An additional protest against the enforced curtailment of the automobile industry in Great Britain has been made by the Motor Trade Association, which represents the motor industry in its entirety. The protest sets forth the various reasons why the industry should not be handicapped as it has been, and advances information as to the essential characteristic of the industry in war times. In this connection the protest states:

"The rich man to-day represents the smallest fraction of the total motoring class of England. The vast majority, even of private motorists, use their vehicles for other than purely pleasure purposes. Far and away the largest proportion of motor vehicles are directly or indirectly in use for business and utilitarian purposes. Most of these vehicles are of moderate or low price and power, purchased because they represented economy of transport for persons and for goods."

The protest goes on to show the present numerical comparison between automobiles owned in Great Britain and those owned in the United States, and says that while the population of the United States is only twice that of Great Britain, the number of automobiles employed is five times greater. It follows this up by stating that there is a potential motoring population of England which is equal to several times the quantity of automobiles available.

The protest expresses regret that the automobile industry in England never received the encouragement and fostering facilities that it did in America, and cites that "it should not have been beyond the wit even of statesmen of quite ordinary vision to secure and safeguard sources of fuel supply."

"We therefore suggest," the protest continues, "that the State in its own interest should take the earliest opportunity to reconsider its attitude toward motorists, motoring, and the motor industry.

"The motorists of the country, and the personnel of the motoring industry of the country have made sacrifices equal to any other section of the people. They have rendered that service gladly and thoroughly. They ask for no more reward, or recognition than may properly be claimed by any other body of citizens; but they ask for just that much.

"They protest against being taxed as motorists, after being taxed as citizens, because no other body of citizens is twice taxed in that way. They protest against being dealt with as pariahs, after having rendered special service. They protest against being the only body of road users required, as such, to bear the burden of

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road making and maintenance. They protest against a tax on fuel for vehicles admittedly indispensible to national efficiency.

"The motor trade joins with motorists in all their protest, and adds its own against its plants being commandeered and diverted to other uses without guarantees for the future.

"Without losing sight of causes it emphasizes a fact, which is not at all sufficiently appreciated, namely, that through the complete turning off of supplies the motor trade has been destroyed literally by starvation.

"It protests against the efforts which are continually being made to represent motoring in any form, and for any purpose as nationally reprehensible, and the purchase of a serviceable motor vehicle as an unpatriotic act while purchase of expensive clothing, jewels, cigars, wine, and other less serviceable articles is encouraged."

The protest accuses the government of being directly responsible for the high price of gasoline, and declares that this is double the reasonable market price solely because of national neglect to secure adequate supplies.

—

Spranger Heads Wheel Company

DETROIT, Jan. 19—At the annual meeting of the Spranger Wire Wheel Corp. the following officers were elected: Dr. N. M. Spranger, president; Jacob M. Schaefer, vice-president; William Finzel, treasurer; John F. Reinke, secretary; John A. Lancaster, Frank Spranger, Christopher E. Stein, Fred R. Schmalzreidt and J. Robert Wilkin, directors. J. Robert Wilkin has been appointed sales manager; Albert J. Hall, assistant general manager; Ed. T. Walling, sales manager and director of purchases.

Light Truck Made by Collier Co.

Single ¾-Ton Model to Sell for $885—Fitted with 3 Types of Body

BELLEVUE, OHIO, Jan. 22—The Collier Motor Truck Co. is manufacturing a single truck model—a three-quarter-ton truck fitted with any one of three bodies and selling for $885. Features of this truck are light weight, flexibility and moderate price.

The Collier truck is assembled from standard units and is designed throughout for heavy duty. A 4-cylinder Lycoming engine with a 3¼-in. bore and a 5-in. stroke is used. Conforming with modern practice, the valve mechanism is entirely enclosed and automatically lubricated. The oil is circulated by a plunger pump and is of the positive feed type. Cooling is by a thermo-syphon, a Zig-Zag tube radiator being used.

Among the engine accessories are a Zenith carbureter and a Connecticut ignition system. The electrical system is particularly complete for truck practice, comprising an Auto-Lite starting and lighting system together with a Willard storage battery.

The gearbox and truck are a unit with the engine, a dry plate Raybestos on steel clutch being used together with a selective three-speed sliding gear set. The drive is taken through a propeller shaft fitted with two universals to the three-quarter floating Salisbury rear axle.

Both front and rear springs are semi-elliptic, the former being 37 in. and the latter 50 in. long. These are special electric furnace steel, and carried on hardened and ground spring bolts fitted with grease cups. The wheelbase of the truck is 118 in. and it is mounted on 32 by 4-in. pneumatic tires. The weight complete is 2600 lb.

As stated, 3 types of bodies are offered, each having a loading space of 7 ft. The first is completely enclosed, the second an open express with driver's cab, and the third is a completely roofed express body.

—

Chevrolet Model 490 Prices Advanced

NEW YORK, Jan. 22—The Chevrolet Motor Co. is increasing the price of its 490 model effective March 1. The old and new prices follow:

	New	Old
Touring	$685	$635
Roadster	660	625
Chassis	625	585

—

Field Motor Directors Re-elected

GRAND RAPIDS, MICH., Jan. 18—At the annual meeting of the stockholders of the Field Motor Co., capitalized at $300,000, the following directors were re-elected: Joseph Northoek, Byron E. Parke, Charles E. Hall, John Senler, Sr., and E. A. Field.

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Michigan Fees Total $2,471,270.77

LANSING, MICH., Jan. 19—Michigan automobile revenues for 1917 amounted to $2,471,270.77. This amount was divided as follows: Passenger, $2,175,276; commercial, $161,185; motorcycles, $19,194; manufacturers and dealers, $42,394; chauffeurs, $36,550; transfers, $11,534; duplicates, $21,857, and non-residents, $3,269.

Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co.	48	50	..
*J. I. Case T. M. Co. pfd.	77	79	—10
Chalmers Motor Co. com.	3	6	+2
Chalmers Motor Co. pfd.	..	50	..
*Chandler Motor Co.	72	73	..
Chevrolet Motor Co.	106	110	—2
*Fisher Body Corp. com.	24	34	+1
*Fisher Body Corp. pfd.	73	80	..
Fisk Rubber Co. com.	49	51	+4
Fisk Rubber Co. 1st pfd.	98	103	..
Fisk Rubber Co. 2nd pfd.	60	70	..
Firestone Tire & Rubber Co. com.	98	100	..
Firestone Tire & Rubber Co. pfd.	96	98	..
*General Motors Co. com.	109	111	—4
*General Motors Co. pfd.	81	83	+ ½
*B. F. Goodrich Co. com.	38½	40	—1
*B. F. Goodrich Co. pfd.	94	98	..
Goodyear Tire & Rubber Co. com.	150	154	..
Goodyear Tire & Rubber Co. pfd.	94	97½	+ ½
Grant Motor Car Corp.	2	3	..
Hupp Motor Car Corp. com.	2	3	..
Hupp Motor Car Corp. pfd.	75	83	..
International Motor Co. com.	15	17	..
International Motor Co. 1st pfd.	36	45	+12
International Motor Co. 2nd pfd.	14	17	—3
*Kelly-Springfield Tire Co. com.	42	45	—1½
*Kelly-Springfield Tire Co. 1st pfd.	75	79	—6
*Lee Rubber & Tire Corp.	14	15	..
*Maxwell Motor Co., Inc., com.	25	26	..
*Maxwell Motor Co., Inc., 1st pfd.	57	58½	+ ½
*Maxwell Motor Co., Inc., 2nd pfd.	22	23	+1
Miller Rubber Co. com.	130	140	..
Miller Rubber Co. pfd.	95	98	..
Packard Motor Car Co. com.	88	92	—11
Packard Motor Car Co. pfd.	92	96	..
Paige-Detroit Motor Car Co.	15	17	+1
Peerless Truck & Motor Corp.	16	17	..
Portage Rubber Co. com.	109	111	..
Regal Motor Car Co. pfd.	..	23	..
Reo Motor Car Co.	16	18	..
*Saxon Motor Car Corp.	7	9	..
Springfield Body Corp. com.	..	..	..
Springfield Body Corp. pfd.	..	..	..
Standard Motor Construction Co.	9	10	..
Standard Parts Co. com.	65	70	—5
Standard Parts Co. pfd.	95½	96½	..
*Stewart-Warner Speed. Corp.	46	48	—2
*Studebaker Corp. com.	47	48	—3
*Studebaker Corp. pfd.	91	97	+1
Swinehart Tire & Rubber Co.	16	26	..
United Motors Corp.	20⅝	21	—3
*U. S. Rubber Co. com.	51¼	53	—1
*U. S. Rubber Co. pfd.	94	95	—3
*White Motor Co.	38½	40	..
*Willys-Overland Co. com.	16½	17	—1
*Willys-Overland Co. pfd.	76	78½	—3½

*At close. Listed New York Stock Exchange.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	Bid	Asked	Net Ch'ge
Auto Body Co.	..	9	..
Bower Roller Bearing Co.	19⅜	19⅝	+ ⅛
Chevrolet Motor Co.	105	109	—4
Commerce Motor Car Co.	4	..	..
Continental Motor Co. com.	5½	5⅞	..
Continental Motor Co. pfd.	..	..	..
Edmunds & Jones com.	14	17	—2
Edmunds & Jones pfd.	80	90	..
Ford Motor Co. of Canada	170	178	—25
Hall Lamp Co.	13	14½	..
Michigan Stamping Co. com.	12⅝	13	+ ⅛
Motor Products	..	..	..
Packard Motor Car Co. com.	86	..	—3
Packard Motor Car Co. pfd.	91	93¼	+1
Paige-Detroit Motor Car Co.	15¼	16	+ ¼
Prudden Wheel Co.	14¾	15¼	+ ½
Reo Motor Car Co.	16⅝	16⅞	— ⅛

INACTIVE STOCKS

Atlas Drop Forge	..	32	..
Kelsey Wheel Co.	81	88½	+1
Regal Motor Car Co.	..	26⅝	..

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Industrial Review of the Week

A Summary of Major Developments in Other Fields

Little Effect on Steel Industry of Closing Order

With so large a part of their product, particularly in heavy lines, going to the Government or its Allies, or to plants having Government contracts, the iron and steel industries felt less than others the closing down order of the Fuel Administration. Fresh snows and intense cold combined to aggravate the freight blockades, as the order went into effect, and made more difficult any measure of its effects.

It is estimated that the five days ending Tuesday brought a curtailment of 10 to 15 per cent from the already restricted rate of recent weeks. Probably 70 per cent of the blast furnace, open-hearth steel and coke oven capacity was kept in operation, but all Bessemer plants were down, the Government not buying converter product, and only such rolling mills were run as had been engaged in producing for ships and shells, including plate mills and some structural and boiler tube mills.

Not only is there great perplexity owing to the new priorities in fuel, but some observers see the steel trade drifting into a state of helplessness that bodes no good even for some work considered important to the war. Exemptions from the closing order do not meet the case if fuel needed to keep iron and steel works going has been diverted to uses higher up on the preferred list.

There has been prompt and generally strict compliance with the Garfield order not only by producers but manufacturer-consumers of iron and steel. Blast furnaces were considered exempt, and open-hearth furnaces in many cases produced much more steel than would take care of exempted rolled product, the remainder going into stock ingots. Rolling mill operation was much curtailed.

The steel trade sees the bearing of the week's events on the effort at Washington to have steel production and prices put under the same executive control that now exists in food and fuel, opinion being that the chances of the Pomerene bill have not been helped by the results of centralized power over fuel.

As a result of the country's engrossment with the throwing of millions of workers into idleness the steel market has had fewer transactions than in months.

Some agricultural implement manufacturers have come into the market for early requirements in both soft and hard steel bars, on a scale pointing to large production in the coming season. In the automobile trade a rather more hopeful view is taken, some makers looking for about 50 per cent of their normal output.

Government awards are being made on 4400 cars for use in France.

A New Service

Herewith AUTOMOTIVE INDUSTRIES *supplies for the benefit of its readers a general summary of important developments in other fields of business. This is rendered possible by the editorial co-operation of leading industrial publications which are recognized authorities.*

By compressing the general industrial situation into this form we hope to give our readers a clear and comprehensive idea of up-to-the-minute developments which they could otherwise secure only with considerable expenditure of time and effort.

Some buyers of finished steel for commercial uses have found it easier to place contracts for plates, shapes, sheets and bars, and mills have been rather more inclined to accept export business on which permits have been obtainable.

Comment has been passed on the action of the Navy Department in seeking bids on various products included in the official price schedule, but not among the few on which prices were specifically announced by the President. It does not appear, however, that bidders are actually naming competitive prices in such cases.—*Iron Age.*

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Weather Hampers Coal Distribution

A cold wave—the coldest for the season in many years—descended on the country, particularly the region west of the Allegheny Mountains during the week under review. The low temperatures were accompanied with high winds and in some localities heavy snows. This tied up railroad transportation to a considerable degree, and while causing an increased consumption, particularly of domestic fuel, rendered receipts much lighter than normal. The suffering in some localities was intense. Along the Atlantic seaboard in particular the movement of coal was considerably hampered by ice in the rivers and harbors. Baltimore, New York and Boston have been and are still suffering in no small degree from this cause, while Hampton Roads is not without its troubles of a similar nature. Of course, the cold weather exerted an adverse effect on production, and many mines worked only part time, and in many cases only partly manned because of the storm. Conditions in New England, while probably no better, or but slightly so, than a week or two ago, are probably no worse. The priority order granted this territory of 500 cars per day of bituminous coal is certain to have its effect sooner or later, but this effect can not be expected immediately. On the other hand, it is believed in some quarters that the diverting of this coal to New England will adversely affect industries in New York, Pennsylvania and some of the Eastern states, and considerable protest is heard concerning it. It would appear that domestic shortage has been in many instances considerably relieved. In some localities, however, added inconvenience and no small amount of suffering was caused by the severe weather conditions. The improvement in transportation, which was being shown in some of the coal producing districts was, of course, nullified by the cold wave. It is believed, however, that as soon as the weather moderates for any length of time the transportation tangle can be largely straightened out, and this will doubtless, at least in large measure, relieve the present stringency. The drastic rulings of the Fuel Administration concerning coalless days may also exert a more or less potent influence in this direction.—*Coal Age.*

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20,000 Disteel Wheels for Government

DETROIT, Jan. 23—The Detroit Pressed Steel Co. will build 20,000 disteel wheels for the 1½-ton aviation trucks ordered by the government.

—

Rumney Made Lieutenant

WASHINGTON, Jan. 23—Mason P. Rumney, formerly sales manager of the Detroit Pressed Steel Products Co., Detroit, has received the commission of lieutenant in the ordnance department of the United States Army.

—

Olds Hampered by Freight Conditions

LANSING, Jan. 23—The Olds Motor Works has enough orders on hand to keep the plant running at capacity during the winter months, but due to the fact that deliveries cannot be made business has had to be held over until conditions improve. Oldsmobiles have been driven to Chicago, Toledo, Grand Rapids and Michigan City, where it is possible to get freight cars, and from these points have been shipped to their destination.

—

Paige Profits Over $1,000,000

DETROIT, Jan. 22—Profits of the Paige-Detroit Motor Car Co. for the fiscal year ending Dec. 31 amounted to over $1,000,000, according to a statement at the annual meeting of stockholders to-day. The following directors were re-elected: Harry M. Jewett, Edward P. Jewett, Walter B. Cady, Gilbert W. Lee, Charles B. Warren, Jerome P. Remick, E. D. Stair, Sherman L. Depew, all of Detroit, and George de B. Keim, of Philadelphia. The directors re-elected the officers as follows: Harry M. Jewett, president; Edward P. Jewett, vice-president; Walter B. Cady, secretary; Gilbert W. Lee, treasurer; F. L. Jewett, assistant to president and assistant treasurer.

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Car Supply Worries Wisconsin

Dealers at Tenth Milwaukee Show Discuss Ways of Meeting Demand

MILWAUKEE, WIS., Jan. 19—This is the most momentous year in the history of the motor car trade of Wisconsin, as it is for the entire industry of the United States. With the best year on record behind them, Wisconsin distributers and dealers, gathering in intimate conferences at the tenth annual Milwaukee show, which is the yearly opportunity for frank and full discussion and interchange of ideas and opinions, seem to hold but one thought—Will we be able to obtain enough cars to fill our requirements? It is not a question of a market, or ability to sell that market, but a problem of furnishing enough stocks to supply its demands.

Business conditions similar to those which made 1917 Wisconsin's greatest motor year presage an equally great new year, or a greater one, so far as the number of prospective buyers of motor vehicles is concerned. The public purse still is well filled. The inclination to purchase motor cars is stronger than ever, in spite of advancing prices. It is a conservative statement to say that every motor vehicle that the manufacturers put into Wisconsin during 1918 will be eagerly absorbed and there will remain an aching void if the number offered is not greater than it was in 1917.

At this time the Wisconsin average is approximately one car to every 17 inhabitants, the population of the commonwealth being figured at 2,800,000. In 1916 the number of cars averaged one to every 24 inhabitants. This is not the best showing made by any State in the Union, but it indicates that the growth of the use of motor vehicles in Wisconsin is a healthy one, and selling is not being overdone by any means, with no possible likelihood of saturation of market.

Talks with leading distributers and dealers at the Milwaukee show serve to indicate that Wisconsin's record in 1917 represents an achievement. In the face of some of the greatest difficulties that the motor car trade has ever been obliged to meet, in excess of 10,000 cars were sold in Wisconsin than was predicted at the beginning of last year. The conditions under which distributers and dealers worked during the latter part of the period are too well known and understood to make explanation necessary. Yet the total business of practically every dealer showed a very appreciable gain over 1916.

Wisconsin Registration For Six Years

	1917	1916	1915	1914	1913	1912
Motor Cars	164,531	115,637	79,791	53,161	34,646	24,578
Dealers	2,167	1,970	1,582	1,202	1,393	1,052
Motorcycles	8,479	8,958	8,601	7,880	6,120	4,060
Increase in Motor Cars	48,894	35,846	26,630	18,515	10,068	.....
Percentage of Gain	42	44	50	53	45	.....

22 More M. A. M. A. Firms for Chicago Show

NEW YORK, Jan. 19—The Motor & Accessory Manufacturers' Assn. has added the following concerns to the list of exhibitors at the Chicago Automobile Show:

Air Device Co.....Chicago
F. A. Ames Co.....Owensboro, Ky.
Anderson Forge & Machine Co.....Detroit
Auto Pedal Pump Sales Corp.
456 Fourth Avenue, New York
Bay State Pump Co.....Boston
Carburetor Mantle Co., Inc.
1476 Broadway, New York
Copeman Laboratories, Inc.....Flint, Mich.
G. L. W. Spring Oiler Co....San Diego, Cal.
Gibraltar Jack Co..1902 Broadway, New York
Guarantee Liquid Measure Co.
Pittsburgh, Pa.
McCord Mfg. Co.....Detroit
Menominee Electric Products Co.
1756 Broadway, New York
Miller Transmission Co.
90 West Street, New York
New Era Spring & Specialty Co.
Grand Rapids, Mich.
Wm. E. Pratt Mfg. Co.....Chicago
Rajah Auto Supply Co....Bloomfield, N. J.
Rand Mfg. Co.....Haverhill, Mass.
Rex Mfg. Co.....Connersville, Ind.
Taft-Pierce Mfg. Co.....Woonsocket, R. I.
C. R. Wilson Body Co.....Detroit
Wire Wheel Corp. of America..Buffalo, N. Y.
Woodworth Mfg. Co....Niagara Falls, N. Y.

Will Not Move Girl's Office

WASHINGTON, D. C., Jan. 21—The plans for moving the offices of Christian Girl and the Military Truck Production Board to the Union Depot Office Building has been abandoned. Mr. Girl and his organization will remain at 1421 Eye Street. J. G. Utz, supervisor of inspection and engineering of the board, has removed his offices, however, from Mr. Girl's division to the Union depot. The Military Truck Production Board which, as was recently stated in these columns, now includes the functions of engineering and maintenance as well as production of Liberty trucks, is now known as the Motor Transport Section of the office of the Quartermaster General. This entire section is headed by Mr. Girl as chairman.

French Becomes a Lieutenant

INDIANAPOLIS, Jan. 22 — Lucius French, advertising manager of the National Motor Car & Vehicle Corp., Indianapolis, has resigned to accept a commission of first lieutenant in the United States Ordnance Department. He will be attached to the motor equipment section.

Australia Modifies Import Law

Extends Time for Shipment of Detached Bodies from U. S. Until March 31

NEW YORK, Jan. 23—The Australian government has made an additional ruling with regard to the shipment of automobile bodies from America to Australia and which ruling extends for a period of 3 months the time in which bodies can be shipped from America to Australia without being fitted on their chassis or accompanied by additional chassis.

The new ruling states that bodies may be shipped from America up to March 31, 1918, which is really a 3 months' extension. This information, given out by the Australian Department of Trades and Customs in this city is really the fourth step in the program with regard to prohibition of automobile bodies which started on Aug. 10.

Prohibition Proved Embarrassing

The absolute prohibition placed on the importation of bodies into Australia at that time proved embarrassing because body builders in Australia were not able to cope with the requirements and a famine of bodies was precipitated.

The ruling was modified so that a complete car was admitted, providing two additional chassis were imported at the same time. Now the final ruling extends the period of receiving bodies without any restrictions whatever, providing they are shipped from America prior to March 31.

Double Aviation Appropriation

WASHINGTON, D. C., Jan. 21—Major-General George O. Squier of the Signal Corps and member of the Aircraft Production Board is asking Congress today for $1,032,294,260. This amount almost doubles the $640,000,000 already allotted for the Aviation program, and does not include $105,000,000 additional which is estimated for the needs of the Signal Corps.

Secret Progress Report

General Squier explained behind closed doors the progress already accomplished and gave the figures and technical details showing what it is expected this billion dollars asked for will accomplish. The Aircraft Board operating on a very efficient basis eliminates all red tape in its methods. It is spending an average of $2,000,000 a day and no contractor has ever to wait more than twenty-four hours for payment. Plans conceived in the morning are voted on at noon and put into operation before night. The need for the billion dollars is created by the fact that the money already allotted has for the most part already been converted into fighting material and into the accessories needed for the conquest of the air.

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Men of the Industry

Changes in Personnel and Position

C. S. Thompson Joins Four-Wheel-Drive Co.

CLINTONVILLE, WIS., Jan. 21—C. S. Thompson, Chicago, has been appointed manager of foreign sales of the Four Wheel Drive Automobile Co., Clintonville, Wis., to fill the vacancy caused by the resignation of J. M. Homs, who has become associated with his brother in the exporting business in New York City.

—

H. G. Ault has been named by the General Tire & Rubber Co., Akron, to head its reorganized sales department covering tire accessories and repair materials. Ault has been connected in a similar capacity with the Firestone Tire & Rubber Co.

—

C. W. Whitston has joined the sales force of the Fulton Motor Truck Co., with headquarters in Chicago. Immediately after the Chicago show he will be assigned the position of district sales manager.

—

E. G. Hosler, formerly connected with the Willys-Overland Co., Toledo, as district manager of the mid-western division, has purchased the Overland-Houston Co., Houston, and on Jan. 1 assumed the duties of president and general manager.

—

Harry Cunningham has become associated with the engineering staff of the Maxwell Motor Co., in the war truck department. He was formerly head of the Cunningham Auto Sales Co., Michigan Maxwell distributer, and has passed examination for a major's commission in the non-flying section of the Aviation Corps.

—

W. J. Drumpelman has been appointed assistant sales manager of the Hudson Motor Car Co., Detroit. He was formerly assistant general manager of the Elgin Motor Car Corp., and has been in the sales department of the Lozier, Oldsmobile and Chalmers companies.

—

Frank J. Foley, formerly manager of the mining department of the Westinghouse & Electric Mfg. Co., has become associated with the Edison Storage Battery Co., Orange, N. J. He will manage the mining and traction department, with headquarters in Orange.

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Morton P. Leihy, branch manager of the Locomobile Co. of Missouri has been appointed branch manager of the Nordyke & Marmon Co., Kansas City, to succeed Major A. L. Ellwood, resigned to enter the army service as aviator.

—

C. Floyd Greene has been appointed wholesale director of the E. A. Myers Co., Pittsburgh. He was formerly district manager of the Chalmers Motor Co.

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Nelson Hall has been appointed production engineer of the Fisher Electrical Works, Detroit, manufacturers of electrical starters for Ford cars.

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Franklin T. Chapman, formerly body engineer and assistant to the manager of the Olympian Motors Co., has been appointed assistant general sales manager of E. F. Houghton & Co., Pontiac.

—

D. H. Wetzel, for the last 5 years sales manager of the Mott Wheel Works, Jackson, Mich., has resigned.

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Charles A. Swan, formerly superintendent of the Becker Steel Co. of America, has joined the sales organization of the Hess Steel Corp., Baltimore. He will represent the Hess company in Cleveland and Detroit territory.

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W. H. Knowles, who was formerly chief engineer of the Saxon Motor Car Co., has been appointed superintendent of Hale & Kilburn Co., Philadelphia.

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Shope Made Zenith Sales Manager

DETROIT, Jan. 21—V. I. Shope has been appointed sales and advertising manager of the Zenith Carburetor Co., to succeed A. H. Doolittle, who resigned recently. Shope was formerly New York branch manager of the company.

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DIVIDENDS DECLARED

The Fisher Body Corp. has declared a regular quarterly dividend of 1¾ per cent on the preferred stock, payable Feb. 1 to stock of record Jan. 21.

The Westinghouse Electric & Mfg. Co. has declared the regular quarterly dividend of 1¾ per cent, (87½ cents per share) on the common stock, payable Jan. 31 to stock of record Dec. 31.

The Stewart-Warner Speedometer Corp. has declared the usual quarterly dividend of 1½ per cent on the common stock, payable Feb. 25. Books close Jan. 30 to Feb. 20, inclusive.

A quarterly dividend of $1.25 a share has been declared on the common stock of the Pierce-Arrow Motor Car Co., payable Feb. 1 to stock of record Jan. 17.

The Kelsey Wheel Co. has declared a preferred quarterly dividend of $1.75 payable Feb. 1 to stockholders of record Jan. 21.

The Nash Motors Co. has declared a regular quarterly dividend of $1.75 a share on the preferred stock and an initial dividend of $6 a share on the common stock, payable Feb. 1 to stockholders of record Jan. 19.

The Curtiss Aeroplane & Motors Corp. has declared a semi-annual dividend of 3½ per cent on preferred stock, payable Jan. 15 to stock of record Jan. 2.

New Companies Formed

Latest additions to ranks of Automotive Industries

Star Co. to Make $750 One-Man Tractor

FINDLAY, OHIO, Jan. 21—The Star Tractor Co. has begun the erection of several buildings in which to construct the Star tractor, a $750 one-man machine. The company has been organized with a capital stock of $100,000, with some of Findlay's best known financiers. J. E. Bicknell is president of the corporation; C. A. Schubert, vice-president; C. E. Jordan, secretary; C. L. Casterline, trustee, and F. H. Gerdemann, engineer.

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BARABOO, WIS., Jan. 21—A. S. Lanich, who recently disposed of his garage and retail business, one of the first to be established in Baraboo, Wis., will engage in the manufacture of a line of garage specialties of his own invention, which he has been producing on a small scale for a year or more. The principal article will be an automatic opening and closing device for garage doors, which also is suitable for double-doors of shipping rooms, factories, etc. Several are now in operation in large Wisconsin garages. For the present contracts for casting and machining the parts will be made with commercial foundries until the business assumes sufficient size to make possible the establishment of a complete plant in Baraboo.

—

MILWAUKEE, Jan. 21—The Texas Co., Houston, Tex., producer and refiner of petroleum products, has been granted a charter in Wisconsin and will open a branch in Milwaukee. The capital stock is $5,500,000 and the Wisconsin interest is given at $5,000.

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Chevrolet General Offices in New York

NEW YORK, Jan. 19—The Chevrolet Motor Co. has moved its general offices from Flint, Mich., to Broadway and Fifty-seventh Street, New York. The New York store will be located in the same building.

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Government Work for Haynes

KOKOMO, Jan. 18—The Haynes Automobile Co. expects a Government contract for the manufacture of 4000 motors and 4000 transmissions, entailing a cost of about $3,000,000. These orders would keep the company's plant in capacity operation for 6 months, and the production of pleasure cars probably would be curtailed temporarily, according to representatives of the company.

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Current News of Factories

Notes of New Plants—Old Ones Enlarged

Detroit Shell Buys Springfield Body Plant

DETROIT, Jan. 22—The Detroit Shell Co. has purchased most of the assets of the Springfield Body Co., including buildings, land and all machinery except that used for wood working. The sale, which brought $600,000, does not include stock on hand, accounts in receiving or patents. The sale of patents on the Springfield body is pending, and patent litigation with the Fisher Body Corp., Detroit, has been successfully terminated. Barney F. Everett, trustee of the bankrupt company, states that the general creditors will doubtless receive 75 cents on the dollar. The Detroit Shell Co. is contemplating important additions to the Springfield plant.

Hayes Wheel to Start Production

JACKSON, MICH., Jan. 21—C. B. Hayes has been elected president of the Hayes Wheel Co. The plants of the Jackson Automobile Co. and the Mutual Motors Co. here will be utilized and the company hopes to start production before the middle of February.

Case Tractors for France

RACINE, WIS., Jan. 21—The J. I. Case Threshing Machine Co., Racine, Wis., has received an order from the French Government for 2000 gas-oil tractors with three-bottom plows, and began deliveries during the week. The 2000 machines are of the 10-20 type. A large number of tractors of a heavier and more powerful type also will be built for France. The Case company recently shipped a large order of tractors and separators to Italy.

May Sell Metz Plant

WALTHAM, Jan. 19—The Metz Co. is planning to sell its plant to liquidate its debts. It will retain one part of the group of buildings in which it will carry on Government work. The matter has been under consideration for some time and a decision was reached a few days ago. The company has some 40 acres of very valuable land, and a lot of fine machinery which should bring good prices now with the demand for these things due to war work in New England.

Overland Starts Airplane Work in Elmira

ELMIRA, N. Y., Jan. 21—The Willys-Overland Co. is manufacturing patterns, dies and jigs, and is assembling airplane engines in its plant here. In its Elyria, Ohio, plant, connecting rods, crankshafts and miscellaneous parts are being made.

National Wheels for Fisher Body Corp.

GENEVA, N. Y., Jan. 21—The National Wire Wheel Works, Inc., will furnish the new type Palmer airplane wheel to the Fisher Body Corp., Detroit. This wheel has been adopted by the Government for use on heavy airplanes.

American Forging Quadruples Output

PONTIAC, MICH., Jan. 21—The American Forging & Socket Co. has quadrupled its output in the last 2 years. The socket department has increased its capacity to 1000 sets a day and employs 150 men.

Olson Truck Going Overland

DETROIT, Jan. 22—In spite of the inclement weather, the Swedish Crucible Steel Co. started one of its Olson 2-ton truck units overland for New York. Two and one-half days were required to reach Cleveland. A full load is being carried.

$20,000,000 Contract for Weidely Motors Co.

INDIANAPOLIS, Jan. 21—The contract of the Weidely Motors Co. for the manufacture of $3,000,000 worth of tractor engines for the Cleveland Tractor Co., Cleveland, has been increased to an order of $20,000,000. To meet the increased expense the Weidley company has issued $400,000 in additional preferred stock, making the total amount $500,000. The company expects to construct new buildings at a cost of $150,000. The program calls for 15,000 motors in 1918, 25,000 in 1919 and 30,000 in 1920. The present output is from 15 to 20 daily.

Marmon Enlarging Plant

INDIANAPOLIS, Jan. 21—The Nordyke & Marmon Co. is completing plans for enlarging its plant. Approximately $400,000 will be expended for the new building and $1,500,000 in machinery. The company is working on a government contract for airplane engines.

New Clubhouse of the Engineers' Club of Dayton

(*Continued from page* 223)

lantern booth. This booth is entirely concealed at the rear of the auditorium and is provided with all modern appliances and conveniences.

Four fireproof stairways lead from the auditorium to the ground level which, together with a fireproof building offer the best possible protection to the occupants.

On the third floor are two attractive bedrooms, cheerfully decorated and furnished, which have bath and toilet facilities conveniently located.

A suburban locker room is also provided on this floor for the convenience of those members living some distance from the club building. The whole building is provided with large steel casement windows, affording ample light at all times.

Fuel for Automotive Apparatus

(*Continued from page* 228)

The utilizing in automobile engines of a type of fuel that contains the combined gasoline and kerosene fractions of crude petroleum would certainly double the available supply, and even if all the other agencies working to this end failed the automotive engineers themselves would postpone for a long time the fateful day when their industry will be handicapped by not having available the material to feed engines after they have been produced.

Author's Conclusion

The present paper has developed along rather heterogeneous lines but can be summarized rather simply. The present fuel situation, in spite of the fact that gasoline is high in price and relatively low in volatility, is good. This will be appreciated more fully if war conditions add one more inconvenience to the already lengthy list that the country is experiencing. The newer types of gasolines are not inherently worse than the old; the price is not out of proportion to the price of crude petroleum, and the supply is abundant and well distributed.

In the future it appears that oil producers must secure more crude petroleum and refiners must get greater yields of volatile products out of oil treated. Designers must work toward higher standards of fuel economy and must strive to develop engines that will handle fuels of lower average volatility than the present type. A certain increase in supply of fuel may be counted on from the coal distillation industry and eventually the supply may be derived either from oil shale or from fermentation industries.

In closing it is desired to remind the members of the Society of Automotive Engineers that the present paper makes no pretense of being a last word on the important subject with which it deals.

The various phases of the fuel situation could be discussed at almost infinite length, and it is realized that even the few problems mentioned in this paper have not been given the detailed consideration they deserve. It is hoped, however, that the attention of the engineers of the Society may have been called to some other problems that they can profitably study.

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New Process May Triple Gasoline

NEW YORK, Jan. 21—A new process, which, it is stated, will triple the quantity of gasoline obtainable from crude oil, is said to have been perfected by Dr. A. H. Ramage, who is a member of the American Electro-Chemical Society. It is stated that a company has been formed in Detroit to manufacture and market gasolene produced under this new process, and that Christian Girl, head of the Standard Parts Co., Cleveland, is interested in the company, which also includes A. H. Goss, a Detroit capitalist; E. W. Farr, a Cleveland capitalist; S. A. Fletcher, an Indianapolis banker; H. B. Smith, a Bay City, Mich., banker; F. C. Finkenstaedt, Bay City, formerly head of the National Cycle Co.; H. B. Barhart, head of the White Star Oil Co., Detroit, and A. E. Leopold, a Chicago capitalist. It is stated that the process differs from the Burton process and does not employ the cracking principle. Instead the oil is claimed to be chemically charged as it passes through the stills with the result that the yield of gasolene is tripled. It is said that the owners of the process have offered it to the Government.

Gillette Tires for New York Cars

EAU CLAIRE, WIS., Jan. 21—The Gillette Rubber Co. has been awarded the contract for furnishing the city of New York with all pneumatic tires required for municipally-owned vehicles during 1918. The plant has now reached a daily production of 350 casings and 400 tubes and the output is being increased as rapidly as possible. Reclaimed and waste material is being worked up into rubber heels and other commercial rubber goods, for which the company has gained an outlet for its entire production for some time ahead.

Calendar

ASSOCIATIONS

Feb. 4-7 — St. Louis, American Road Builders' Assn. Convention.

April 18-20 — Cincinnati, Fifth National Foreign Trade Convention.

GENERAL

Jan. 22-24—Montreal, Can., Convention of All Men Interested in the Automobile Industry in Eastern Canada.

Jan. 29-31—Chicago, Annual Convention, Garage Owners' Assn. of Ill., Green Room, Congress Hotel.

SHOWS

Jan. 16-25 — Milwaukee, Wis., Milwaukee Automobile Dealers, Inc., Auditorium. (First 7 days, passenger cars; last 3 days, commercial cars.) Bart J. Huddle, Mgr.

Jan. 18-24 — Des Moines, Ia., Ninth Annual Passenger Car and Second Annual Truck, Des Moines Automobile Dealers' Assn., Coliseum. C. G. Van Vliet and Dean Schooler, Mgrs.

Jan. 19-26—Detroit Automobile Dealers' Assn., Overland Bldg. H. H. Shuart, Mgr.

Jan. 19-26 — New York Motor Boat Show, Grand Central Palace, National Assn. of Engine and Boat Manufacturers.

Jan. 19-27 — Cleveland, Seventeenth Annual. Cleveland Automobile Show Co., Wigmore Coliseum. Fred. H. Caley, Mgr.

Jan. 19-26 — Montreal, Can., Montreal Automobile Trade Assn., Ltd., Almy Bldg. T. C. Kirby, Mgr.

Jan. 21-26—Scranton, Pa., Scranton Motor Trades Assn., Armory. Hugh B Andrews, Mgr.

Jan. 21-26 — Wilmington, Del., Hotel Du Pont.

Jan. 21-26—Buffalo, N. Y., Buffalo Automobile Dealers' Assn., Broadway Auditorium.

Jan. 21-26—Richmond, Va., Richmond Automobile Dealers' Association, First Regimental Armory Henry B. Marks, Mgr.

Jan. 22-26 — Mifflintown, Pa., Automobile Trade Assn. Valley Stream Auditorium.

Jan. 22-26—Baltimore, Md., Baltimore Automobile Dealers' Assn. and Automobile Club of Maryland, 5th Regiment Armory.

Jan. 22-26 — Oklahoma City, Okla., Oklahoma City Automobile Dealers' Assn., 701 No. Broadway. Roy H. Haun, Mgr.

Jan. 23-28—Allentown, Pa., Lehigh Auto Trade Assn., Traylor Motor Co.'s Garage. P. W. Leisering. Publicity Mgr.

Jan. 26-Feb. 2 — Chicago National Show, Coliseum and Armory, National Automobile Chamber of Commerce.

Jan. 26-Feb. 2—Chicago, Salon, Elizabethan Room of Congress Hotel.

Jan. 26-Feb. 2—Bridgeton, N. J., Bridgeton Auto Dealers' Assn. O. P. Riley, Sec.

Jan. 26-Feb. 2—Harrisburg, Pa., Harrisburg Motor Dealers' Assn., Emerson-Brantingham Bldg. J. Clyde Myton, Mgr.

Jan. 26-Feb. 3—York, Pa., York County Auto. Dealers' Assn., Tabernacle. T. F. Pfeiffer, Sec.

Jan. 28-Feb. 2—Manchester, N. H., Academy. Couture Bros.

February — Greensburg, Pa., Westmoreland Automobile Dealers' Association.

Feb. 5-9 — Twin City Auto., Truck, Tractor and Industrial Exposition, Overland Bldg. Minneapolis Auto. Trade Assn. Walter B. Wilmot, Mgr.

Feb. 5-9 — Kalamazoo, Mich., Kalamazoo Automobile Dealers' Assn., Armory.

Feb. 5-9—Binghamton, N. Y., Binghamton Automobile Dealers' Assn., Kalurah Temple. William M. McNulty, Mgr.

February — Peoria, Ill., Peoria Auto and Accessories Dealers' Assn. W. O. Ireland, Mgr.

Feb. 6-9—Lancaster, Pa., Automobile Track Assn., Fidelity Bldg. R. W. Shreiner, Mgr.

Feb. 7-13—Portland, Ore., Ninth Annual Dealers' Motor Car Assn., Auditorium. M. O. Wilkins, Mgr.

Feb. 9-16 — Bronx, N. Y., 2d Battery Armory, Bronx Automobile Dealers' Assn. D. J. Barrett, Mgr.

Feb. 11-17 — Toledo, Terminal Auditorium. Toledo Auto Show Co.

Feb. 11-16—St. Louis, Mo., St. Louis Auto Mfrs. & Dealers' Assn. Robert E. Lee, Mgr.

Feb. 11-16 — Kansas City, Mo., Kansas City Motor Car Dealers' Assn., Convention Hall. E. E. Peake, Mgr.

Feb. 11-16—Kansas City, Mo., Third Annual National Tractor Show.

Feb. 13-16 — Ft. Wayne, Ind., Automobile Trade Assn., Concordia Gymnasium.

Feb. 16-23—Albany, N. Y., Albany Auto Dealers' Assn., State Armory.

Feb. 16-24—San Francisco, Cal., San Francisco Dealers' Assn., Exposition Auditorium. G. A. Wahlgreen, Mgr.

Feb. 18-23—Syracuse, N. Y., Syracuse, Automobile Dealers' Assn., State Armory. Harry T. Gardner, Mgr.

Feb. 18-23 — Nashville, Tenn., Nashville Auto Trade Assn., Hippodrome. Henry B. Marks, Mgr.

Feb. 18-23—Grand Rapids, Mich., Automobile Business Assn., Klingman Building. Ernest T. Conlon, Mgr.

Feb. 18-23—Newark, N. J., N. J. Auto Exhibition, Co. G First Regiment Armory. Claude E. Holgate, Mgr.

Feb. 18-23 — Springfield, Ohio. Springfield Auto Trades Assn., Memorial Hall. C S. Burke, Mgr.

Feb. 18-23 — Waterbury, Conn., United Shows Co.

Feb. 18-23—Duluth, Minn., Duluth Automobile Trade Association. John J. Lane, Mgr.

Feb. 18-23 — Pittsfield, Mass. State Guard, State Armory. James J. Callaghan, Mgr.

Feb. 18-27—So. Bethlehem, Pa., Fourth Annual (cars 18-23: trucks 25-27). Coliseum. J. L. Elliott, Mgr.

Feb. 20-23—Quincy, Ill., First Annual, Armory. L. B. Bartlett, Mgr.

Feb. 23-Mar. 2—Brooklyn, N. Y., Brooklyn Motor Vehicle Dealers' Assn., 23d Regiment Armory. I. C. Kirkham, Mgr. Passenger cars Feb. 23-Mar. 2; Trucks Mar. 5-9.

Feb. 23-Mar. 2—Omaha, Neb., Omaha Auto. Trade Assn. Auditorium. Clarke G Powell, Mgr.

Feb. 25 - Mar. 2—Indianapolis, Indianapolis Automobile Trade Assn., Diamond Chain Work Bldg. John B. Orman, Mgr.

Feb. 25-Mar. 2—Muskegon Mich., Second Annual Merrill Auditorium. John C. Fowler, Mgr.

Feb. 25-Mar. 2 — Bridgeport, Conn., Fourth Regiment Conn. Home Guard, State Armory and Casino. B. B Steiber, Mgr.

Feb. 27-Mar. 2—Columbus, O. Auto Exhibitors Co. W W. Freeman, Mgr.

Feb. 27-Mar. 6—Boston, Mass. Salon, Boston Automobile Dealers' Assn., Copley Plaza Hotel. Chester I Campbell, Mgr.

Mar. 1-15—Lyons, France, Third Sample Fair.

Mar. 2-9—Boston, Mass., Boston Auto. Dealers' Assn., Mechanics' Bldg. Chester I. Campbell, Mgr.

Mar. 2-9—Pittsburgh, Pa., Automobile Dealers' Assn. of Pittsburgh, Motor Square Garden. John J. Bell, Mgr.

Mar. 4-9—Utica, N. Y., Utica Motor Dealers' Association, Inc., State Armory.

Mar. 6-9—Clinton, Ia., Clinton Automobile Dealers' Assn., Coliseum.

Mar. 6-9—Watertown, N. Y., Automobile Dealers, Inc., State Armory. Arthur E. Sherwood, Mgr.

Mar. 6-9—St. Joseph, Mo., St. Joseph Automobile Dealers' Assn., Auditorium. John Albus, Mgr.

Mar. 8-11 — Green Bay, Wis., Brown County Automobile Trade Assn.

Mar. 12-15—Fargo, N. D., Gate City Auto. Show Co., Auditorium. J. W. Murphy, Mgr.

Mar. 15-20—Great Falls, Mont., Montana Automobile Distributors' Association, Lexington Garage. A. J. Breitenstein, Mgr.

Mar. 19-24—San Francisco, Cal., Motor Truck Dealers of San Francisco, Auditorium. Ivan R. Gates, Mgr.

Mar. 11-16—Cedar Rapids, Ia., Cedar Rapids Auto Trade Assn., Auditorium.

Mar. 20-22—Houlton, Me., Second Annual, Houlton, Motor Car Dealers' Assn., Bangor St. Exhibition Hall. J. D. Luth, Mgr.

Mar. 20-23 — Holdredge, Neb., Second Annual of Southwest Nebraska.

Mar. 20-23 — Trenton, N. J., Trenton Auto Trade Assn. Second Regiment Armory. John L. Brock, Mgr.

Mar. 30-Apr. 6—Hartford, Conn., Eleventh Annual, Hartford Automobile Dealers' Assn., Inc. State Armory. B. F. Smith, Mgr.

Apr. 6-13—Red Bank, N. J., Monmouth County Auto. Dealers' Assn., Armory. E. C. Von Kattengell, Mgr.

Apr. 9-13—Stockton, Cal., Third Annual San Joaquin Auto Trade Assn. Samuel S. Cohn, Mgr.

Apr. 17-20—Calumet, Mich., Upper Peninsular Show, Copper County Automobile Dealers & Garage Owners' Assn., Coliseum.

Sept. 23-28 — Chicago, National Accessory Show for Fords, Coliseum.

S. A. E.

Feb. 1 — Chicago, War Dinner during Winter Meeting.

ENGINEERING

American Society of Heating and Ventilating Engineers.

Mining and Metallurgical Society of America.

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1910

DOUBT
RIDICULE



1918

APPRECIATION
IMITATION

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"There doubtless are other good bearing bronzes, but I *know* Non-Gran is good and I *know* Non-Gran is uniform."

The man and engineer who spoke those words is known to every Automotive Engineer not only of this Country but of the entire World. You know him, as does everyone else, as easily one of the first five Automotive Engineers of America. In those few words hasn't this man expressed the majority opinion of the entire American Automotive Industry?

HIGH SPEED
NON-GRAN
BEARING BRONZE

American Bronze Corporation
Berwyn Pennsylvania

Please mention Automotive Industries when writing to Advertisers

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JOHNSON'S RADIATOR CEMENT

Repairs Leaky Radiators Instantly

Stop Those Leaks

THE easiest and quickest way of repairing leaks in radiators, pumps, water jackets, hose connections, etc., is to use Johnson's Radiator Cement. This will stop the leaks in just a few minutes without laying up the car. No mechanical experience is required—all you have to do is to remove the cap and pour the cement into the radiator.



JOHNSON'S RADIATOR CEMENT

Johnson's Radiator Cement blends perfectly with the water until it reaches the leaks—just as soon as it comes in contact with the air it forms a hard, tough, pressure-resisting substance which is insoluble in water and consequently makes a permanent seal.



Quick—Efficient—Harmless

Johnson's Radiator Cement contains nothing which can clog or coat the cooling system. It will ordinarily seal leaks in from two to ten minutes. It requires no experience to use Johnson's Radiator Cement.—All you have to do is to remove the radiator cap and pour it in.

Quarts, $1.75 Pints, $1.00 Half-pints, $ .65

Write for our folder on "Keeping Your Car Young"—It's Free.

S. C. JOHNSON & SON, Dept. A, Racine, Wis.

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JOHNSON'S PREPARED WAX

Liquid and Paste

Keeps Your Car Young -



FOR POLISHING, preserving and protecting the finish of motor cars, no polish can take the place of Johnson's Prepared Wax (Liquid or Paste). Johnson's Prepared Wax is accepted standard the world over. More is used than all other polishes combined.

Johnson's *Liquid* Prepared Wax is a revelation to motorists who prefer a liquid polish. It polishes immediately with but very little rubbing. You can go over a good sized car in half an hour.

Johnson's Prepared Wax covers up mars and scratches—prevents checking and cracking—sheds water and dust—removes road-oil—and makes a "wash" last twice as long.



JOHNSON'S CLEANER

Johnson's Cleaner entirely removes all stains, discolorations, scum, tar, grease, etc. Even those spots that are ground in—mud freckles—and surface scratches which you thought were permanent—will disappear like magic under Johnson's Cleaner. It doesn't injure or scratch the finest varnish—simply cleans and prepares it for the Johnson's Prepared Wax polish.

If you cannot get Johnson's Cleaner and Johnson's Prepared Wax of your dealer, order direct from us, and we will prepay the express to any point in the U. S. East of the Rockies.

Prepared Wax Liquid	Qts. $1.40, Pts. 75c Half-pints - - 50c
Cleaner—Auto Size (8 oz. net)	35c

Write for our folder on "Keep Your Car Young"—it's free.

S. C. JOHNSON & SON, Dept. A, Racine, Wis.

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JOHNSON'S CARBON REMOVER

Keeps Your Motor Powerful

YOU KNOW that more than anything else you would prefer to have your car powerful and smooth-running. Carbon kills power—quick pick-up and hill climbing ability.

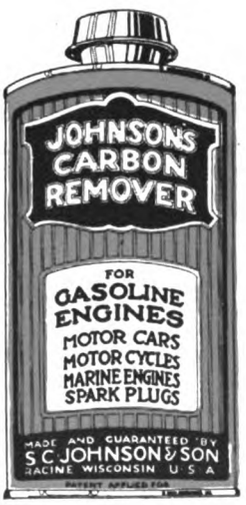


JOHNSON'S CARBON REMOVER

Johnson's Carbon Remover increases power—improves acceleration, stops that knock, quiets your motor—saves your batteries—and reduces your gasoline consumption 12% to 25%.

Positively Harmless

Johnson's Carbon Remover is a harmless liquid to be poured into the cylinders. It softens the carbon and releases it from the metal. It then burns, powders and goes out with the exhaust. Five minutes' time and no labor required. You will save from $3.00 to $5.00 over any other method, without laying up your car and with very much better results.



Use It Every 1,000 Miles

If you will use Johnson's Guaranteed Carbon Remover at regular intervals giving Carbon no chance to accumulate, you will automatically eliminate most valve trouble and your engine will always be clean. It will run as it did the first 500 miles—quietly and full of "pep."

Quarts, $1.75 Pints, $1.00 Half-pints, 65c

Order of your dealer, or if he cannot supply you, order direct. Write for our folder on "Keeping Your Car Young"—it's free.

S. C. JOHNSON & SON, Dept. A, Racine, Wis.

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JOHNSON'S STOP SQUEAK OIL

Makes Your Car Ride Easier





IT keeps your springs—which are the natural shock absorbers of your car—permanently flexible and resilient. Apply it occasionally and your springs will retain their original easy riding qualities **indefinitely.**

Reduces Chance of Spring Breakage

Johnson's Stop-Squeak Oil prevents rust—stops squeaking. Rusty, squeaky springs break first. Friction causes them to crystallize. Squeaks warn you of friction and call for an immediate application of Stop-Squeak Oil.

No Trouble to Apply

You paint Stop-Squeak Oil on with a brush or squirt it on with an oil can. It instantly seeps between the spring leaves. No tools are required. You do not have to jack up the car, remove the spring clips or pry the spring leaves apart.

Stops Squeaks Anywhere About the Car

Johnson's Stop-Squeak Oil removes squeaks of any kind—in springs, shackle-bolts, bodies, windshields, fenders, tops, enclosed bodies. Just locate the squeak and touch it with the oil. It stops instantly.

Quarts..... .85 **Pints**..... .50

Order of your dealer or if he cannot supply you, order direct and we will prepay express charges to any point in the U. S. A. East of the Rockies.

Write for our folder on "Keeping Your Car Young."—It's Free.

S. C. JOHNSON & SON, Dept. A, Racine, Wis.

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JOHNSON'S FREEZE-PROOF

Prevents Your Radiator *from* Freezing

THERE is only one SURE way to prevent your radiator freezing. That way is to use a non-evaporating anti-freeze preparation. You cannot depend on alcohol or any other product which evaporates with water.



Does not Evaporate or Steam

Johnson's Freeze-Proof does not evaporate or steam. One application lasts all winter under normal conditions—making it the most economical anti-freeze compound on the market.

Cheaper and Better than Alcohol

Anyone can use it—simply dissolve in water and pour into radiator. One package will protect a Ford to 5° below zero. Two packages will protect a larger car to 5° below zero, and three packages to 20° below zero.



Absolutely Harmless

It does not injure rubber, cloth, packing or metal of any kind. It does not rust or corrode metal. There is less rust with it than with water alone or with water and alcohol.

Raises Boiling Point of Water

It not only prevents frozen radiators. It prevents overheating as well. It raises the boiling point of water (212°) anywhere from 225° to 250°, depending upon the amount of Freeze-Proof used.

Johnson's Freeze-Proof can be obtained from good dealers and supply houses in 6½ pound containers at $1.50 per package. If your dealer will not supply you send us his name and order direct.

Write for our folder on "Keeping Your Car Young"—it's Free

S. C. JOHNSON & SON, Dept. A, Racine, Wis.

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This Book FREE Tells How to Keep Your Car Young



Write for This Book—It's Free

IT ISN'T FAIR to yourself or your car to run it two or three years without attention and then sell it at a big loss. With but very little effort you, yourself, can keep your car in such condition that the depreciation will be very slight. We manufacture a line of automobile products particularly for this purpose. No experience is necessary for the use of them—they can all be applied by the novice with perfect satisfaction.

Our booklet "Keep Your Car Young" tells how you can reduce automobile depreciation and on a turn-in or sale secure from 10% to 25% more for your old car. It will also tell you how to secure the maximum in pleasure and performance from the car you intend to drive next season—whether it is old or new.

Easy to Use

ALL OF JOHNSON'S Automobile products are very easy to use.—It requires no mechanical experience and but very little time. Write for it today. Insist upon your dealer supplying you with Johnson's Auto Products. Under no circumstances accept substitutes. Johnson's Line consists of the following:

Johnson's Prepared Wax—(liquid and paste)—the best polish for automobile bodies, hoods and fenders.—Sheds water and dust and makes a "wash" last twice as long.

Johnson's Cleaner — for removing spots, stains, discolorations, etc., and putting the finish in perfect condition for the wax polish.

Johnson's Carbon Remover cures 80% of engine trouble. Makes your car run like it did the first 500 miles. —No mechanical experience necessary.

Johnson's Stop - Squeak Oil — lubricates the springs perfectly. Removes squeaks from all parts of the car. Easy to use.

Johnson's Black-Lac — for dusty, grimy, gray tops, side curtains, cushions, etc. Does not rub off on the hands and clothing. Dries in fifteen minutes, ready to use.

Johnson's Auto-Lak — a body varnish that amateurs can use successfully. Dries in 24 hours.

Johnson's Freeze-Proof —prevents frozen radiators. One application lasts all winter.

Johnson's Radiator Cement (liquid)—our new product for 1918—of the same high quality as other ***Johnson*** preparations.

S. C. JOHNSON & SON, Dept. A, Racine, Wis.

S. C. JOHNSON & SON, Dept. MA, Racine, Wis.
Please send me free and postpaid a copy of your booklet entitled, "Keep Your Car Young."

NAME.....

ADDRESS.....

CITY & STATE.....

MY DEALER IS.....

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MARMON 34



Marmon Dominance

Today, And In The Days To Come

WHEN, in any industry, the law of diminishing returns sets in by whatever reason, the real leader quickly emerges from the rest. As for the automobile field, you have seen the Marmon pass through the back-fire of wartime, unscathed. Every day you meet this car in greater numbers in the motor traffic of America, overtaking, as it has, everything except demand.

Meanwhile, the Marmon has added more vital discoveries to the lore of motor car construction than any other car of the past decade.

And so, when peace shall at length remove the physical limitations to Marmon production and distribution, you may safely expect to see this car wield the influence overseas that it exerts at home.

On the following page—a few of the reasons why.

136-Inch Wheelbase—1100 Pounds Lighter

Chicago Automobile Show
Coliseum

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MARMON 34

Advanced Engineering

THE car through which the world has received the much-wanted combinations not thought feasible prior to this car's introduction—a half-ton lighter weight, yet unexcelled roadability and riding ease; long wheelbase, yet short turning radius; deep, wide seats, yet exceptionally low body; great speed and power, yet small fuel and tire consumption.

And as for the dealers, the Marmon has given them ideal combinations too—higher average sales with lower sales expense; more gross business with less cost for service; an expanded fine car market with a permanent future.

Marmon sales records in small towns, small cities, and metropolitan centers, substantiate these facts. They are open to the inspection of interested dealers.

NORDYKE & MARMON COMPANY
Established 1851 : INDIANAPOLIS

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Careful Checking the Analysis of Raw Material — For Safety — *For Service*

These men, trained for rigid and careful testing of materials, safeguard you on the road. Every piece of material that goes into our products must come up to our special and drastic requirements. There can be no flaw—no "seconds"—no *good enough*. No imperfection can get by—every operation is checked by a rigid test. That is one reason why both

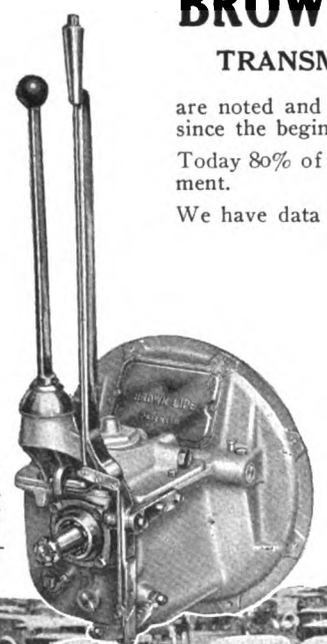
BROWN-LIPE TRANSMISSIONS

BROWN-LIPE-CHAPIN DIFFERENTIALS

are noted and recognized for their quality, service day in and day out, and general superiority since the beginning of the automobile industry.

Today 80% of the passenger car and truck manufacturers use either one or both as standard equipment.

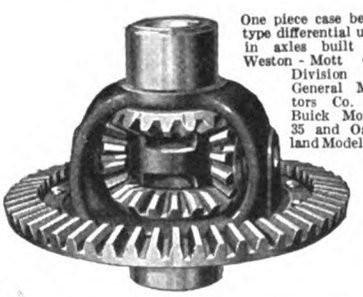
We have data of special interest to dealers and owners. Furnished on request.



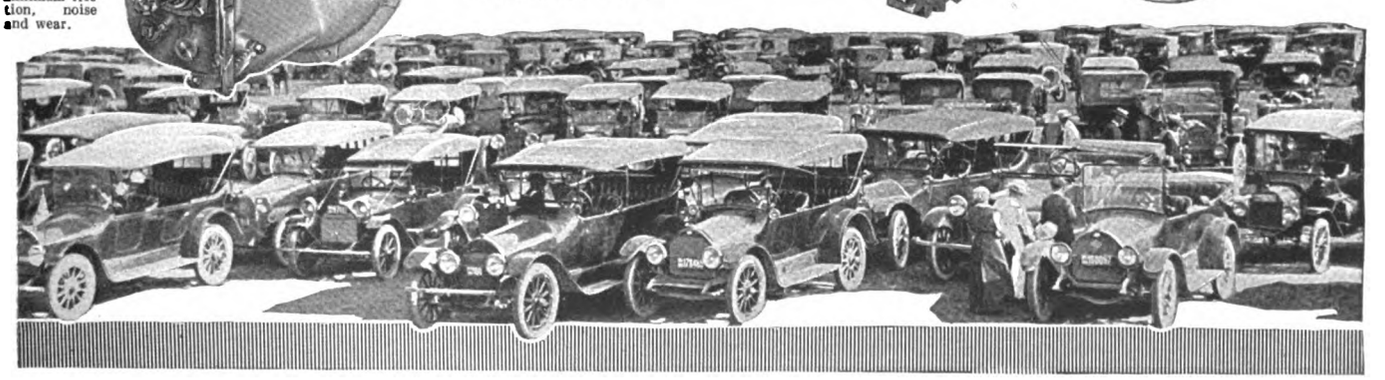
Model 35, 3-Speed, U.P.P. Transmits maximum power to drive wheels with minimum friction, noise and wear.

BROWN-LIPE GEAR CO.
TRANSMISSIONS
BROWN-LIPE-CHAPIN CO.
DIFFERENTIALS
Syracuse, N. Y.

Representatives:
NEW YORK: Thos. J. Wetzel, 29 W. 42d St.
SAN FRANCISCO: A. H. Coates, 41 Spcare St.
FOREIGN AGENT: Benjamin Whittaker, 2 Norfolk St., Strand, London, W. C.



One piece case beval type differential used in axles built by Weston - Mott Co. Division of General Motors Co. In Buick Modal 35 and Oakland Model 34.



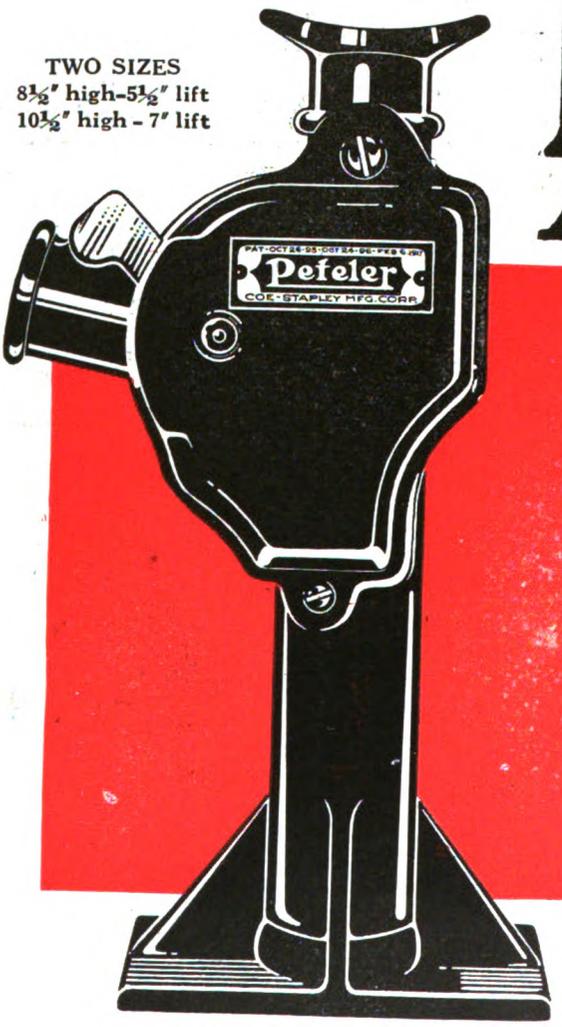
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COE-STAPLEY

$6 for the best Jack in the World

Peteler AUTO JACK

TWO SIZES
8½" high-5½" lift
10½" high - 7" lift



The previous model of the Peteler Jack was considered the best, and it had a tremendous sale—but this model, the new Peteler Jack, is better—and better by a big, wide margin than any other jack ever built.

Consider its utility—there is a long telescoping handle which, together with the jack, occupies very little room in the tool box.

By means of the long handle it can be shoved to any point under the car, the car raised, then lowered and the jack withdrawn—all with the operator standing upright.

It has a short stroke so that the overhang of the car in any case cannot interfere with the up and down movement of the handle.

The lifting action is easy and quick—it goes up ⅜" to the stroke, which is far faster than other jacks.

There is no danger point—it raises to the limit of the length of the lifting bar without possibility of failure.

It lowers with the same facility—a turn of the handle operates a lever which reverses the action and—the car comes down step by step as it went up. When relieved of the load, and only then, a slight lift of the handle lets the lifting bar drop the remaining distance into the jack.

For right-off-the-bat utility, can you conceive of a better jack?

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Manufacturing Corporation

Now then—

You dealers could sell the Peteler Auto Jack on appearance alone if you wanted to—for it's the most distinctive appearing, best proportioned, finest finished, staunchest looking jack you ever saw.

But add to that its world-beating utility, its surpassing power, its strength and endurance and you have a proposition full of possibilities for profit—because its features make the Peteler Jack easily salable to the great majority of the car owners of your locality.

The Peteler Auto Jack is almost as simple as your pocket knife. There's nothing complicated in its makeup—just a few working parts made of the finest materials for their purpose. A lifting bar of cold rolled high carbon steel, pawls of tool steel, plates of pressed steel and case of malleable iron—all fool proof and trouble proof and capable of a lifetime of wear.

The Peteler Jack has a capacity of 3000 lbs., 1000 lbs. more than it could possibly be called upon to lift—a half ton of over-strength. Furthermore, it is a non-skid jack—under any condition of load or road it can't slip.

In every respect the Peteler Jack justifies its title—"The Best Jack in the World"—and as such it should be on your counter, on your shelf, in your window. The price, $6, allows you a mighty liberal profit.

Sold through jobbers only

Write your jobber today

JOBBERS

Mr. A. Peteler will be in Chicago during the week of the Chicago Show (Jan. 26 to Feb. 3) and will be pleased to demonstrate by appointment. Write New York office.

Take advantage of this: You and we will save time by making selling arrangements early.

COE-STAPLEY MFG. CORP.

Executive Offices:
115 Broadway, New York

Factories:
Bridgeport, Conn., and Brooklyn, N. Y.

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Blankets won't help much if—

the oil you are using does not flow freely at Zero.
SUPREME AUTO OIL flows freely at Zero.

STARTS WITH THE ENGINE

THIS is most important during the Winter months. You should know whether the oil you are using "flows freely at Zero." All oils do not possess this feature—notably the paraffine-base oils, which thicken up under cold and often cause great damage to the motor.

MANUFACTURED BY

GULF REFINING COMPANY

The Largest Independent Refining Company in the World

General Sales Offices: Pittsburgh, Pa.

District Sales Offices:
New York Philadelphia Boston Atlanta Tampa New Orleans Houston



There is MORE POWER in
THAT GOOD GULF GASOLINE
AND SUPREME AUTO OIL
MANUFACTURED BY
GULF REFINING COMPANY
PITTSBURGH, PA., U. S. A.

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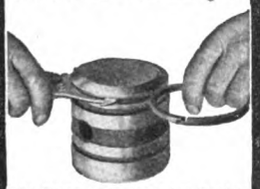


Make your pistons gas tight

The MUNGER "ALWAYS TIGHT" PISTON RING OUTFIT—

for FORDS
8 "Always Tight" Rings (Regular Size)
4 "Always Tight" Rings (Over Size)
1 Regrooving Tool
1 Ring Insertion Tool


Ready to insert the Munger Re-grooving Tool to true-up a worn piston groove


The Munger Re-grooving Tool in position for cutting. Testing width of groove with an over-size ring


A Munger "Always Tight" Piston Ring being slipped over the Munger Ring Insertion Tool


Showing how easily Munger "Always Tight" Piston Rings can be placed in the piston grooves with the Munger Ring Insertion Tool

MUNGER "Always Tight" Piston Rings


The MUNGER ALWAYS TIGHT EXPANSION JOINT

When piston grooves become slightly worn it is impossible to fit any rings in them gas-tight without first truing-up the grooves. With each complete set of Munger "Always Tight" Piston Rings is one oversize ring for each piston (to be used in worn grooves) and a Munger Regrooving Tool with which worn grooves can be straightened quickly and accurately without resorting to expensive lathe work, and without even disconnecting the piston from the connecting rod.

Munger Piston Rings *always* remain compression-tight.

These unique rings quickly conform to the shape of any cylinder and retain their perfect fit until completely worn out.

The wonderful compression-holding power of these simple one-piece rings is due to their scientific design and their accuracy of manufacture. The Munger Expansion Joint, so simple, yet so efficient—the patented process of peening, which makes these rings fit the walls of any cylinder—the minute oil grooves, which cause these rings to seat themselves almost immediately—are distinctive features that make Munger "Always Tight" Piston Rings superior to all others.

They are the easiest of all rings to install. With the Munger Ring Insertion Tool even a novice can place them in the piston grooves without breakage or the slightest trouble. And Munger Rings are the most inexpensive because they are practically wear-proof.

List price for all sizes up to 3¼ in. diameter, $1.25 per ring. With each complete set of rings a *Munger Piston Regrooving Tool* and a *Munger Ring Insertion Tool* are supplied without extra charge.

Splitdorf Electrical Co., Newark, New Jersey

Splitdorf Branch Houses and Service Stations:

Atlanta,	10-12 E. Harris St.	Minneapolis,	816 Hennepin Av.
Boston,	68 Brookline Av.	Newark,	278 Halsey St.
Chicago,	64 E. 14th St.	New York	7 West 61st St.
Dallas,	402 Ervay St.	Philadelphia,	210 N. 13th St.
Detroit,	1295 Woodward Av.	Pittsburgh,	5943 Ellsworth Av.
Kansas City,	1827 Grand Av.	San Francisco,	1022 Geary St.
Los Angeles,	1215 S. Hope St.	Seattle,	1628 Broadway
		Toronto.	469 Yonge St.

Accessory Dealers and Garage Men!
Any jobber will supply you with Munger "Always Tight" Piston Rings. Order them now!

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Know Harrison Radiators for Their Selling Value

If the cars you handle are equipped with Harrison Radiators you have a talking point that will help you sell them.

Show your prospects how Harrison construction, although the lightest per cubic inch, nevertheless has such "inbuilt" strength that a leakage from a frozen core is practically unknown.

Tell them the Harrison cooling system embodies greater fuel economy due to higher cooling efficiency.

Point out the big, free Harrison Hexagon air passages and explain why they promote cool, easy-flowing water circulation.

Tell them that Harrison lightness of weight, Harrison durability and other Harrison qualities are direct results of the peculiar arrangement and construction of the Hexagon cells, original with Harrison.

The list of Harrison users is another advantage to you. This representative list of cars, itself, adds prestige. Don't overlook the value of the name Harrison to you in making sales.

See Special Exhibit New York and Chicago Shows.

Look over this List of Harrison users

Chandler
Chevrolet
Hudson
Dort
Mitchell
Oldsmobile
Peerless
Columbia
also
Gramm
and
Federal Trucks

HARRISON

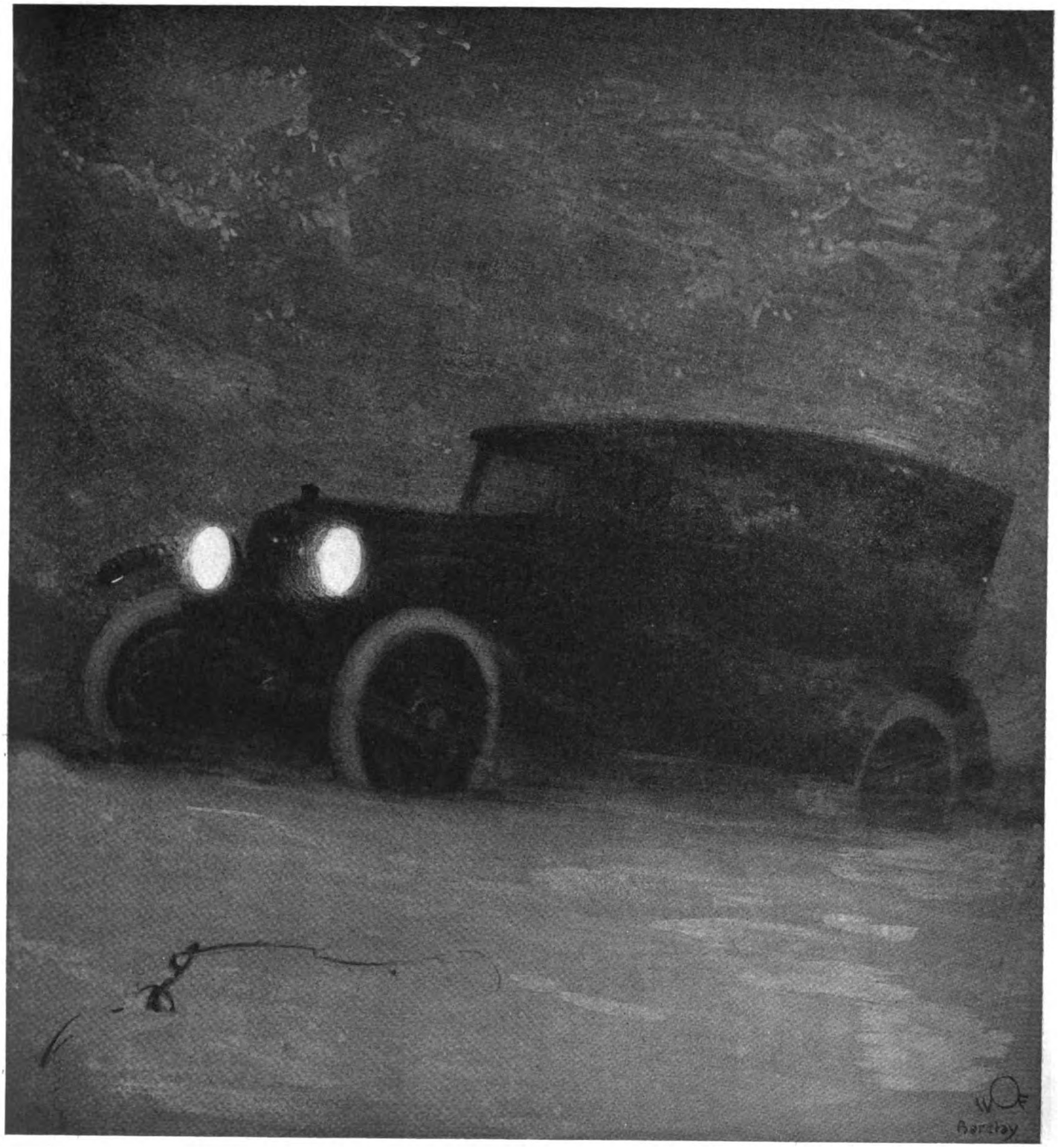
Original Hexagon Cellular
Radiators

Harrison Radiator Corporation
Lockport, New York

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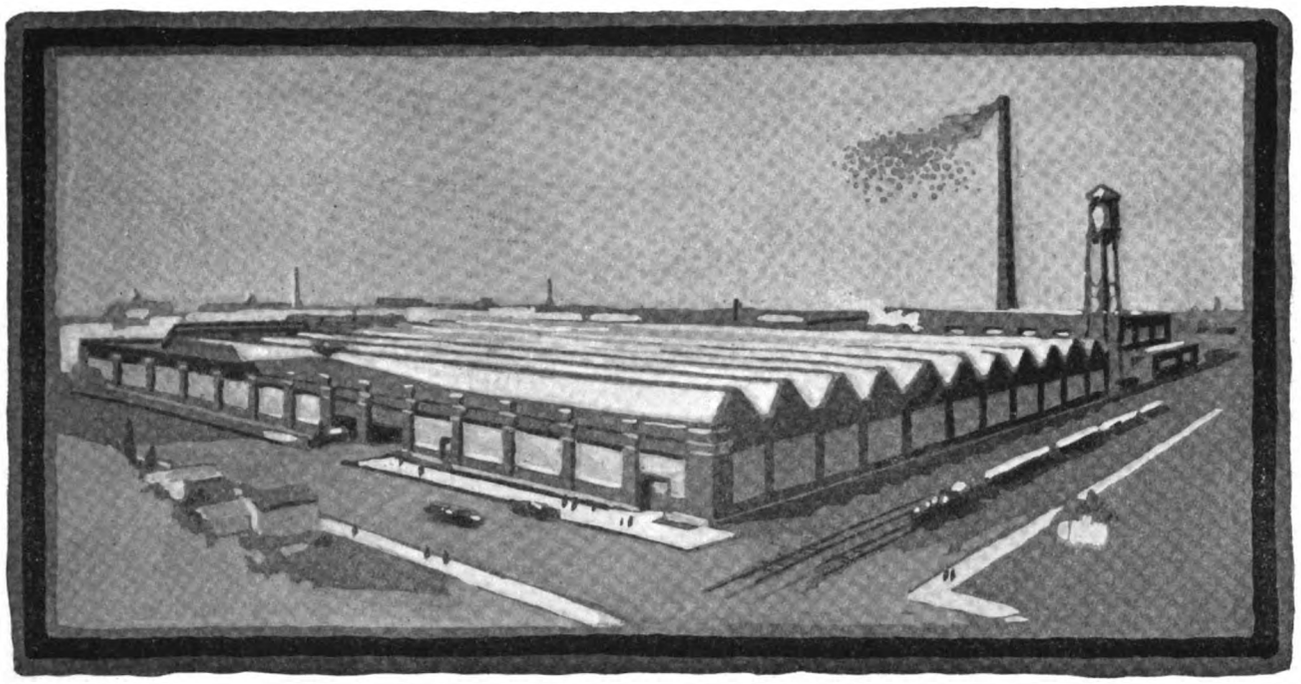


The Comfort Car

Ⓗ

Hupmobile

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Send for your set of Strom Bearing data sheets, if you have not already done so.

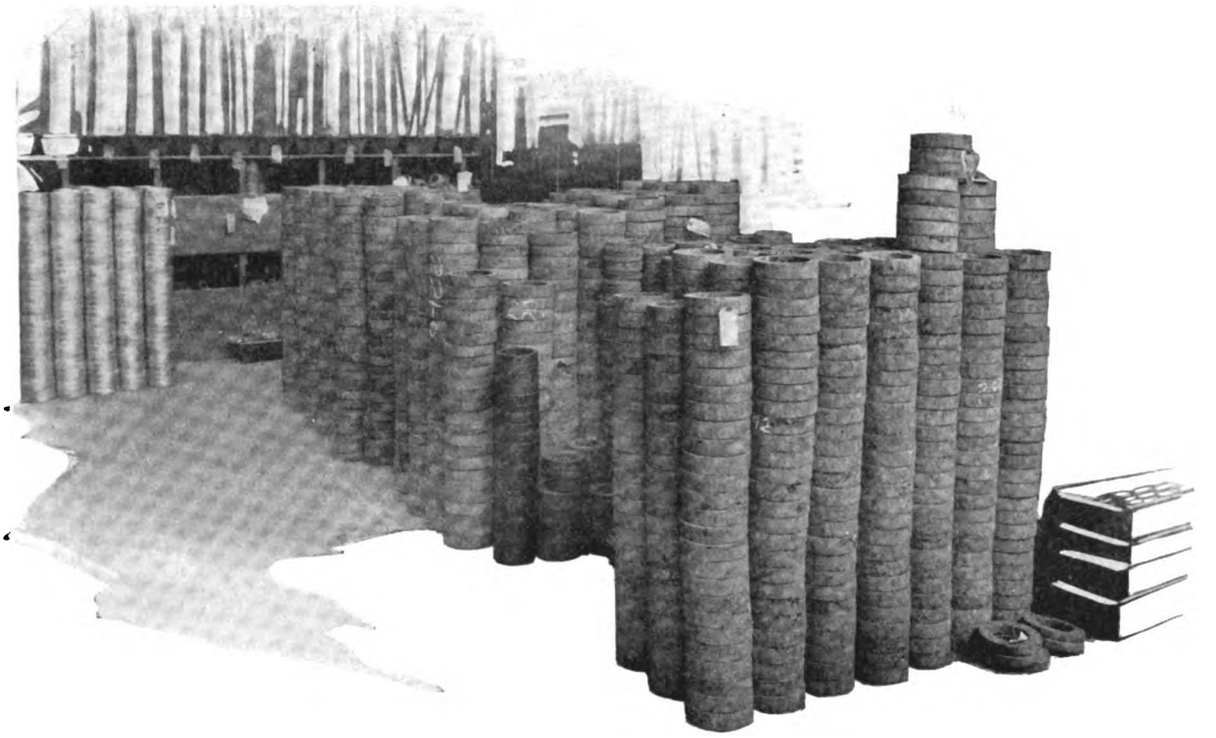
You will find a large range of special size bearings to select from, as well as other new lists covering additional types of both radials and thrusts.

Your Engineering Department will be glad to have these data sheets.

Strom BEARINGS

FORMERLY U.S. BALL BEARINGS

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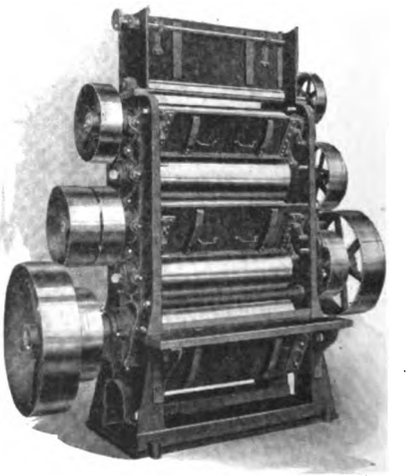
The above illustration shows a stock of forged blanks ready to start on their way through the many refining processes toward the finished bearing.

. . . .

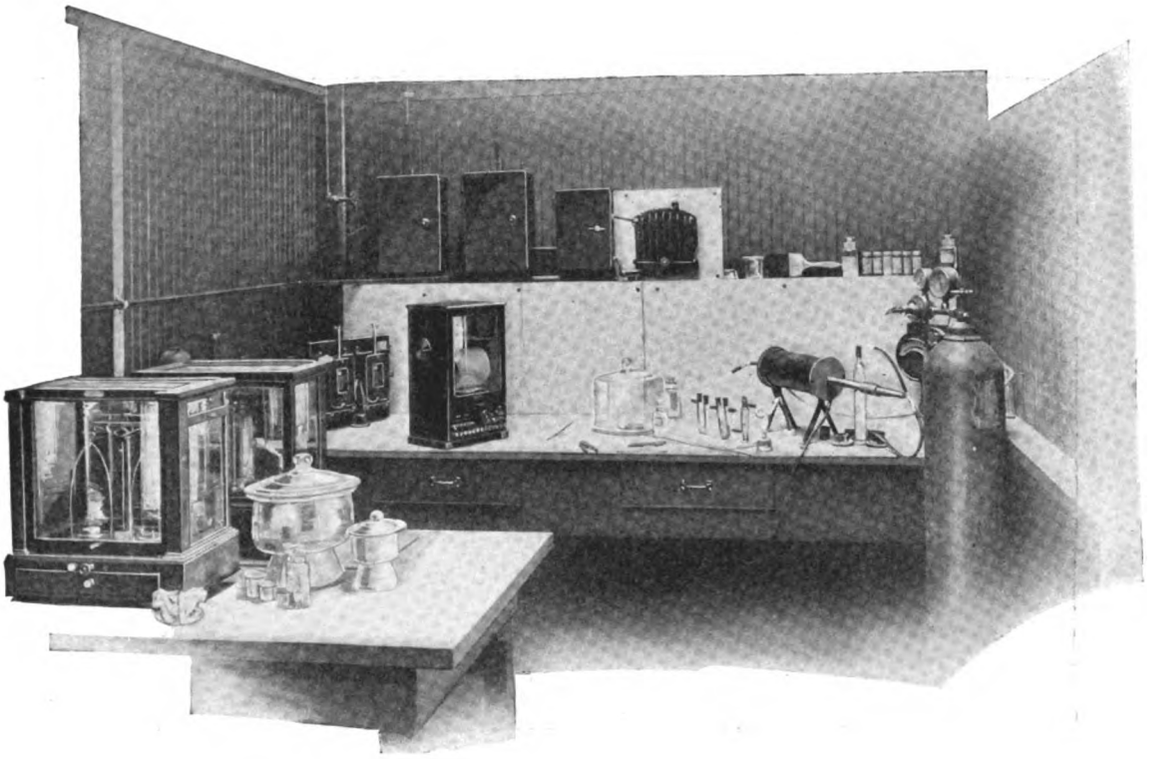
When you think of reducing friction, you instinctively think of the Ball Bearing which has been doing this for years under loads varying from a few ounces to thousands of pounds.

. . . .

Strom BEARINGS

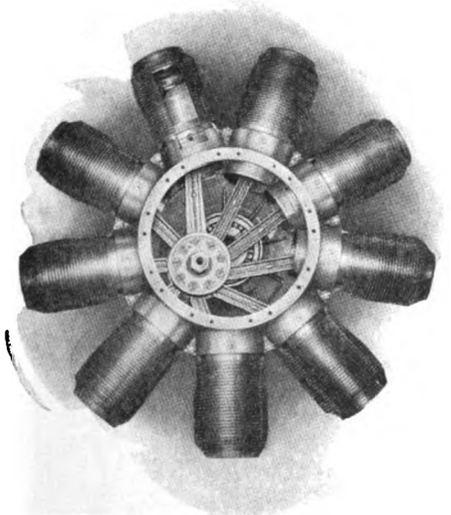


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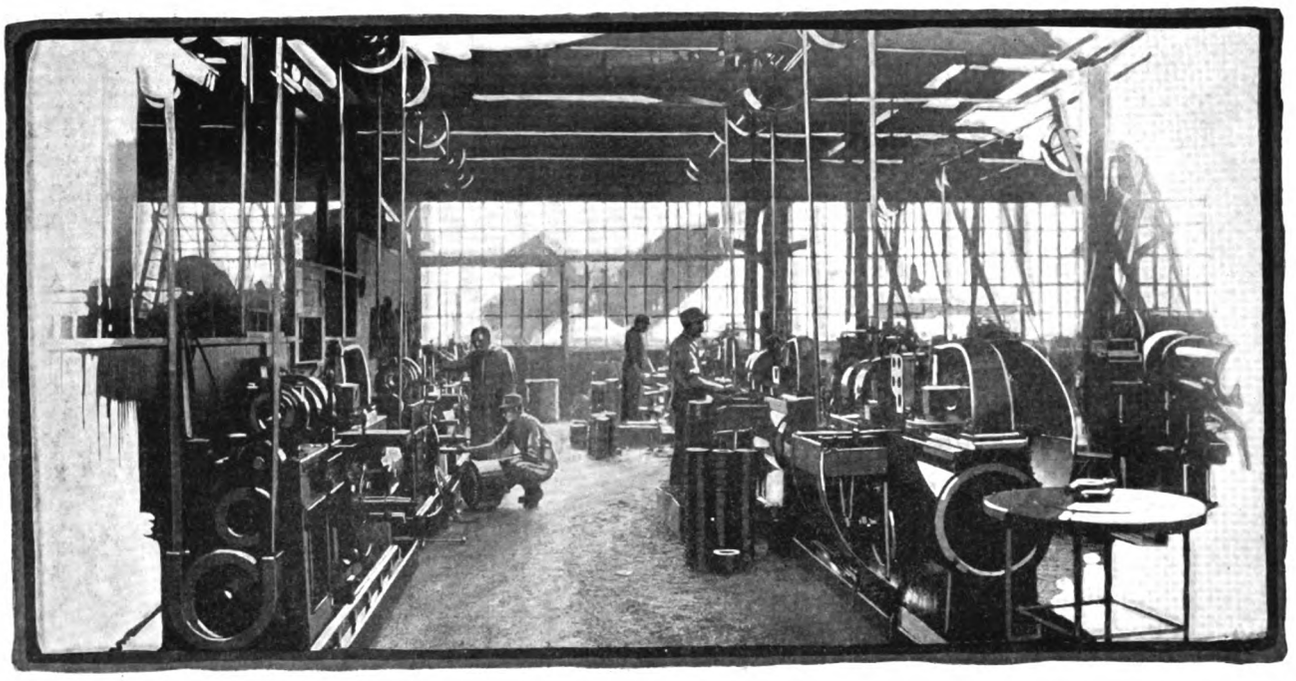
A small section of our laboratories where the quality of steel is determined by the most exhaustive tests.

Ball Bearings are the logical bearings where minimum friction and reliability of service are desired. Witness their extensive use in Airplanes, Tanks, Tractors, Motor Trucks, Motor Cars—in fact, in all classes of machinery where dependable and efficient bearing service must be had.



Strom BEARINGS

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Strom Bearings are made in one of the largest and most completely equipped factories in the world, exclusively devoted to the production of ball bearings.

This plant has a capacity of 10,000 quality bearings a day.

U. S. BALL BEARING MFG. CO.
(Conrad Patent Licensee
Palmer Street and Kolmar Avenue, Chicago, Illinois

Strom BEARINGS
FORMERLY U.S. BALL BEARINGS

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The successful production and marketing of approximately

3,000,000 Bosch Magnetos

have furnished unequalled opportunity for perfection of design and skill in construction. The quality of materials has ever been the highest obtainable and production has been curtailed at times to make it possible to avoid departure from **BOSCH QUALITY.** This is still the standard by which all other ignition systems are judged.

This high grade product can be obtained in quantities to care for those manufacturers desiring to have the advantage of **BOSCH IGNITION.**

Car owners and prospective car owners should specify Bosch and insure themselves satisfaction.

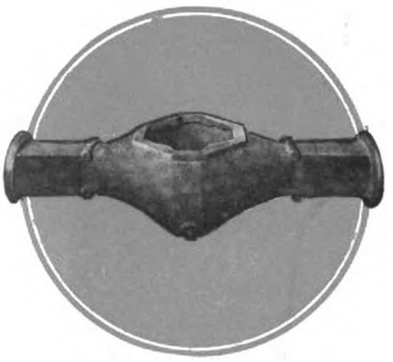
CORRESPONDENCE INVITED

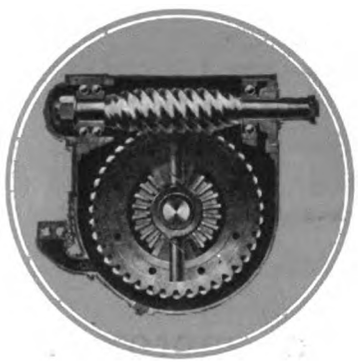
BOSCH MAGNETO COMPANY

New York **Detroit** **Chicago** **San Francisco**

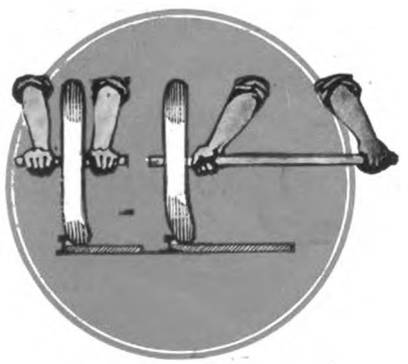
Service Stations in Every State

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Point for Point There is no better Truck Axle built than Sheldon

1 THE SHELDON WORM-GEAR AXLE is encased in a *one-piece* housing. This means that instead of the various parts being cast separately and then welded together, the complete housing is cast in one mould. By virtue of this one-piece construction, there can be no loosening of parts, regardless of road or operating conditions—an extremely vital factor to consider where commercial haulage is concerned.

The one-piece axle housing furthermore protects and strengthens the working parts in a manner that cannot be duplicated in any other form of construction.

It requires from 90 to 100 tons hydraulic pressure to bend the housing double; even then it does not crack, owing to the extreme toughness of the metal used—the result of careful and expert annealing.

2 THE STRAIGHT OR DAVID BROWN TYPE OF WORM is used in the Sheldon Axle because it has proved to be more silent and more double, as well as the simpler of the two types of worm generally in use. Neither use nor abuse can make it noisy. Forged from the finest steel, and heat-treated to wear-proof toughness, the worm threads are machined to microscopic limits.

The worm carrier, in which the worm is mounted, is a substantial casting, machined so accurately that later adjustment is never necessary.

The lower section of the worm wheel runs in a bath of oil in the base of the housing. This is splashed through the worm shaft bearings, maintaining a constant film of oil between the surfaces of the worm threads and the teeth of the worm gear.

3 SHELDON BRAKES, are made ultra-efficient, to insure complete safety of operation. This is accomplished by means of double external expanding type of brake—simple in operation, self intensifying, easily adjusted, exceedingly powerful, quick-acting and unfailingly sure.

Sheldon brakes have a generous bearing surface and are doubly enclosed to thoroughly protect the bearing surfaces from dirt, grit and other foreign substances. The brakes are easily accessible for relining. When it comes to the question of adjustment, it is not necessary to touch the brakes themselves; they are tightened merely by moving back the sector to which the brake pull lever is bolted, and inserting the lever bolt in the next hole.

4 SHELDON AXLES are of the semi-floating wheel bearing type. Consequently Sheldon axles are more simply constructed by reason of fewer parts, lighter in weight for the same reason, yet have a greater carrying capacity than the full-floating type. This simplified construction means greater accessibility and the greater carrying capacity means greater economy of upkeep and operation.

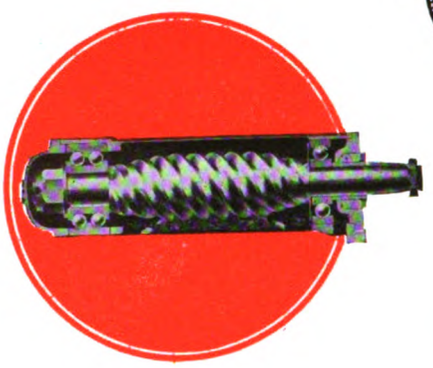
The wheels in the Sheldon axle are mounted on an extra heavy axle shaft which bears the dead load of the truck. In the full-floating type the wheels are mounted directly on the less dependable tubular extension of the axle housing—a construction in which any slight bending, as a result of skidding or other causes, requires an expensive replacement—generally a factory repaid job.

But the greatest advantage of Sheldon semi-floating construction is graphically shown in the sketch opposite. To the left (Fig. 1) is illustrated the simple leverage angle of the full-floating type against the side strains at the wheel rim, and to the right (Fig. 2) is shown the wide leverage angle of the Sheldon semi-floating construction. Obviously the latter incorporates the correct principle for resisting side strain.

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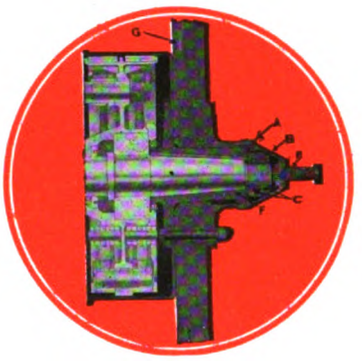
BALL BEARINGS offer less friction and have greater load capacity than any other type of anti-friction device invented. This is borne out by innumerable tests, conducted under every imaginable condition. This is particularly true under the wedging action of a thrust load of such proportions as is exerted on the worm. Furthermore, in the case of the worm, the use of the ball bearings is the only way whereby the elongation of the worm due to frictional heat can be perfectly compensated. This is accomplished by leaving the annular ball bearing placed at the front end of the worm, free to float.

Finally, and of great importance, ball bearings do not require the adjustment which other bearings, by their nature, must receive.



THE SHELDON WHEEL BEARINGS are enclosed in the main axle housing. They are thus protected against grit and other foreign matter when the wheel is demounted. At the same time the bearings are easily accessible, it being necessary only to remove the wheel and then the bearing retainer in order to get to them.

The shape of the hub itself gives greater strength where greater strength is needed, and furthermore allows the easy demounting of the wheels, thus making a change of tires quick, easy and economical.

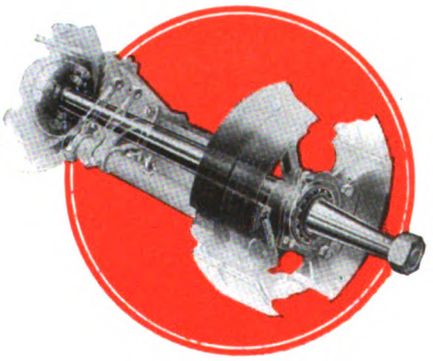


NOT A SINGLE SHELDON DIFFERENTIAL, as far as we can learn has ever worn out. Notice how the gear teeth instead of being concave in design are broad and thick at their base, this providing ample protection against gear stripping and quick wear. Each bevel gear is supported *on both sides* by an intended hub inserted into a bearing ring in the spider. This insures absolute alignment and eradicates all possibility of faulty performance. Strength is further continued with efficiency in the hexagonal broaching of the differential gear to receive the axle shaft. A square insertion would permit quick wear, a splined insertion would weaken the metal. Sheldon design avoids both weaknesses.



THE BIG, HUSKY SHELDON DRIVE SHAFT is a forging 3½% nickel steel; accurately proportioned, expertly heat treated, and ground to size.

The distribution of strain along this length dictates a taper from the differential to the wheel bearings—thus a uniform strain is secured throughout and ample strength is provided where needed.



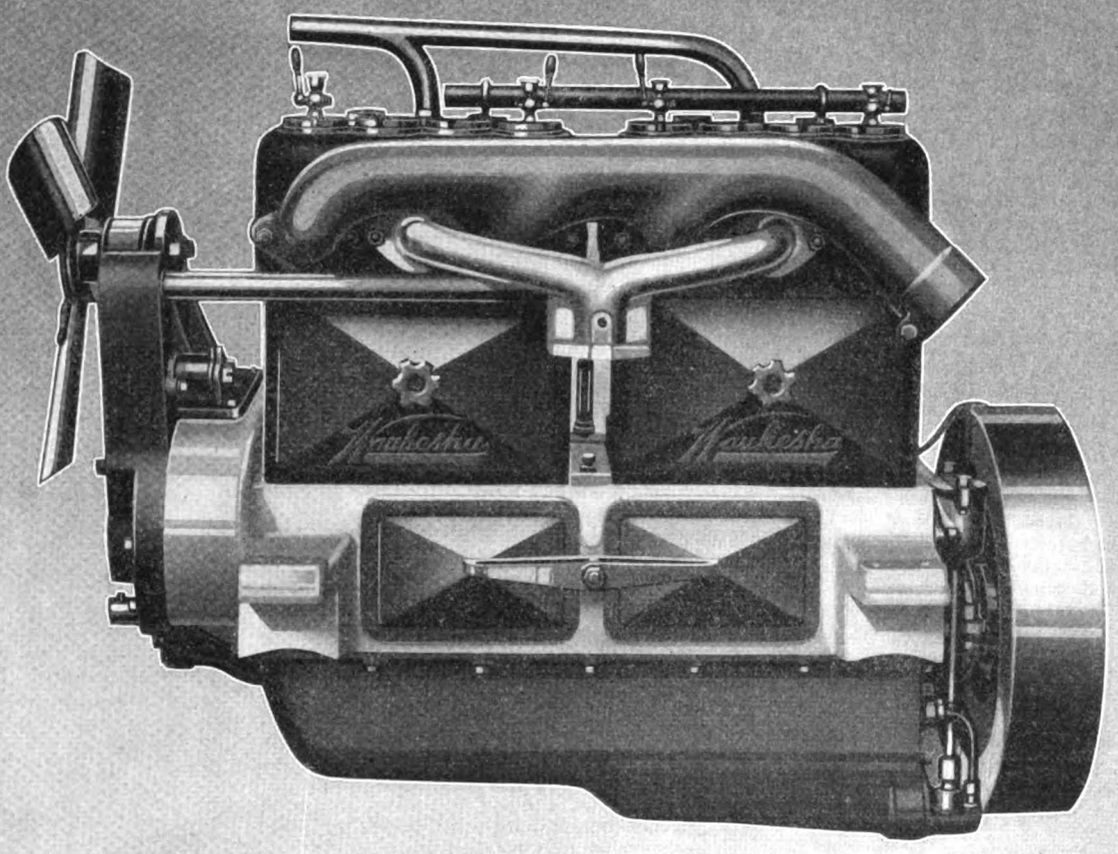
SHELDON AXLE & SPRING CO.
WILKES-BARRE, PA.

Builders of

SHELDON

WORM DRIVE AXLES

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The will-to-do of an organization is invariably revealed in the product. By constantly and unfalteringly adhering to the higher business ideals, the builders of

Waukesha
TRADE MARK

Four-Cylinder Motors for Trucks and Tractors

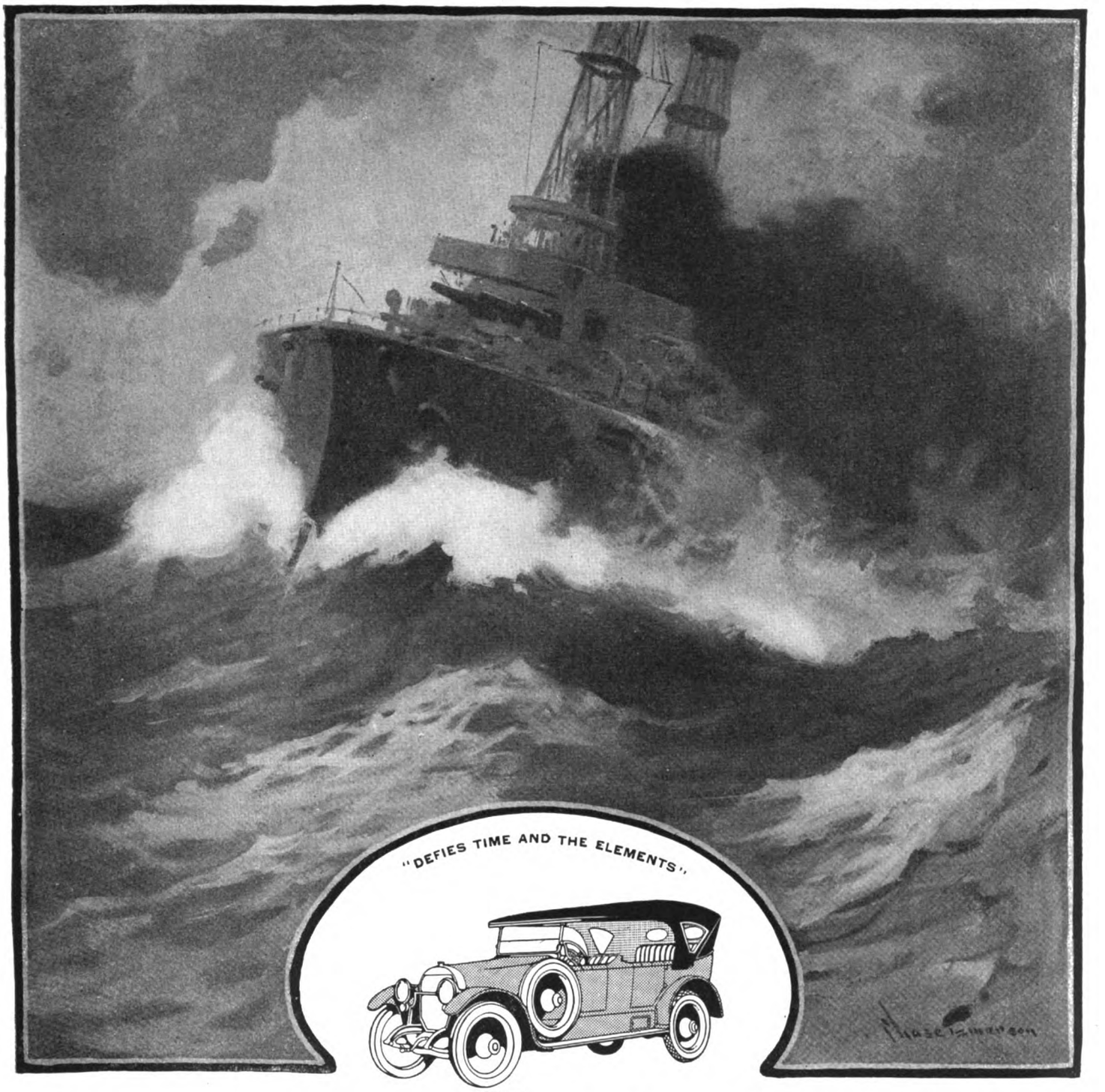
have succeeded in embodying true character in their product. This fact is evidenced by the most authoritative world-wide endorsement of Waukesha Motors for truck and tractor service.

"Demand a Waukesha Motor in the Truck or Tractor You Buy"

WAUKESHA MOTOR CO., Waukesha, Wis.

World's Largest Manufacturers of Truck and Tractor Motors Exclusively

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DURABILITY is a quality often looked for in top material but rarely found. When Drednaut is used an unequalled, weather-resisting, long-wearing top, which often outlasts the car itself, results.

More cars will be retopped during the coming year than any year previously.

Drednaut Motor Topping will please your customers — the trade mark means protection.

Leaders in Manufacturing Since 1847

CHASE

DREDNAUT Motor Topping

L. C. CHASE & CO., BOSTON
NEW YORK DETROIT CHICAGO

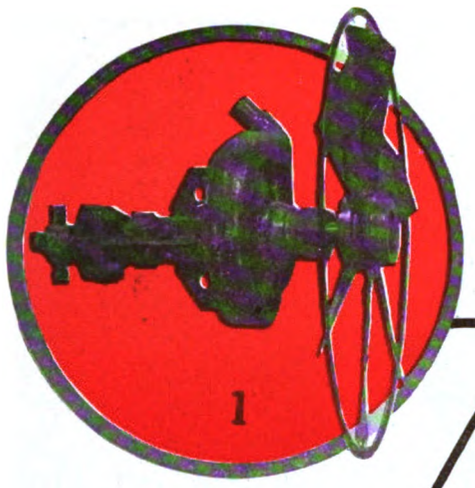
APPEARANCE is a big factor when considering top material—a Drednaut top will add to the beauty of any car. It has a beautiful, rich-looking surface, which is not impaired by folding or the elements.

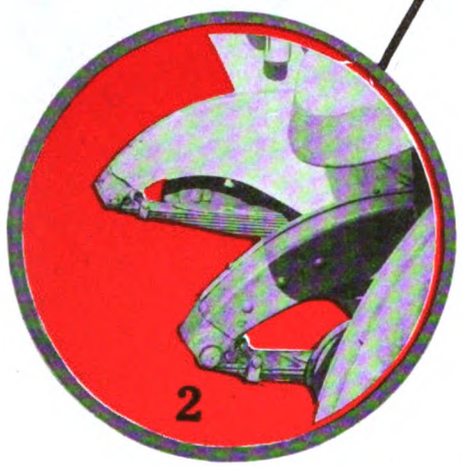
More "Chase" material is used on vehicles today than any other brand.

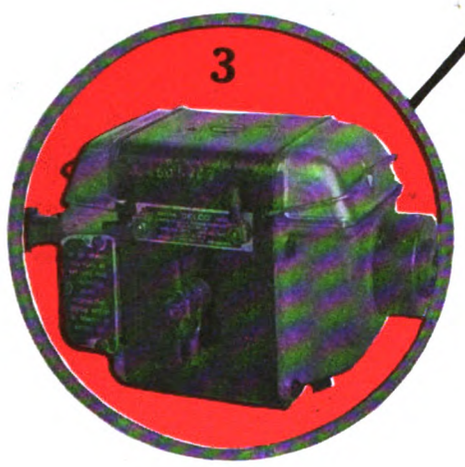
Drednaut Motor Topping retains its fine appearance after years of the severest use.

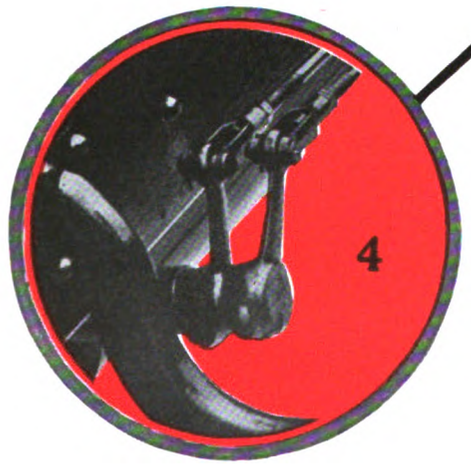
Write for Interesting Booklet

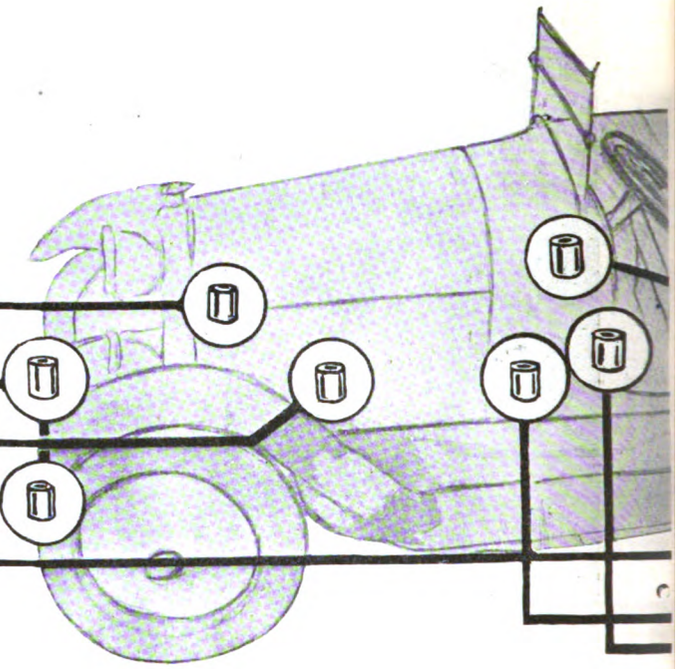
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IT is important to remember that the service life of a car is determined by the life of its bushings.

It is likewise important to remember that the service life of a bushing is determined by the amount of proper lubrication that it receives.

Ordinary bushings, when neglected, quickly wear out and cause early break-downs.

Therefore the leading manufacturers of trucks and passenger cars use genuine graphited oil-less bushings in those important bearing places that are liable to be neglected. In this way they safeguard and prolong the service life of their product.

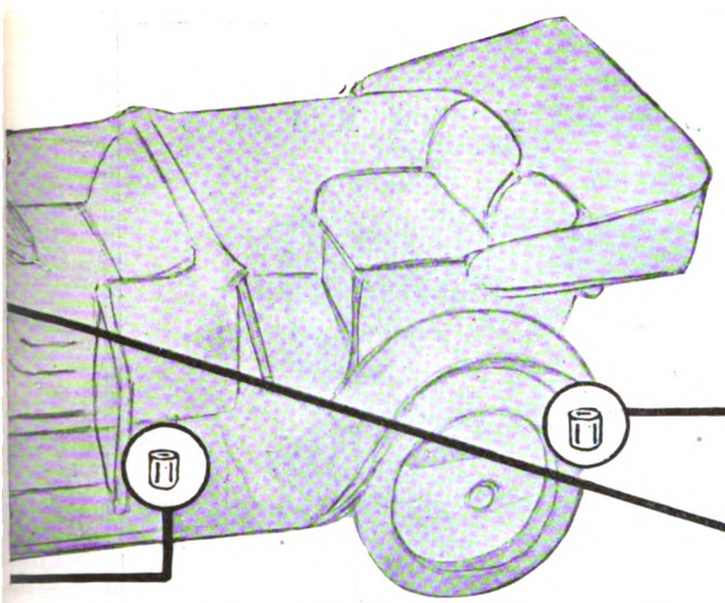
Genuine graphited oil-less bushings are self-lubricating. They are "oiled for life" when made, and though oiling will not harm them, still they will run efficiently and smoothly without oiling or attention of any kind.

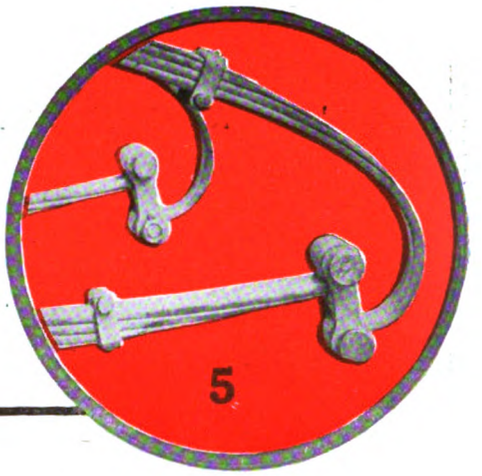
We also manufacture "Nigrum" (Impregnated Iron Wood) Oil-less Bushings.

Oil-less
BOUND BROOK

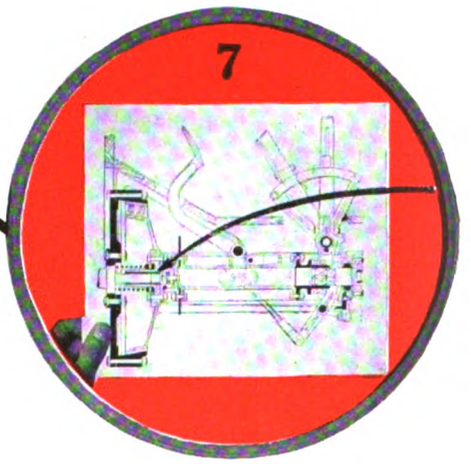
TRADE MARK REG. U. S. PAT. OFFICE

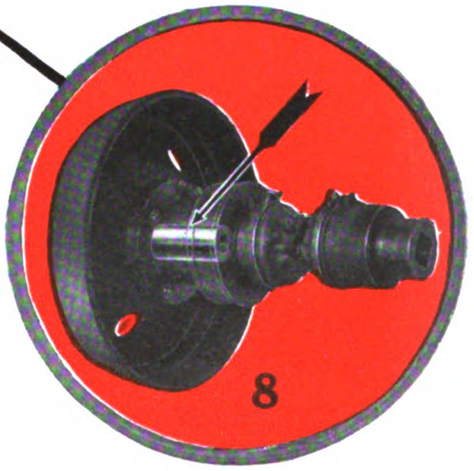
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1—In the water-pump, owing to the impossibility of using oil and grease the use of Oil-less Bushings is imperative.

2—Oil-less Bushings in the Front Springs eliminate the nuisance and cost of grease cups.

3—Virtually all popular makes of starting motors are oil-less-bushing-equipped.

4—Brake Counter Shaft bushings should be "Oil-less" because of their inaccessible location.

5—Oil-less bushings in the rear spring shackles reduce wear and squeaks.

6—Oil-less bushings in the steering column mean a smooth, quick, easy turning column plus insurance against sticking, gripping and quick wear.

7—The pilot or thimble bushing in the clutch is one of the most difficult to lubricate. Oil-less Bushings are used to eliminate these lubrication troubles.

8—Oil-less bushings in the clutch insure long life and smooth service.

BOUND BROOK OIL-LESS BEARING COMPANY

Specialists in the manufacture of Oil-less Bushings for more than a third of a century.

BOUND BROOK NEW JERSEY

Bushings NIGRUM

TRADE MARK REG. U. S. PAT. OFFICE

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O'BANNON COATED FABRICS



—Easily Cleaned

Soap and water will not hurt O'Bannon "Moleskin Quality" upholstery material. Neither will blazing sun or blinding rain destroy the smart appearance of O'Bannon "Nonleek" motor topping.

Their high quality and beautiful finish remain distinguishing characteristics through all vicissitudes of wear and weather.

Manufacturers are requested to write for samples

O'BANNON CORPORATION
200 Fifth Avenue, New York

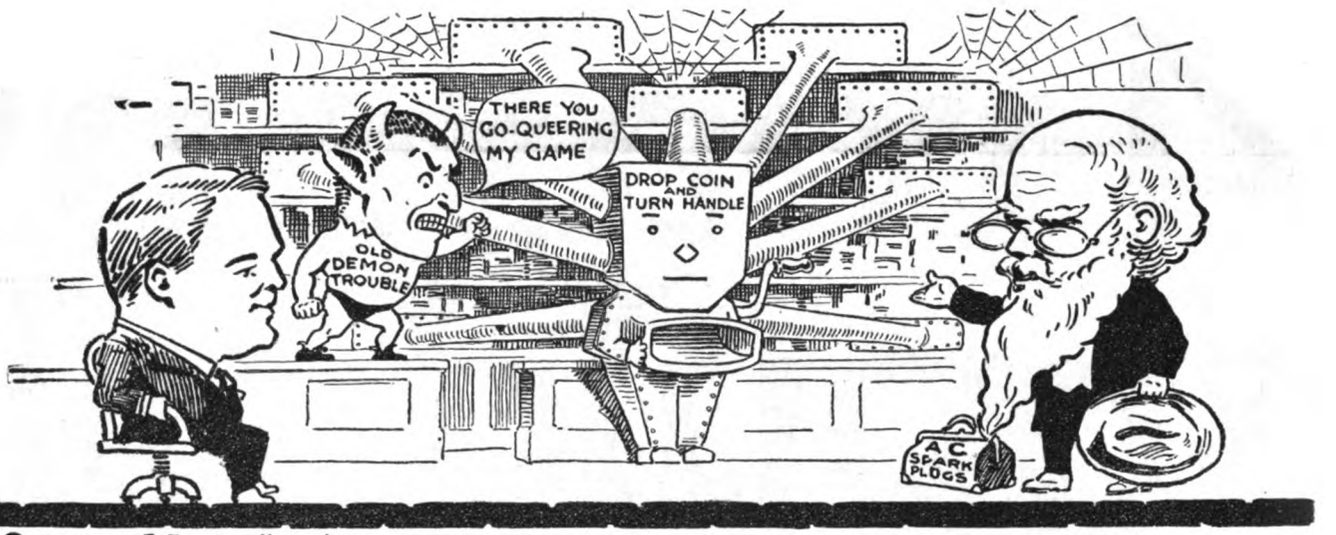
Detroit Representative:
Matthew L. Sullivan, Lenox Apartments

Chicago Representative:
James F. Sanborn, 5311 Harper Avenue

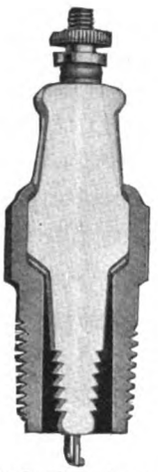
O'BANNON INTERNATIONAL
TRADE MARK

O'BANNON ARTIFICIAL LEATHER
REG. U. S. PAT. OFF.

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OLD MAN WISE —"DON'T MAKE A SLOT MACHINE OF YOURSELF — GET ACQUAINTED THROUGH RELIABLE GOODS THAT WILL ALWAYS BACK UP YOUR TALK — FOLKS COME FROM FARTHER AND BUY MORE THROUGH THE CONFIDENCE THUS ESTABLISHED."



AC Carbon Proof
For Fords Overlands and Studebakers

IF you want to "queer the game" of Old Demon Trouble, use AC Spark Plugs. They are standard equipment on all these leading cars—*not* because of "claims" but because of *conduct*: actual *performance* on all roads, whether for racing speed or steady grind. There's no reason why *your* car should not have the benefit of



7/8 in. Regular for Maxwells AC Titan

AC Spark Plugs

The Standard Spark Plug of America

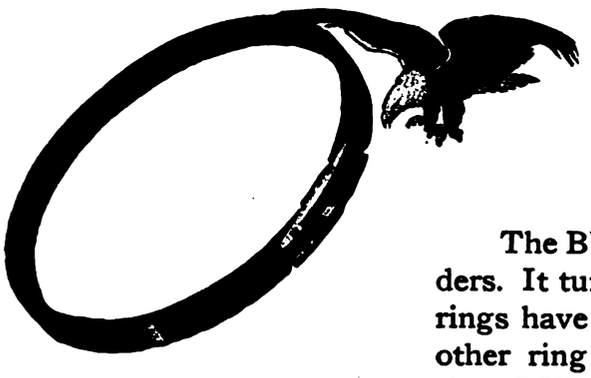
CHAMPION IGNITION COMPANY
SOLE MANUFACTURERS, FLINT, MICHIGAN

These Manufacturers Use AC As Standard Equipment

Cadillac	Buick	McFarlan	Jackson	American-La France	Federal Trucks
Pierce-Arrow	Oakland	Paterson	Apperson	Henderson Bros.	G. M. C. Trucks
Packard	Oldsmobile	Davis	Anderson	Old Reliable Trucks	Netco Trucks
Marmon	Nash	Lexington-Howard	Phianna	Gabriel Trucks	Sandow Trucks
Hudson	Kissel Kar	Scripps-Booth	Locomobile	Gramm-Bernstein Trucks	Signal Trucks
Chalmers	Premier	Crane-Simplex	Disbrow	Moreland Trucks	Brockway Trucks
Hupmobile	Knox	Stearns-Knight	Daniels	Wilcox Trux	Samson Tractor
Chandler	Abbott	Saxon	Westcott	Sterling Trucks	Acme Trucks
Haynes	Pathfinder	Stutz	Monroe	Republic Trucks	Menominee Trucks
Chevrolet	White	National	Singer	Diamond T Trucks	Riker Trucks
Dort	Delco-Light	Velie	Dodge Brothers	Four Wheel Drive	Stewart Trucks
Cole	Murray	Stephens	McLaughlin (Canada)	Titan Truck	Wisconsin Trucks
Reo	Case		Dorris	Maxim Trucks	Robinson Fire Truck
Paige	Economy		Duesenberg	Case Tractors	La Crosse Tractor
Peerless	Jordan		Hatfield		Advance-Rumely Tractor
Pilot	Liberty				Lombard Tractors

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4 reasons should sell



A Scientifically Perfected Ring

BURD Piston Rings represent the greatest advancement in piston ring manufacture of the past decade. They are the work of mechanical experts. The result of years of experimentation.

The BURD Guarded Opening seals the power in the cylinders. It turns waste power into extra power. No other piston rings have this feature. It is exclusively BURD. And so no other ring assures the perfect and constant piston ring fit that BURD offers.



A Nation-Wide Advertising Campaign

Full page advertisements in the Saturday Evening Post are appearing regularly. They are educating motor car owners to the vital importance of perfect piston rings in motor performance. They are proving to them that BURD Rings excel — and why.

And so just as motor car owners are demanding certain axles, bearing and lighting systems, they will now demand BURD Piston Rings.

Burd High Compression Ring Company
Rockford, Illinois

BURD

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why you Burd rings

A Complete Dealer Service

The BURD Company is not content merely to manufacture a perfect ring and to tell its story in national publications.

The most complete dealer service ever offered by an accessory manufacturer ties up right to your store its quality product and the thousands of dollars spent in advertising.

Circulars, letters, placards, signs, newspaper advertising that point to you as a BURD Piston Ring dealer are furnished you free.



Easy Sales—Big Profits

A combination such as we offer guarantees a demand for BURD Rings. You don't have to SELL them. Motor car owners will ASK for them.

And with all this you get a margin of profit that we know you will consider most liberal.

You, as a live dealer, must realize the exceptional opportunity BURD HIGH COMPRESSION RINGS offer. So write your jobber or direct to us today.



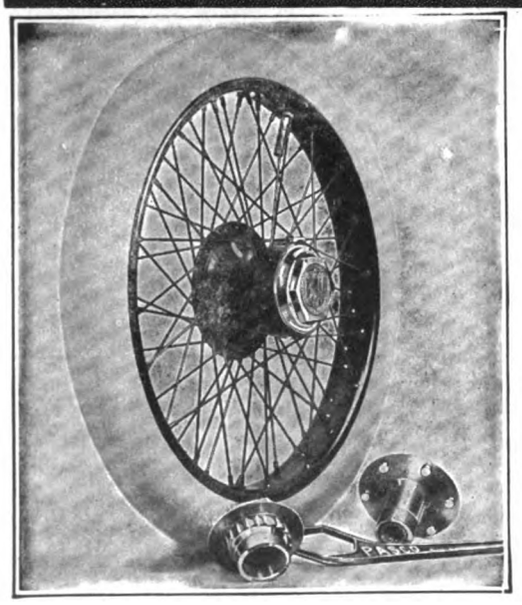
Burd High Compression Ring Company
Rockford, Illinois

HIGH COMPRESSION PISTON RINGS

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PASCO WIRE WHEELS have 3 Exclusive Patented Features in which lies the Secret of their Lightness, Dependability, Utility and Beauty

PASCO TRADE MARK



Note the Simplicity and Accessibility of Parts

The three exclusive Pasco features are of tremendous importance because they affect the entire wheel—make it stronger, more enduring, easier to change and more economical.

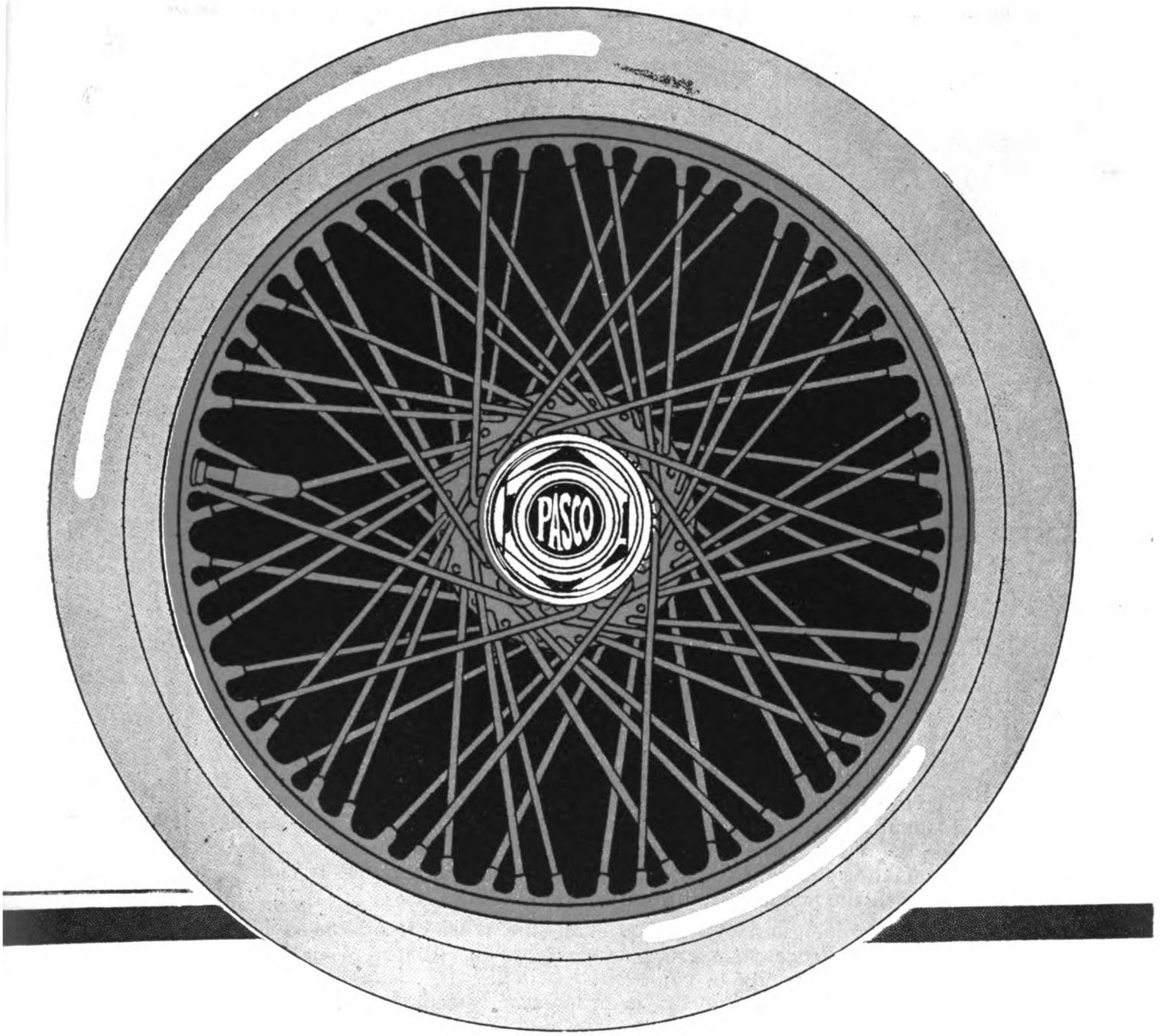
(1) **The Web**—All spokes in the Pasco Wire Wheel cross four other spokes—as against two or three crossed spokes in other makes. This forms a double web which is stronger than in any other wire wheel and 60% stronger than wooden wheels.

This distinct improvement is made possible by the patented four series Pasco method of Rim Punching and Spoke Lacing.

(2) **The Hub Cap** is made of a strong, indestructible metal that stands up perfectly in collisions, due to crowded traffic conditions, where aluminum, brass and other soft metal compositions will strain or break. It is sturdy, massive looking, yet attractive.

(3) **The Safety Locking device** absolutely prevents the wheel from working loose or coming off from a

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moving car. This exclusive, patented feature is positive insurance against accidents from such a cause.

The hub cap and wheel are locked on to the threads of the inner fixed axle with a vise-like grip and can only be removed by using the Pasco wrench.

The tire saving qualities of Pasco Wire Wheels, their lightness, their shock absorbing construction, the speed and ease with which they can be replaced on the road—all these factors make for genuine economy in upkeep cost and a saving in time and trouble.

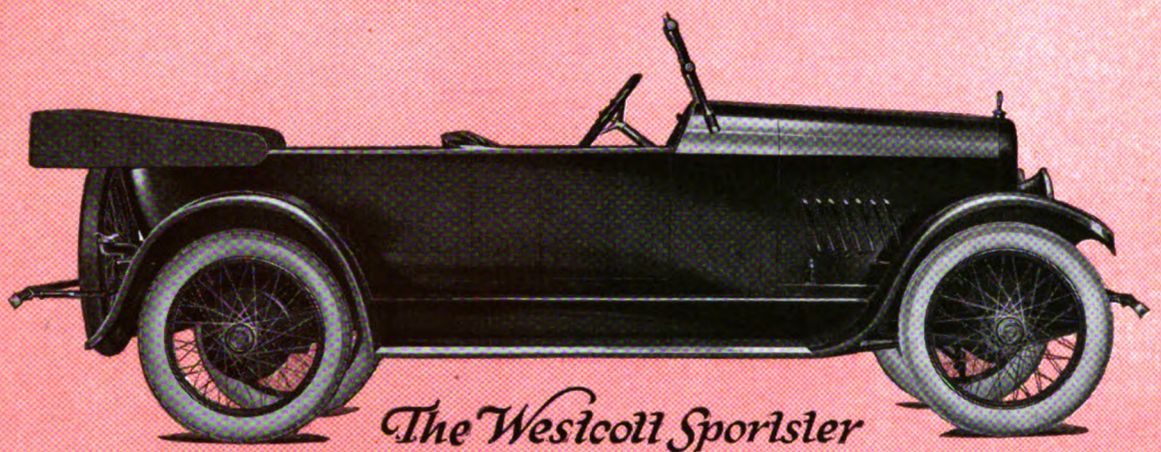
Pasco Wire Wheels give to a car an air of distinctiveness and beauty and an impression of speed and class which will appeal to all motorists.

Dealers—Write for particulars and prices and our liberal proposition to you.

NATIONAL WIRE WHEEL WORKS

(Incorporated) **GENEVA, N. Y., U. S. A.**

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The Westcott Sportster

$2290 f. o. b. Springfield, Ohio
Wire Wheels $100 Extra. Price includes Cord Tires and Bumpers front and rear

THIS new pre-season Sportster is the latest evidence of the Westcott policy of keeping the Westcott Six well in advance not only in mechanical progress but in development of design and completeness of equipment.

To the engineering excellence and exclusive construction features that distinguish the Westcott from a practical standpoint, this new model adds the dashing lines, richness of finish, and wealth of accessories that will make it a delight to those who are satisfied in cars, as in clothes, only with the fashions that are a season ahead.

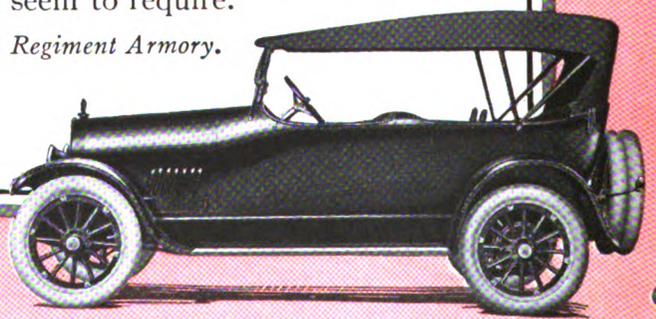
With the inclusion of the Sportster, the Westcott advanced ideas in motor car construction are available to distributor or individual buyer in just the type of car desired, whether the purchaser is concerned with winter comfort or is anticipating the preferences that will prevail in the months to come.

To see the Westcott line at the Show, to study the Westcott Specifications, and to examine the Westcott workmanship is to realize why the Westcott is bought by the man who wishes to represent or ride in a car that offers more in performance and appearance than present standards of motor car value would seem to require.

Chicago Show Space, B-2, First Regiment Armory.



The Westcott Four Passenger Touring Roadster
Price $1890. f. o. b. Springfield, Ohio



The Westcott Seven Passenger Touring Car
Price $1940. f. o. b. Springfield, Ohio

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Westcott

Sportster Features

Long Wheel Base. Low Body. Straight, rakish lines.

Sloping Wind-shield of latest design.

Undivided Front Seat.

Walnut Cabinet in rear of front seat. Three compartments, each with door and Yale lock, opened with ignition key. Icy-Hot Bottle in middle compartment. Tonneau Light above cabinet.

Electric Cigar Lighter with extension cord.

Cord Tires, 32 x 4½.

Westcott "self-acting" top. Gypsy curtains.

Bumpers front and rear.

Warner Lenz.

Body Liberty Blue.

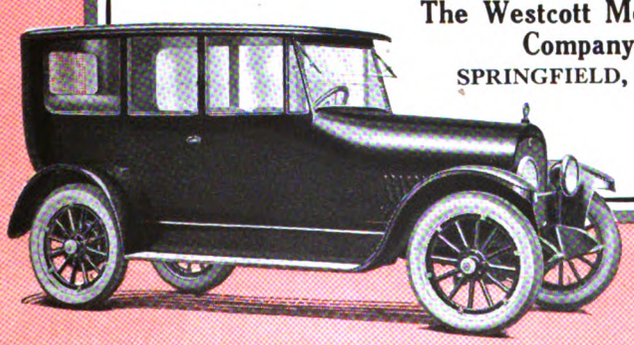
Geared to qualify as a gentleman's Sportster.

Other specifications same as the general Westcott line.

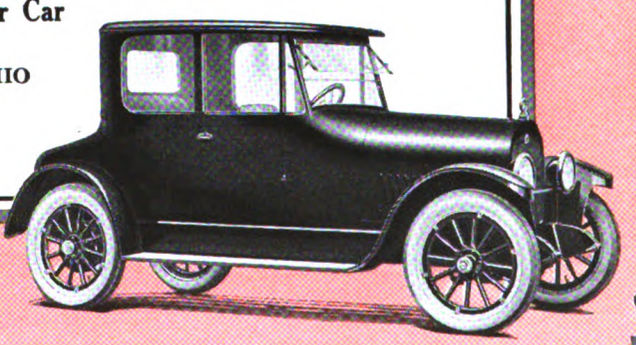
Westcott Superiorities

Continental Motor, 6-cylinders, 3½ x 5¼; Cast Aluminum Crank Case. Timken Axles, Bearings, and Brakes. Delco Starting, Lighting, and Ignition. Wick-fed Oil Cup Chassis Lubrication *without a single grease cup.* "Self-acting" Top of Pantasote on all open models, affording simplicity and ease of adjustment. Thermostatic Control of Engine Temperature. Fedders Cellular Radiator. Rayfield Carburetor with Integral Priming Device, operated from seat. Gemmer Semi-irreversible Steering Gear; Adjustable Steering Column; Solid Walnut Steering Wheel, Aluminum Mountings. Spicer Universal Joints. Boyce Moto-Meter. Jiffy Curtains with Blackmore Door Openers; Tool Compartment in Driver's Door. Wheel Base 125". Double-ventilating, Rain-visioned, Storm-Proof Wind-shield. Chrome Vanadium Springs throughout. Controls in Normal Driving Position. Concealment of Auxiliary Seats. Quality and Beauty of Upholstery. Quality of Instrument Board and Instruments. Low Up-keep; Endurance; Beauty; Comfort. 35 x 4½ Oversize Tires (32 x 4½ on Sportster) Non-skid Rear; Ribbed Front. French Pleated No. 1 Long Grain Dull Leather upholstery; Genuine Curled Hair and Double-deck Springs. Power; Hill Climbing; Low Throttling; Acceleration; Accessibility; Freedom from Vibration. Variety of Color Selections. Ample Leg Room in both Compartments. Every Car Road-tested before Shipment.

The Westcott Motor Car Company
SPRINGFIELD, OHIO



The Westcott Seven Passenger Convertible Sedan
Price $2790. f. o. b. Springfield, Ohio



The Westcott Four Passenger Convertible Coupe
Price $2790. f. o. b. Springfield, Ohio

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Cooling

¶ The cooling system that guards the high-speed aeroplane engine of the Standard "8" has never been known to fail. ¶ "Hot engine" is unknown in this 83 horsepower motor. ¶ After 50,000 miles of hard touring, your engine is as proficient as after 1000. The Standard "8" will see you through. ¶ This great cooling system means greater power on grade and mountain —and the greater riding comfort that ensues from confidence. ¶ Ride just once at the wheel of this flying wedge of steel and style, and indecision as to what car to buy will vanish. Especially when you discover that the Standard is listed $500 less than any car that begins to approach it in ability. ¶ 83 H. P.— 127-inch wheelbase—optional upholstery and color. ¶ Distributors and dealers in territory still open are invited to call on any of our representatives for a ride in this truly wonderful car.

Prices, $2450 to $4000

STANDARD STEEL CAR CO.
Pittsburgh, Pa.



STANDARD "8"
The Magneto Equipped Eight

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DOUGLAS & RUDD MFG. CO.

BE SURE THIS MARK IS ON YOUR CONNECTIONS



DOUGLAS

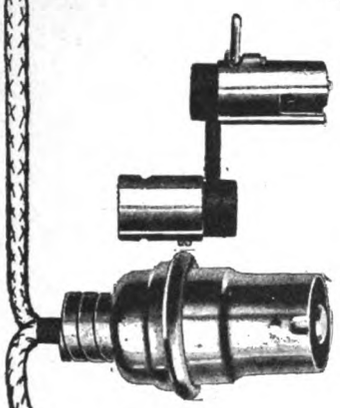
LET
DOUGLAS & RUDD
SOLVE
YOUR LIGHTING TROUBLES
WITH



RUDD

A LINE OF CONNECTORS

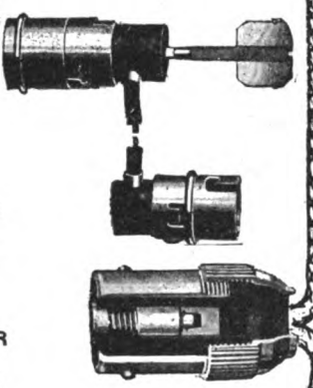
THAT CONNECT
WITH
EVERY UP TO THE MINUTE
ENGINEER



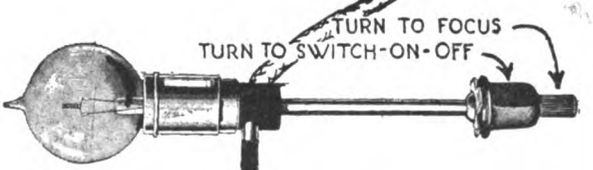
ANYTHING
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CONNECTIONS
FOR
AUTOMOBILE
LIGHTING
SYSTEM

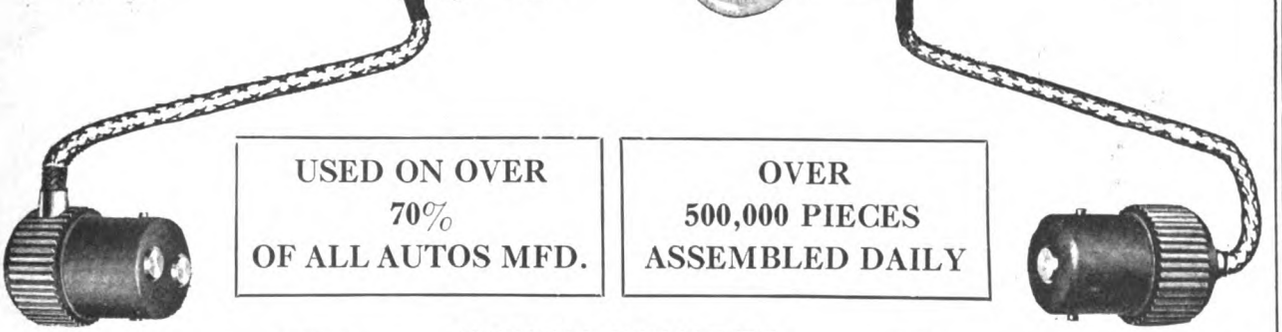


IF YOU DO
NOT FIND
THE
CONNECTOR
REQUIRED
ASK US]
WE MAKE IT



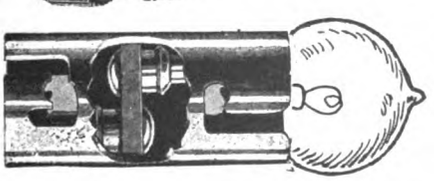




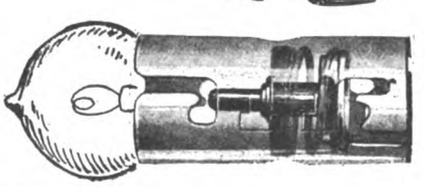


USED ON OVER
70%
OF ALL AUTOS MFD.

OVER
500,000 PIECES
ASSEMBLED DAILY



WHICH INSURES
THE RIGHT GOODS
AT THE RIGHT PRICE
AT THE RIGHT TIME



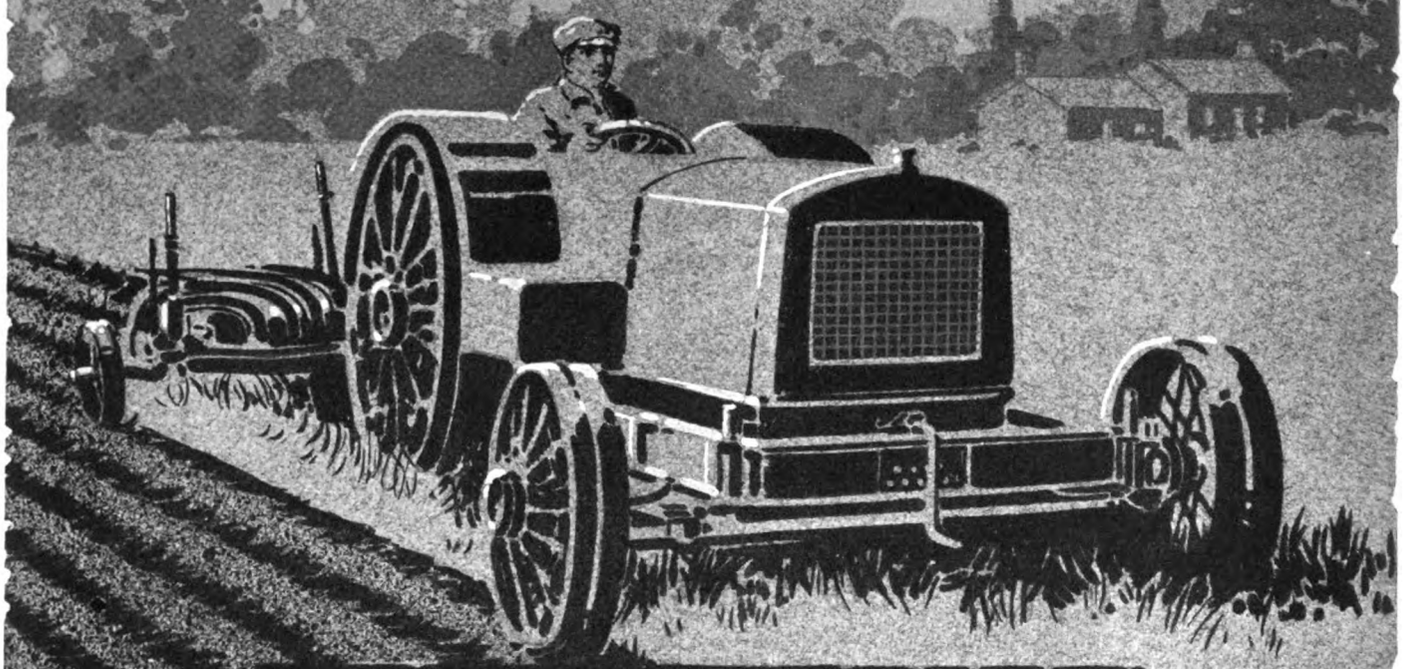
BRONSON CONNECTORS that CONNECT MICHIGAN

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Tractor Service Is Hard On Bearings

LAMINUM

Makes Adjustments Easy

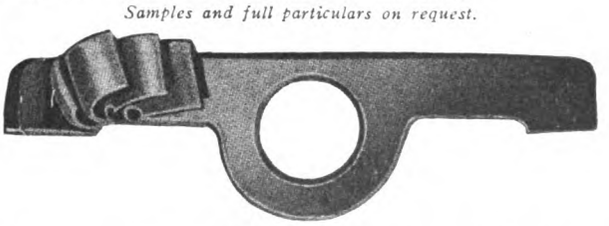


It has been said that the bearings were the weakest point of the present-day tractor. The work is so severe and the demands upon the bearings abnormal that excessive wear seems inevitable.

Loose bearings are an abomination, and anything that will enable wear to be taken up quickly and easily is a real boon to everyone connected with a tractor, from maker to user.

Laminum solves the problem. It makes reductions the work of a moment. A penknife strips off enough layers to make the shim the right thickness. The surface is as smooth and uniform as when first used. It makes a perfect adjustment possible by unskilled labor in very brief time. That's a mighty important consideration to tractor buyers. It's also a good reason why you should use shims made of Laminum.

Samples and full particulars on request.



LAMINATED SHIM CO., Inc., 533 Canal St., New York

Dime Bank Building, Detroit
English Representative: R. A. Rothernel, 6 Great Marlboro' St., London, W.

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SERVICE-ABILITY



NO component of the machinery that is contributing to the worth of your truck, tractor or aeroplane will render to you greater service value than the ball type of bearing.

No ball bearing offers advantages over the New Departure, a product of intensified refinements throughout. Furthermore, New Departure service includes prompt deliveries and gratuitous engineering co-operative consultation service.

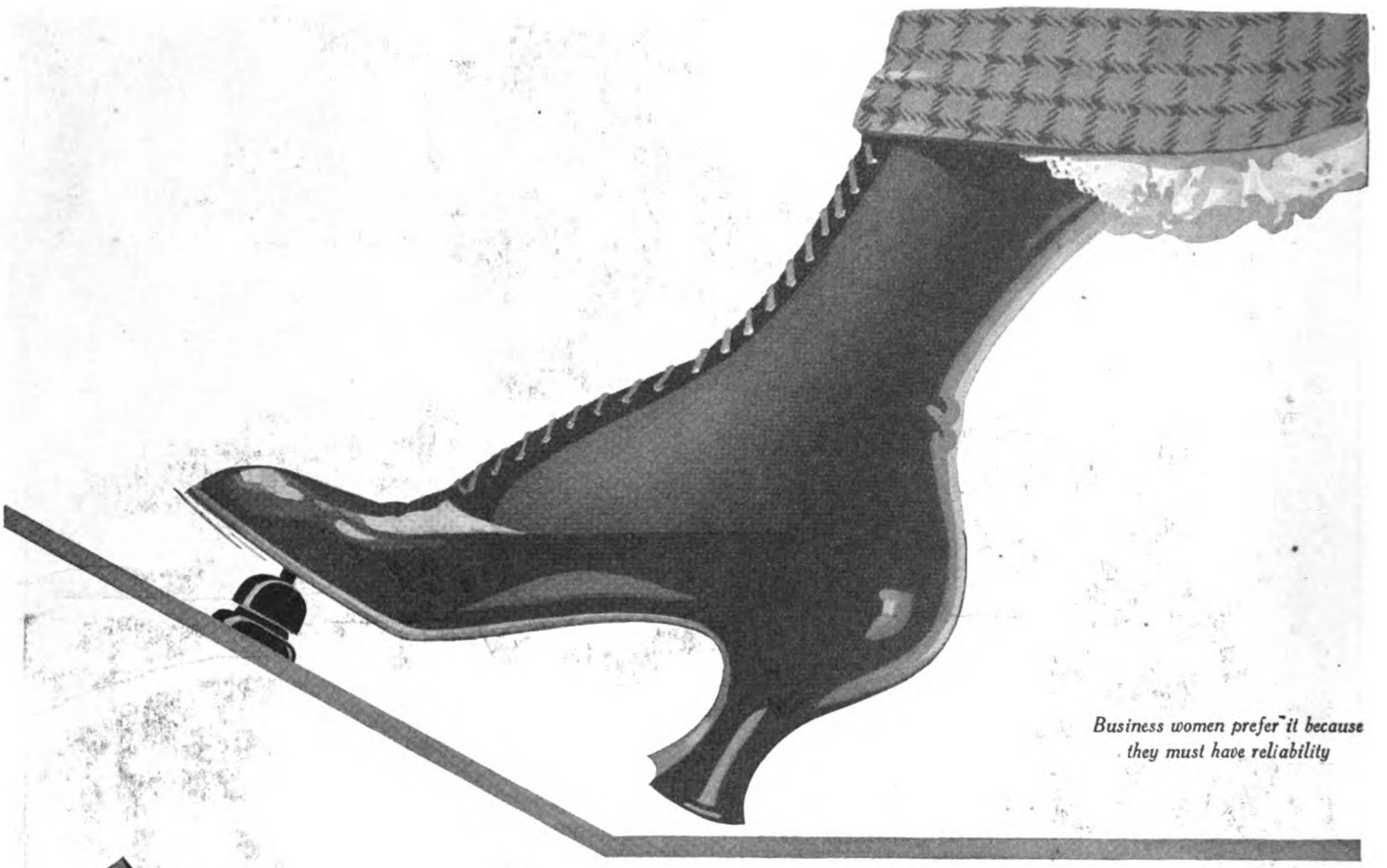
New Departure engineering ball bearing reference book will be sent to engineers and others interested who write on the letterhead of their firm.

THE NEW DEPARTURE MANUFACTURING COMPANY,
Bristol, Conn. Detroit, Mich.

Conrad Patent Licensee.

NEW DEPARTURE BALL BEARINGS

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Business women prefer it because they must have reliability

Auto-Lite

Starting, Lighting & Ignition



Modernizes Motor Cars!

What one thing more than any other makes the modern automobile so convenient and safe?

Surely the perfection of the electric starting, lighting and ignition adds marvels to the ease, comfort and efficiency of any make of car.

You can hardly tolerate the thought of a car without it.

The world is largely indebted to Auto-Lite for the wonders achieved in this work.

Auto-Lite originated the six-volt principle, separate unit, now the standard of highest quality and efficiency.

This is why Auto-Lite is the world's largest company devoted exclusively to making starting and lighting systems for motor cars.

The intrinsic merit of its product has won supreme leadership for Auto-Lite and is your guide in the purchase of your next car.

Electric Auto-Lite Corporation

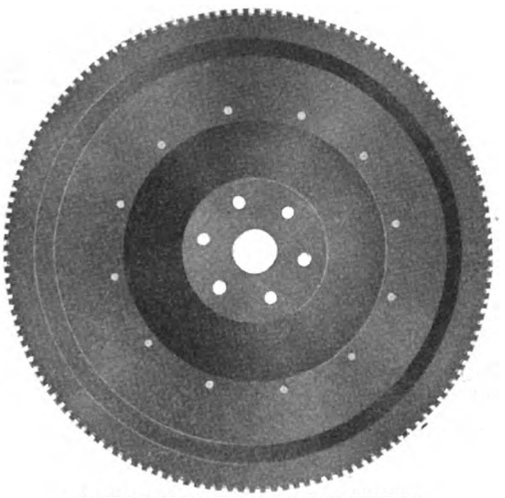
Head Office and Factory, Toledo, Ohio — Detroit Sales Office, 1507 Kresge Bldg.

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Steel for Service



CADILLAC



AMERICAN LA-FRANCE FLY WHEEL



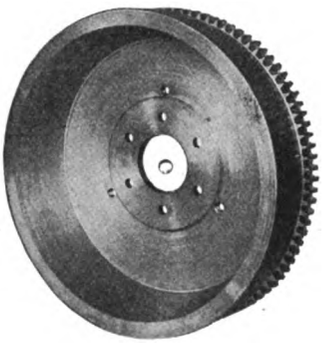
AMERICAN LA-FRANCE
Brake, Drum and Sprocket



WHITE

These fly wheels made from

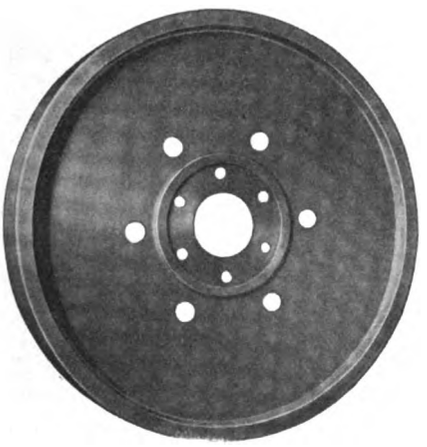
Rolled Steel Fly Wheel Blanks



STUTZ

are only a very small portion of a great variety of rolled steel circular sections manufactured by the Carnegie Steel Company.

It will gladly consider any such sections suitable for its mills.



ROCHESTER MOTOR CO.
(London Busses)



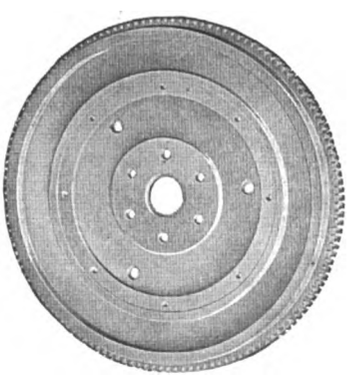
F. I. A. T.



PACKARD



PIERCE-ARROW



PATHFINDER

Carnegie Steel Company

GENERAL OFFICES: PITTSBURGH, PA.

908

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SKF
BALL BEARINGS



With Pride We Say

THERE is a sense of satisfaction, a pride in surveying such a motor truck—a truck which is powerful, dependable and efficient in all its parts. The extreme limits of accuracy observed in the manufacture of S K F Ball Bearings enable this Mack Truck to operate without binding strains, fatigue or bearing trouble.

SKF BALL BEARING CO.
HARTFORD 204 CONN.

Please mention Automotive Industries when writing to Advertisers

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What Keeps the Gears Silent?

Smooth, silent operation of rear axle gears is one of the great objectives of the car builder's engineer.

He specifies gears mechanically and mathematically correct, but he must also provide one other essential—protection against *wear*.

The big ring gear has the whole dead weight of the car dragging it back. The little pinion gear at the end of the propeller shaft says it must go forward.

If the bearings supporting these gears wear loose, under pressure of conflicting forces, the pinion will climb on the ring gear, and the latter will be thrown out of perpendicular position.

When gears work out of mesh they begin to wear—and the more they wear the faster they wear and the noiser they become.

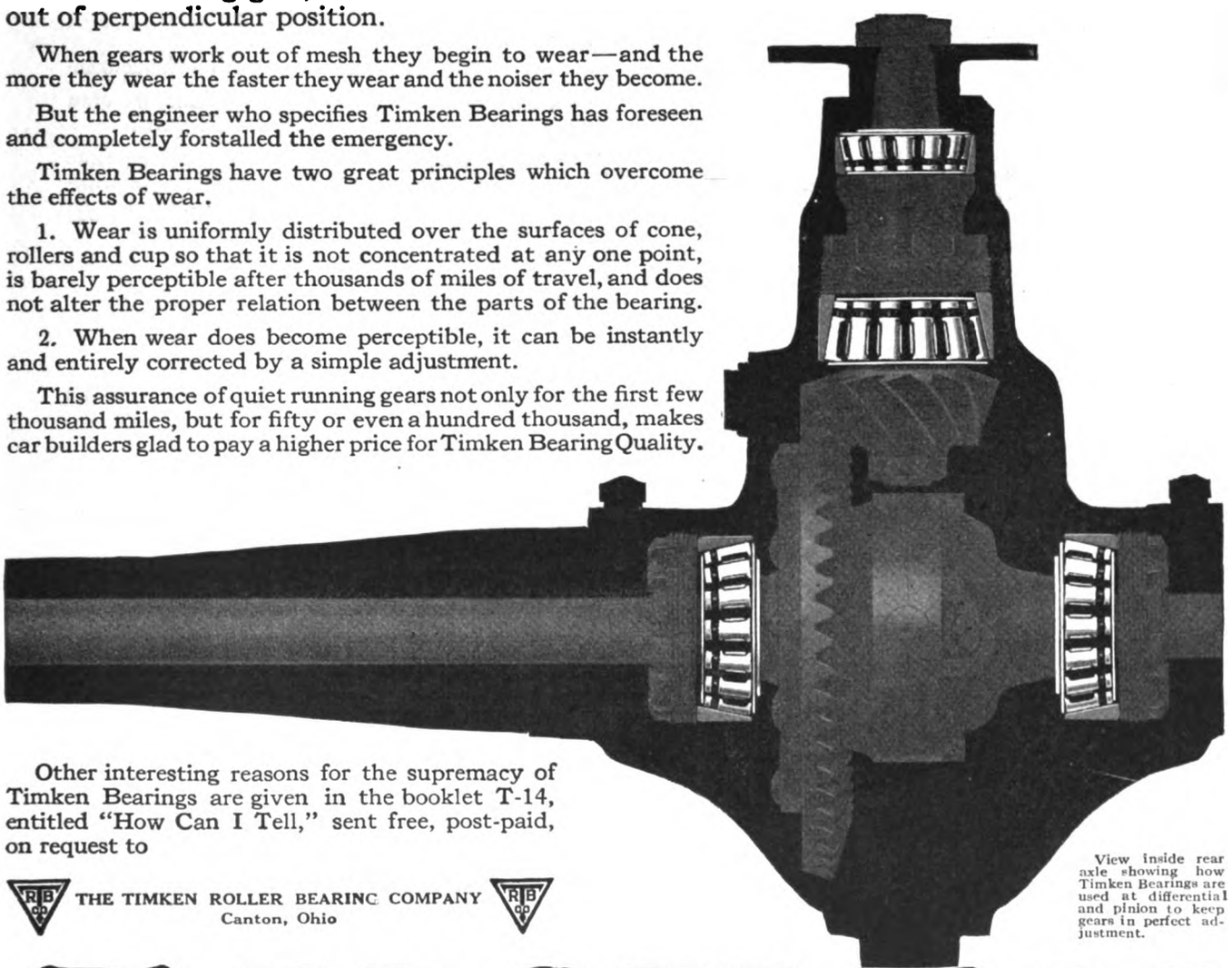
But the engineer who specifies Timken Bearings has foreseen and completely forstalled the emergency.

Timken Bearings have two great principles which overcome the effects of wear.

1. Wear is uniformly distributed over the surfaces of cone, rollers and cup so that it is not concentrated at any one point, is barely perceptible after thousands of miles of travel, and does not alter the proper relation between the parts of the bearing.

2. When wear does become perceptible, it can be instantly and entirely corrected by a simple adjustment.

This assurance of quiet running gears not only for the first few thousand miles, but for fifty or even a hundred thousand, makes car builders glad to pay a higher price for Timken Bearing Quality.



View inside rear axle showing how Timken Bearings are used at differential and pinion to keep gears in perfect adjustment.

Other interesting reasons for the supremacy of Timken Bearings are given in the booklet T-14, entitled "How Can I Tell," sent free, post-paid, on request to

THE TIMKEN ROLLER BEARING COMPANY
Canton, Ohio

TIMKEN BEARINGS

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SUNDERMAN
Vacuum Carburetor

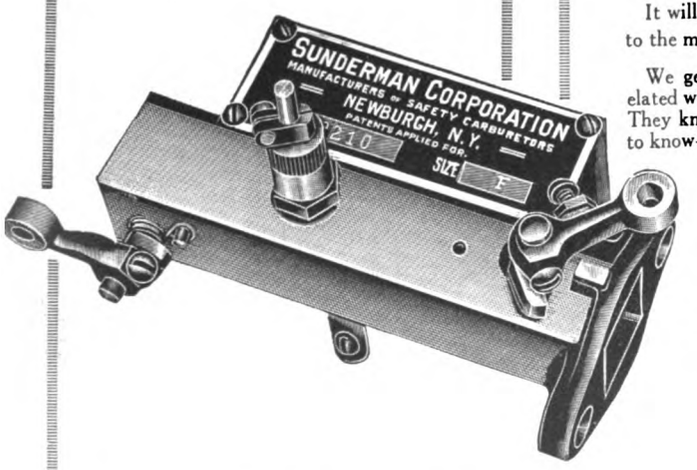
$6

F. O. B.
Newburgh

For FORD and METZ

For all other cars the prices are $8 and $10, depending on the fittings required. Its service is supreme on all makes and models of cars.

See us at the Chicago Show— Armory Balcony, Booth 5.



Your Carburetor Is Leaking

unless you've already equipped your car with a Sunderman.

You'd sew up a hole in your pocket, or else buy a new pair of trousers, wouldn't you?

Every time you turn your motor over, you're letting some good, hard-earned coin of the realm slip away from you without getting anything for it, unless you have a Sunderman Carburetor.

You Can Stop This Leak With a Postal Card

Just tell us to send you a carburetor (give the make and model of your car) and prove to yourself what the Sunderman will do.

It will positively save from 30 to 50% in your gasoline or other fuel consumption—that means it will give you from 43 to 100% mileage increase. We're proving it every day.

It will give your motor more power than it ever had—unless it is ready for the junk pile. Even then it will give it more pep, punch and pull than it has had in a long while.

It will give you better hill-climbing—the surest claim we make—an absolute, unfailing certainty. It will give your engine greater flexibility—a wider range of speeds, low, high and intermediate, taken without "bucking"; a smooth, swift acceleration or slowing down that has hitherto belonged only to the sixes, eights and twelves.

It will give your car a livelier getaway, a quick, sure pick-up, responding to the motor's demands like a great-hearted athlete who's bound to win.

We get in every day's mail testimonial letters from car owners who are elated with the Sunderman Carburetor's performance in power and economy. They know—and we know—what the Sunderman will do. We want you to know—you have ten days to prove it. Send us an order today.

Dealers: There is no better or more favorably known carburetor on the market today. We back it with consistent advertising. We make fine selling arrangements with the right people. See us at the Chicago Show, or write at once.

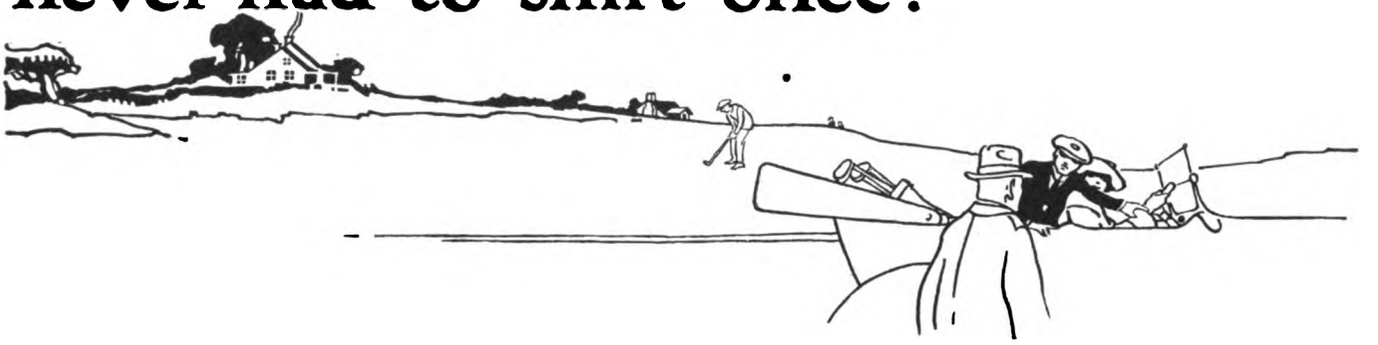
Sunderman Corporation

5 Chambers Street Newburgh, N. Y.

Western Office: 403 Kresge Building, Detroit

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"coming home they sold her some poor gas, but with that switch on 'H' she never had to shift once."



FOR when she threw the switch to "H" the motor, which has been missing badly, immediately responded to the flood of sparks turned loose by the Philbrin High Frequency System.

That High Frequency System delivers a thousand sparks a second to each cylinder in its regular firing order. There's no mixture, even though poor, that won't give way before that stream of fire.

But the High Frequency is a secondary system to the Philbrin Single Spark System. Most of your running is done on the latter system with its hot, uniform spark, hottest at low speeds.

This system will fire a lean mixture perfectly and give your engine the power, speed and "pep" that every motorist considers his heritage.

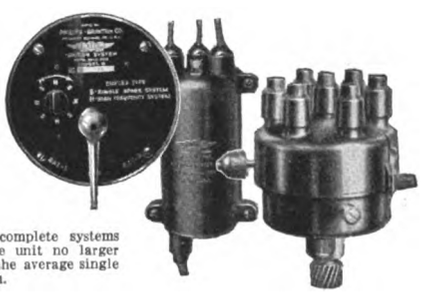
The efficiency of Philbrin Single Spark Ignition is due in no small part to the Philbrin Contact Maker and Condenser, which provide for ample saturation of the coil and an instantaneous break, assuring a full-bodied, powerful spark with extreme y small current consumption.

Philbrin Duplex Ignition, by combining two distinct systems under one control, accomplishes results that could not be expected of any single system alone. And each system, separately, has been developed to the highest point of dependability and efficiency.

Made in sizes for all cars, with special mountings for magneto replacement when required. Our trade policy assures Jobber and Dealer an attractive margin of profit. Territories now being assigned. Write at once.

See Our Exhibit at the Chicago Automobile Show, Booth 87.

PHILIPS-BRINTON CO. 501 S. Broad St. Kennett Square, Pa.



Two complete systems in one unit no larger than the average single system.

PHILBRIN

DUPLEX IGNITION

—with a second system to spur the motor to super-service.

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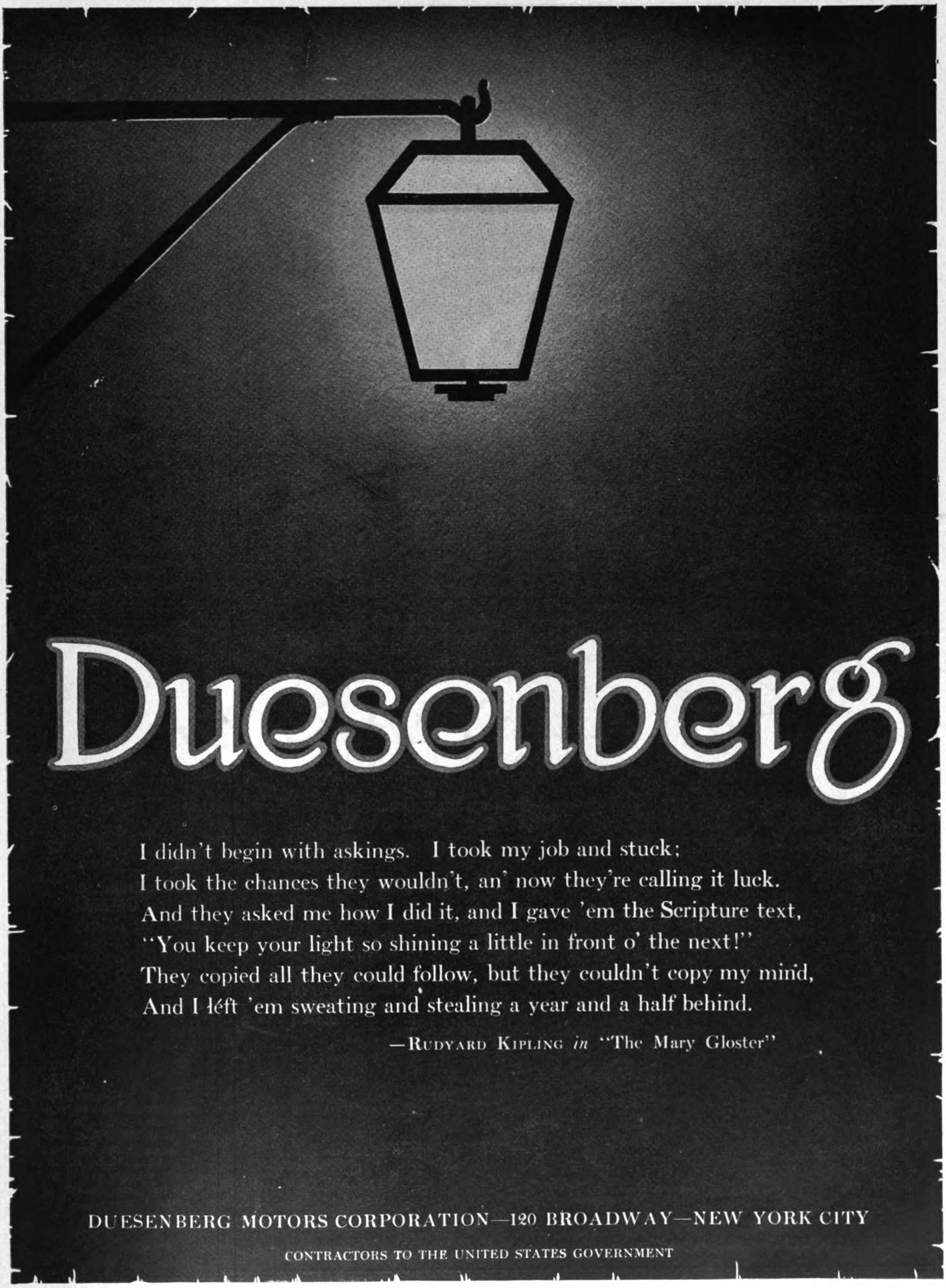
At the show you'll see many cars with—

beautiful lines, sumptuous upholstery and glittering finish. But these alone do not establish quality in motor cars. The real test is when, after thousands of miles of running, that car still operates smoothly and silently, still free from vibration. Such are the cars that have Hess-Bright Ball Bearings. The choice of cars famous for exceptional service—the bearings of precision and long life—Hess-Brights are a mechanical feature you should certainly look for in your coming car.

THE HESS-BRIGHT MANUFACTURING COMPANY

Where Performance takes Preference over Price

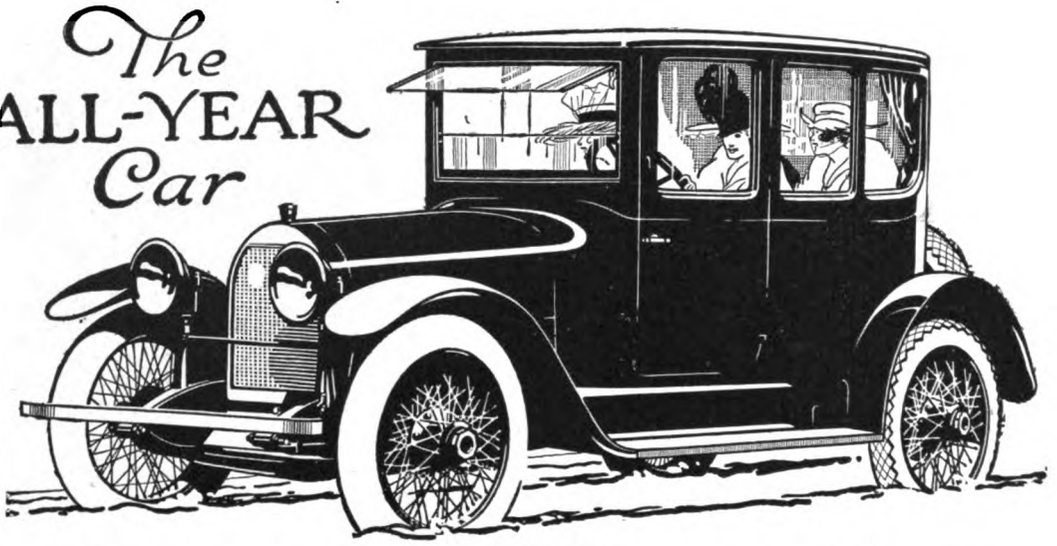
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KisselKar

The ALL-YEAR Car



Now at the Chicago Show

DIRECT from its triumphs at the New York Show, the entire KisselKar exhibit has arrived at the Coliseum—including the new **KisselKar Silver Special Sixes,** the supreme embodiment of custom-built exclusiveness and mechanical excellence.

In the 4-passenger ***Sedané*** and the 5-passenger Staggered Door Sedan, with the latest All-Year Top—entirely removable—all side windows may be lowered full length, an exclusive Kissel feature.

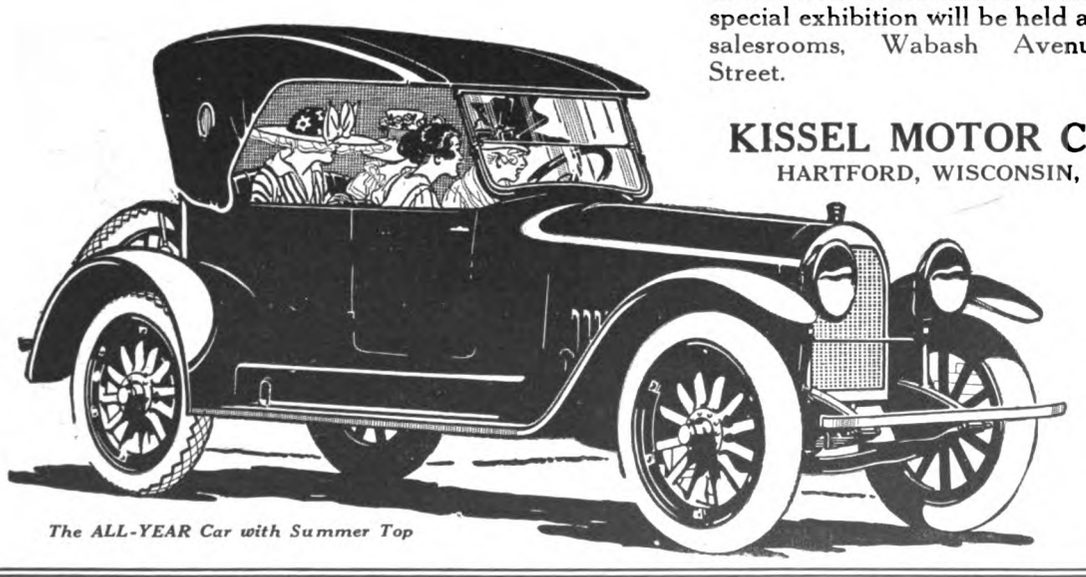
The ALL-YEAR Car
MAINTAINS ITS LEADERSHIP

The perfect expression of the two-cars-in-one idea. The All-Year Top is built-**in,** not **on**—no visible fastenings, no rattles or drafts, yet entirely removable.

The HUNDRED POINT SIX, with its Hundred Quality Features, holds its supremacy in its class.

In addition to the exhibit at the Coliseum, a special exhibition will be held at our Chicago salesrooms, Wabash Avenue at 26th Street.

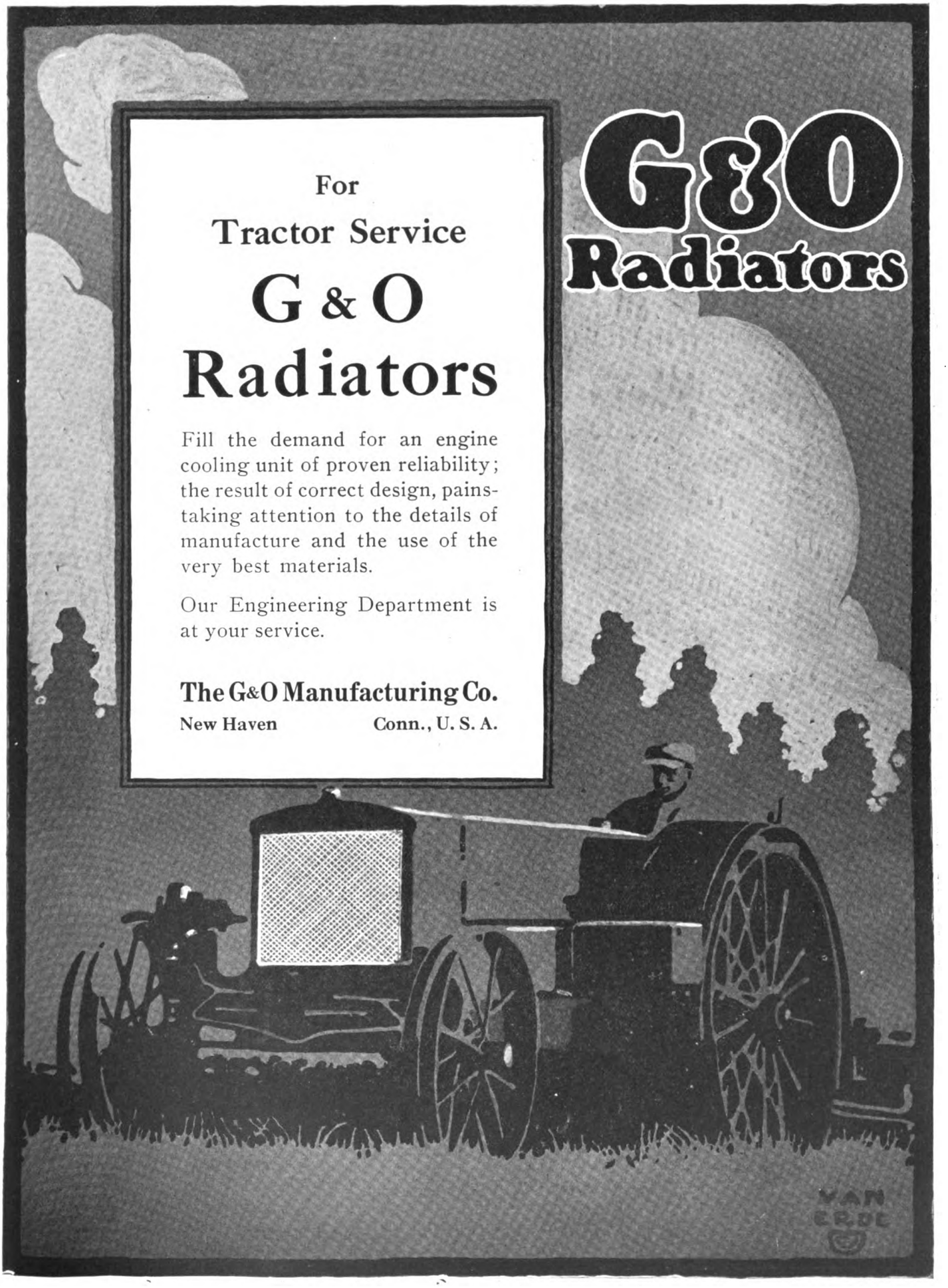
KISSEL MOTOR CAR CO.
HARTFORD, WISCONSIN, U. S. A.



The ALL-YEAR Car with Summer Top

Dealers—Dealers who attended the New York Show found in the KisselKar their answer to the question: "What line for 1918?" It will pay you to see the same exhibit at the Coliseum.

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A DRIDEK Leather Top Will Not Scratch or Chafe Will Hold Its Color and Appearance and Is Guaranteed Absolutely Waterproof

TRADE DRIDEK MARK REG.

The Most Remarkable Top Material Yet Produced

"Over the Top"

When you put a DRIDEK leather top on your car, you cover it with a character and distinction that produces an increased value and puts your car in the class where it belongs.

DRIDEK tops are being put on many of the *best* cars. If you don't know all about DRIDEK get samples and price list at once.

L. J. Mutty Company, Boston, Mass.

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Why the Maxim Silencer Reduces Back Pressure And Silences BOTH Exhaust Noises

As to Back Pressure

The Maxim Silencer whirls the exhaust gases. It does not stop them suddenly or bandy them to and fro among baffle plates, or squeeze them through tiny holes and tortuous channels.

Have you ever seen waves breaking against a wall, or water suddenly deflected from its course and made to run at a right angle to that course? If so, you remember the inevitable reverse wave that goes rippling back along the current.

Now, suppose this water, instead of hitting a sudden obstruction and being sharply deflected, merely runs into a whirlpool. There is then no reverse wave—no back pressure. And if the outlet to this whirlpool be in the reverse direction to the whirl of the pool it is easy to understand that the water leaving will be the water that has slowed down and drifted out.

The Maxim Silencer acts in just that fashion. It starts the gases whirling and uses up their velocity in this whirling motion. They leave the first chamber to enter the second through an opening in the reverse direction, so that only that portion of the exhaust that has slowed down passes through.

The exhaust is thus slowed down and cooled off (by contact with the walls of the second or outside chamber) without being stopped or sharply deflected. Therefore, practically no back pressure is developed. It is the simplest—and most efficient—method.

As to the TWO Noises

Mr. Maxim's study of gun report noises disclosed the fact that there are two separate and distinct noises produced by the discharge of a fire-arm. One is caused by the sudden liberation of high pressure gases; the other by the bullet in its flight through the air. The latter is not a "whistle" or "shriek," but a sharp "crack," exactly like the crack of a whiplash.

Two noises of similar character are made by an automobile exhaust. One is caused by the sudden expansion of gases abruptly liberated into the atmosphere; the other by the high velocity with which these gases rush through the outer air.

The Maxim Silencer is designed to quiet both these noises; the first by a whirling motion of the gases, causing centrifugal pressure against the outer walls of the Silencer chamber. This pressure slows up the gases and sends them into the atmosphere in a thin, creeping stream, instead of a solid, rapidly moving mass.

It also cools them against the walls of the chamber, so that they are more nearly the temperature of the outside air.

The second or "cracking" noise, caused by the speed with which the exhaust rushes into the atmosphere, originates under the exhaust valve, and when it reaches the Silencer it is already a noise or sound wave. Being such it has no inertia and will turn a corner as readily as advance forward. When it issues from the first to the second tubes therefore it starts around in both directions. Every time it passes the outlet of the second tube some of the wave escapes, while the rest continues on around the endless chamber.

This sound wave, or noise, is thus split into a great many smaller waves, and its strength and sharpness materially lessened.

The MAXIM-SILENCER

Next year the "Maxim-Equipped" cars will have the call. Motorists will learn a great deal about mufflers this winter, and they are going to ask for a "Maxim-Equipped" Car. It means more power, less fuel, no blowouts, a muffler that cannot rattle or come loose and that will outlast the car itself.

Write at once for full particulars and very generous terms.

G.P.&F. SERVICE
"KNOWING HOW SINCE '01"

Geuder, Paeschke & Frey Company

1422-1700 St. Paul Ave. MILWAUKEE, WIS.



Where Maxim Silencers Are Now Made

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"Have used
set of Cork Insert Transmission Linings on my Ford for
10,000 miles
and they are
good as new"

—so writes Edward P. Schafer of Millvale, Pa., and his is a typical Ford owner experience with Cork Insert Transmission Linings. Outwearing two to three sets of ordinary linings, they end the nuisance and expense of frequent replacements. Throughout their long wear they give wonderfully efficient service. They stop the grab, slip and chatter — replace it with velvety smooth transmission action. They eliminate the heavy vibration and strain on mechanism and the Ford rear end. They make the Ford brake *brake*. They require less pressure on the pedal. They permit the hauling of a heavier load. Service considered, Cork Inserts are by far the most economical linings you can buy. Your dealer has them or can easily get them for you.

Dealers: Cork Insert Transmission Linings and Fan Belts give you a line of *good profits* in place of a small margin staple. Sales have jumped ahead every month the past year. Order Cork Inserts from your jobber and cash in on this winner.

Advance Automobile Accessories Corporation
Dept. A16-1, 56 East Randolph Street
Chicago, Ill.



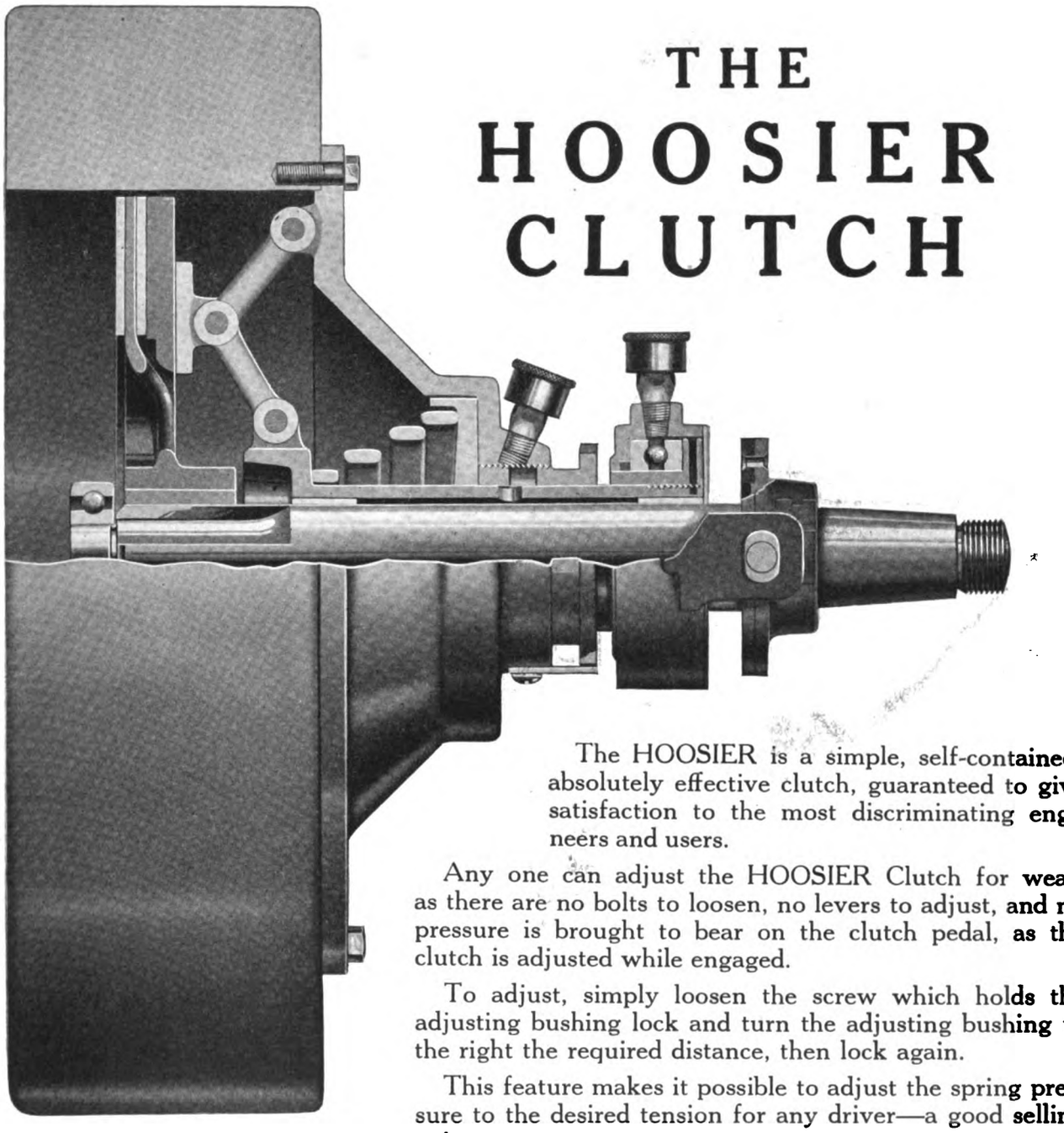
A fast selling non-slip fan belt for Fords

$3 per set of 3

$1 for
1917 models
85c for preceding models

Please mention Automotive Industries when writing to Advertisers

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THE HOOSIER CLUTCH

The HOOSIER is a simple, self-contained, absolutely effective clutch, guaranteed to give satisfaction to the most discriminating engineers and users.

Any one can adjust the HOOSIER Clutch for wear, as there are no bolts to loosen, no levers to adjust, and no pressure is brought to bear on the clutch pedal, as the clutch is adjusted while engaged.

To adjust, simply loosen the screw which holds the adjusting bushing lock and turn the adjusting bushing to the right the required distance, then lock again.

This feature makes it possible to adjust the spring pressure to the desired tension for any driver—a good selling point.

With the exception of the plates and friction discs the HOOSIER Clutch is entirely self-contained, which makes its assembly in the chassis a very simple operation.

Extra wide friction discs are used, which gives larger gripping surfaces, and insures longer life and fewer adjustments for wear.

The HOOSIER Clutch is made in the standard sizes, both Unit Power and Amidship types, and interchanges with other makes of clutches of similar design.

We guarantee first class material and workmanship, and can easily take care of your delivery requirements.

HOOSIER AUTO PARTS COMPANY

MUNCIE MANUFACTURERS **INDIANA**

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Back Your Good Workmanship With Good Brake Lining!!

Protect the lives of your customers—protect your own reputation—get the big end of the renewal business in your territory coming to you—by using

GARCO BRAKE LINING

GARCO is dependable. Our pledge of highest quality—our guarantee of absolute satisfaction—stands squarely back of every foot. GARCO dealers easily win the reputation of selling the best accessories in every line.

Solidly woven from high-grade, long-fibre asbestos, GARCO holds with the grip of a giant down till the last shred is gone.

GARCO will not heat or burn. Oil, water, grease or dirt on the brake drums do not affect it. The chemical solution with which it is impregnated gives it unequalled gripping power.

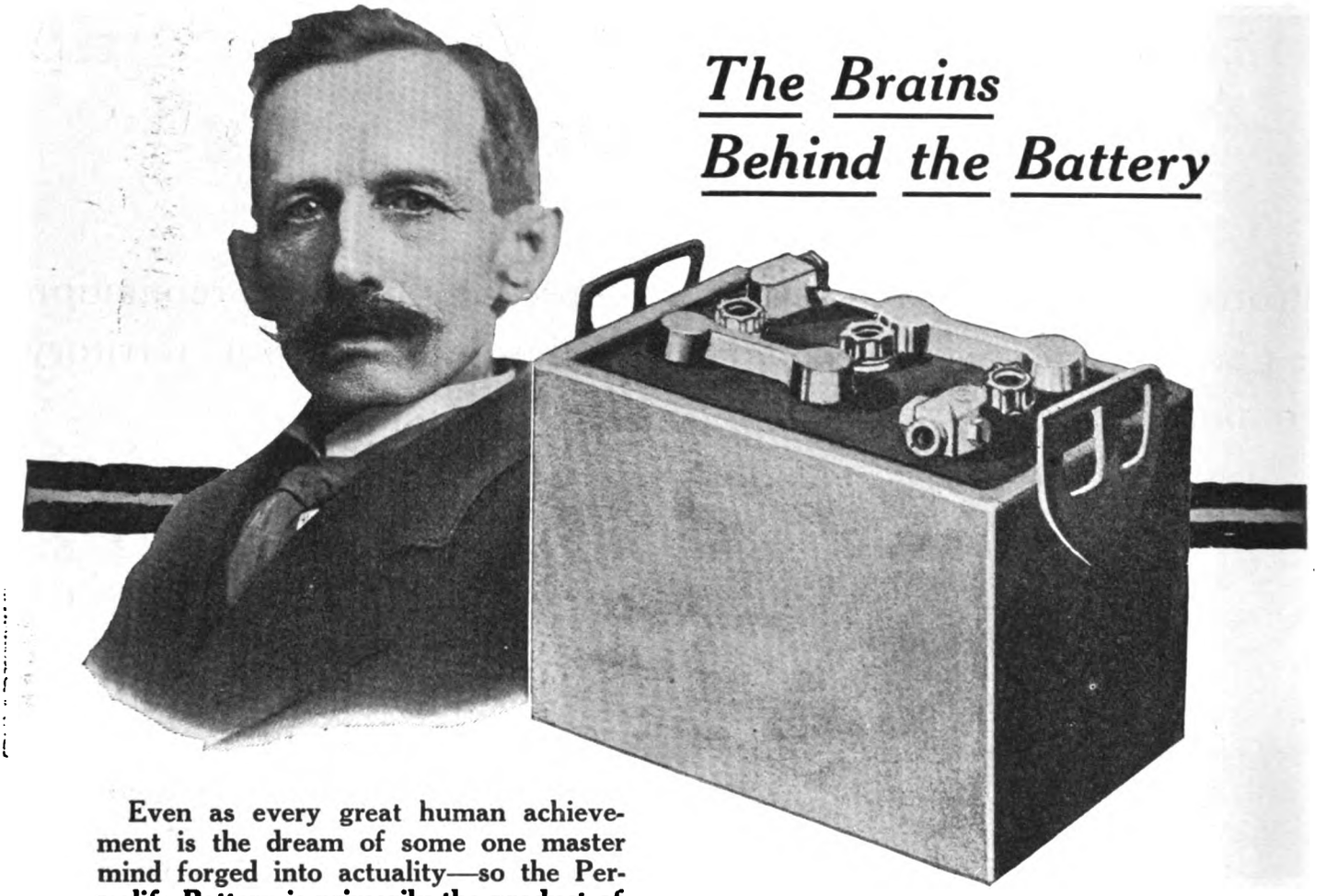
Your jobber will gladly tell you more about GARCO—about the full line of selling helps supplied free of all charge to every GARCO Dealer.

GARCO BRAKE LINING is only one of our complete line of automobile asbestos specialties. For big profits and big repeat business, order GARCO Transmission Band Lining for Fords Today.

GENERAL ASBESTOS & RUBBER CO., MAIN OFFICES and FACTORIES **Charleston, S. C.**

Branches and Complete Stock: 58 Warren Street, New York
106 West Lake Street, Chicago
311 Water Street, Pittsburgh

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The Brains Behind the Battery

Even as every great human achievement is the dream of some one master mind forged into actuality—so the Permalife Battery is primarily the product of the brains of one man.

Frederick Wright, electrical genius, whose name is writ high on the honor roll of inventors, is the master mind back of Permalife.

This man possessed the will and the grit and the faith that led him struggling through years of bitter disappointments and failures, to at last bring forth to the world the one truly great storage battery.

In Permalife Wright built—

A battery which delivers a higher discharge for a greater length of time than any other ever produced.

A battery which is absolutely free from harmful sulphation.

A battery whose plates are so designed as to be positively protected against buckling, and which are interspaced with electrically treated separators to prevent short circuiting.

A battery whose plates are *packed* (not pasted) with an active material so permanent as to give them supreme durability and yet so porous as to facilitate the quick chemical action of the electrolyte.

In short—a battery which is so perfect in design and construction as to stand alone in its capacity for service and long life.

Nothing succeeds like success. Frederick Wright was sought by great interests and told to name his own terms, but he preferred his independence. The end justifies his judgment.

Today, in the model Permalife factory at Poughkeepsie, Wright's dream has reached fruition. Here under ideal conditions with a corps of trained assistants and expert workmen operating under his personal supervision, Permalife Batteries are being produced to satisfy his most exacting specifications, and in ever-increasing quantities to meet a tremendous, healthy demand.

The merchandising plan of the Permalife Co. is unique. It places before the dealer a plan by which the bulk of the local battery business can be gained and held and made to yield rich returns.

Write for this co-operative proposition today.

PERMALIFE STORAGE BATTERY CO., Inc.
POUGHKEEPSIE, N. Y.

Permalife
THE EVERLASTING BATTERY

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We Recommend
MONOGRAM
OILS AND GREASES
Service and Quality



The Franklin CAR

SIGNS LIKE THESE

DODGE BROTHERS
MOTOR CARS

Get priceless advertising space on agency windows without cost. It's advertising that focuses public attention on your selling agencies at the right time and place.

THE Gould
STORAGE BATTERY

MEYERCORD
GENUINE DECALCOMANIA
WINDOW SIGNS

COLE 8

Are oil-paint color designs easily applied on the windows. Made in any size and style in colors and gold. Bright and attractive for years. Surpass hand-painted signs. Dealers like them. Not in their way, yet live business-getting trade-magnets night and day. Can you get the same utility from any other sign?

Used by over eighty-five per cent of the Automobile manufacturers, Tire and Accessory people and every leading national advertiser.

The cost of Meyercord Decalcomania Window Signs is not great. At a small outlay thousands are reached daily. Begin now to get your share of dealers' window space. This is just the time to get started.

Write today for samples and prices

Visit our Display Rooms, 11th floor, Chamber of Commerce Building, during the Show

THE MEYERCORD CO.
CHICAGO

The Meyercord Co., Ltd.
Toronto

Makers also of Decalcomania Transfer Name Plates

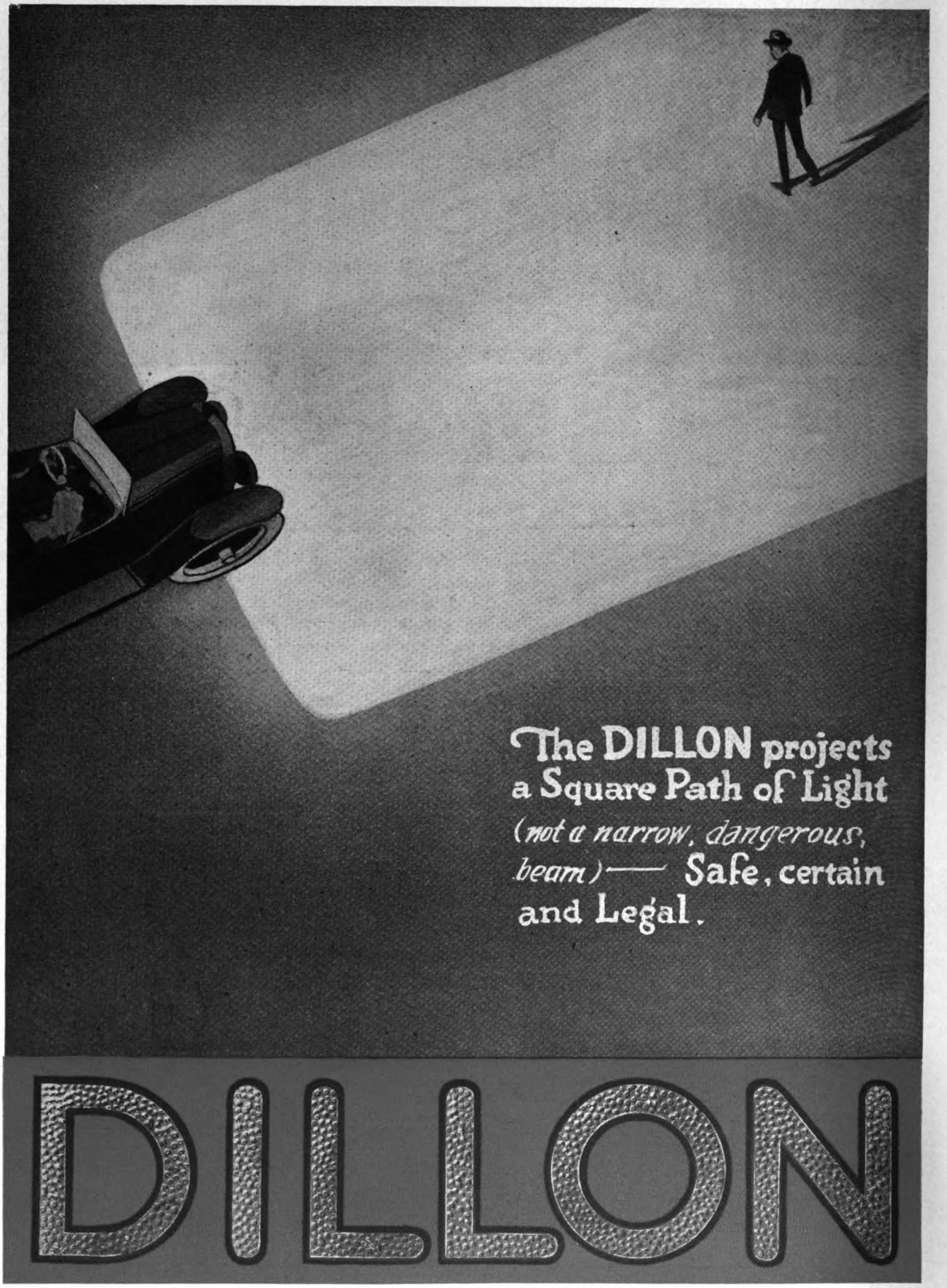
Goodrich Tires

Knight Tires

PAIGE
MOTOR CARS

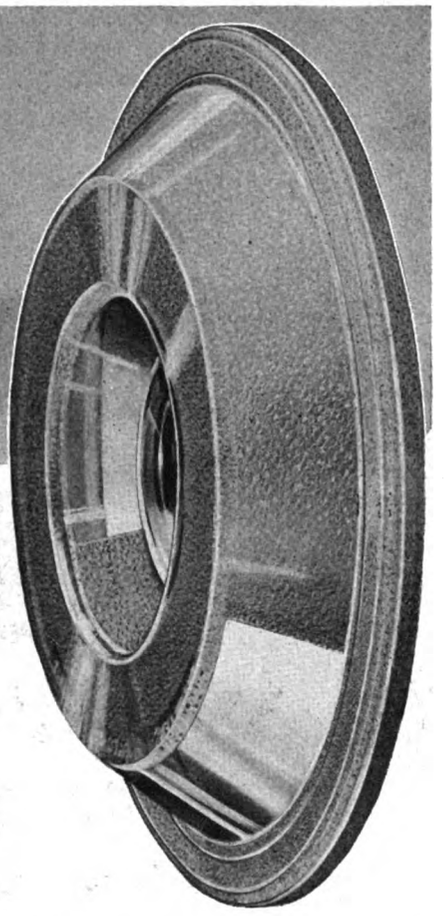
HUDSON
SUPER
SIX

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Don't Buy Glass—Buy Performance



YOU can't buy a good lens on appearance or on claims alone. PERFORMANCE forms the only sound basis for your selection.

The Dillon Multi-Vision Lens **does** what other lenses **claim to do.**

The average lenses prevent glare, but in so doing **restrict** the light.

The Dillon Multi-Vision Lens, on the other hand, gives you TWICE the lighted area instead of decreased vision. It gives you a SQUARE path of light instead of a narrow, fan-shaped shaft. It gives you long-range light for over 500 feet ahead and for over 25 feet on either side.

So brilliant, yet so glareless, is Dillon illumination that you can ride as safely at night as by day.

In addition, the Dillon Multi-Vision lens possesses distinction; it is so made that it cannot work loose in the rim and it cannot break from contraction or expansion.

You must SEE a Dillon Lens to appreciate its worth. You must buy the Dillon if you want dependable performance. See your dealer today.

Why the Dillon is More Efficient

THERE are three vital features of Dillon design, each of which contributes to the **ultimate** in light distribution. The mottled glass diffuses the light, while the clearer portion below illuminates the road at the side and front—hence a square path of light and, therefore, twice the lighted area. The bull's-eye in the center, **a distinguishing feature of the Dillon Multi-Vision Lens, concentrates and magnifies the central beam of light below eye-level. These otherwise dazzling rays are scientifically neutralized, diffused and deflected from the clear glass immediately above the bull's-eye.**

$3.50 Per Pair

Any Size—Anywhere

6

Dealers—See Your Jobber

Jobbers are now stocking Dillon Lenses. If yours does not have them, write us. Also write us about a free and valuable chart we are offering dealers.

Auto Manufacturers—

The Dillon is the most efficient lens—the most valuable from every viewpoint for the manufacturer. Write.

NATIONAL DISTRIBUTING BUREAU INC.

NDB

Oliver Building Pittsburgh, Pa.

Dillon Lenses are made by the Dillon Lens & Mfg. Co., Wheeling, W. Va.

MULTI VISION LENS

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Another Great

This car will be exhibited at the Chicago Show — Space G24 to 49 in the Greer Building.



This car will be exhibited at the Chicago Show — Space G24 to 49 in the Greer Building.

By World's Champion Light Six

6,202 Miles With SEALED Hood, Clutch and Transmission

CHICAGO to the Pacific Coast and back—no CHANCE to touch the engine --no chance to even LOOK at clutch or transmission—that is the latest wonderful record of the ELGIN SIX.

The Valve-in-head Motor never faltering on the steepest inclines, in the deepest mud nor the heaviest sands—

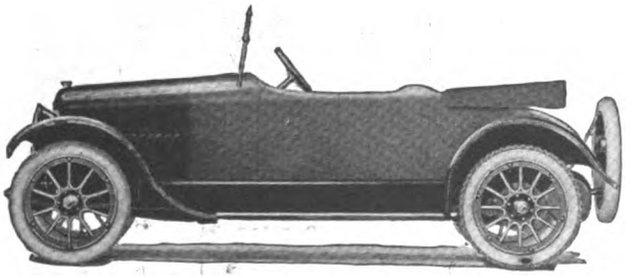
The CLUTCH holding on mile after mile of steepest mountain climbs—

The BRAKES holding fast on mile after mile of downward plunges—where slipping meant death—

What eloquent proof of the 100% *stamina* and *dependability* of this strictly stock ELGIN SIX.

And Economy—19.4 miles to the gallon of gasoline.

Elgin Six



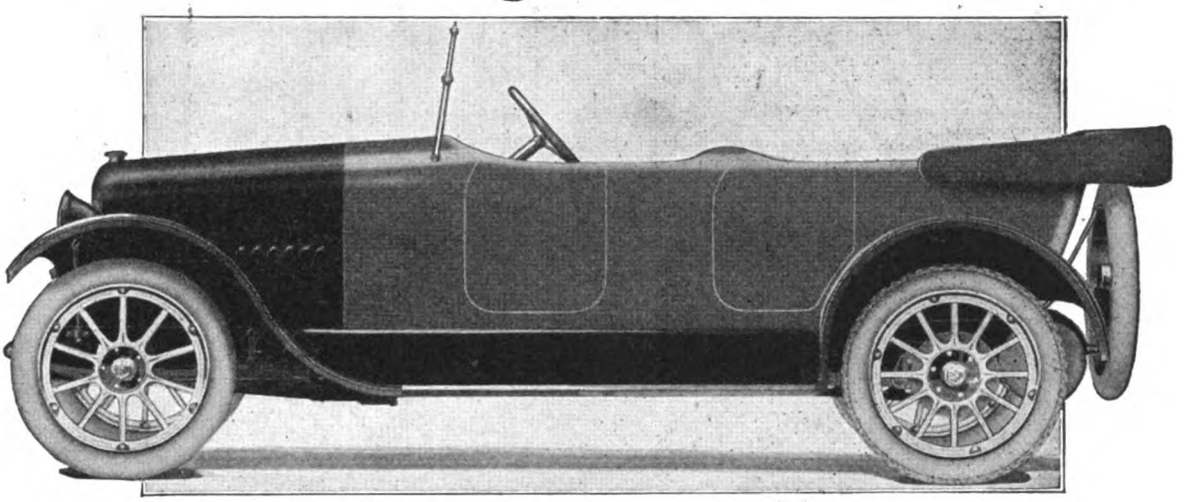
Elgin Six 4-Passenger Roadster, $1095
F. O. B. Chicago

A car for business and professional use, as well as for all-'round driving. Roomy enough for four people, yet not too large for one or two. Front seats divided. Beautiful yacht-line design. A popular, practical model. Same chassis as touring car, with 117-in. wheelbase, valve-in-head motor, etc.

A full Page Ad. on this Story appeared in the Saturday Evening Post, January 12, 1918

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Victory Scored



Elgin Six 5-Passenger Touring Car, $1095 F. O. B. Chicago

A roomy, impressive car. 117-inch wheelbase. Valve-in-head motor. Quality upholstery and finish throughout. Flexible, powerful, smooth running and easy riding. The most economical car of its size. Beautiful, durable. A family car which old and young alike enjoy.

ENGINE, clutch and transmission performed *without adjustment—without repair*—for two solid months of continuous travel under the roughest usage.

The Elgin climbed and descended the precipitous slopes of the Rocky Mountains; threading its way along tortuous, rock-strewn mountain trails; plunging through unbridged streams.

Without a break the car ran perfectly in the freezing, rarefied atmosphere above the clouds; and cooled perfectly in 132 degrees of desert heat, where heavy pulling increased the difficulty of *keeping* a motor cool.

A broken fan-belt—compelling the car to travel a thousand miles homeward *with a still fan*—a performance almost unbelievable—added a crucial test.

The record-breaking run from Chicago to Miami, Fla., the Minneapolis-Fargo dash, and many other famous ELGIN winnings had fairly earned for the ELGIN the title of "World's Champion Light Six."

Hence, when the officials of the Chicago Motor Club determined to secure authentic data on the condition of the two great national highways—The Lincoln Highway and The National Old Trails Highway—they selected the ELGIN SIX because of its previous wonderful records. It was made the "Official Scout Car," traveling under the auspices of the Chicago Motor Club, the American Automobile Association, the Detroit Automobile Club, and many other Associations affiliated in the Good Roads Movement of America.

In the Service of the U. S. War Department

But the greatest honor was conferred upon the ELGIN SIX when Secretary of War Newton D. Baker, in a personal letter, appointed it Official Scout Car to report transcontinental road conditions to the War Department—to gather information that may prove most valuable to the War Department in emergency movements of troops and supplies.

It was a commission of honor for the ELGIN. No car had ever been sent on an errand so important to this Government. No car had ever been charged with a service so distinguished.

Successful dealers are fast coming to the Elgin Six.
A highly profitable connection may be awaiting YOU.
Wire for territory and full details.

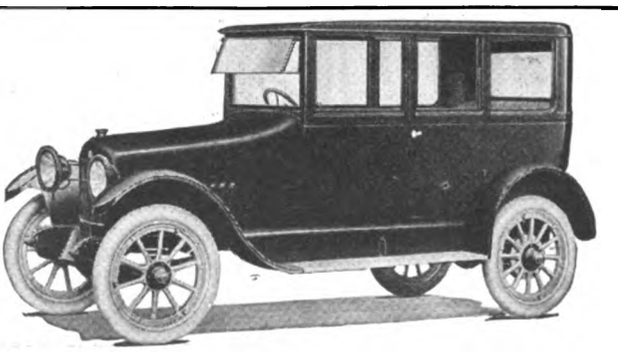
Address Dept. 19F

Elgin Motor Car Corporation, Chicago, U. S. A.

Elgin Six Sedan, $1645

F. O. B. Chicago

A richly finished, luxuriously upholstered car that meets the all-season, all-weather requirements. Interior of best Bedford Cord. Plate glass windows. Silk curtained rear and rear quarter windows. Patented, adjustable steering wheel. Heavy Brussels carpeting for the floor. Electric dome light for interior.



Elgin Six

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WARNER

GEAR COMPANY OF MUNCIE

Warner
Truck
Transmissions



A Mark of High Quality and Long Service in Any Motor Truck

TRANSMISSIONS
CLUTCHES
STEERING GEARS
DIFFERENTIALS

WARNER GEAR COMPANY · Muncie Indiana

Detroit Office - 967 Woodward Ave.

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Master of the Load on any Road

Prompt Deliveries

Don't be held up now on delayed deliveries. Don't lose both sales and reputation in these difficult times by pushing any truck on which you cannot depend. Sell the Master—deal with a concern making trucks alone, equipped to fill your orders *on time.*

Today, as never before, there are opportunities for dealers to make enormous profits in the truck business. The press of government orders makes truck deliveries surer than railway deliveries, and the demand for real, service-giving trucks must soon exceed the supply. Sell the reliable MASTER—your orders and re-orders are delivered *on time.*

MASTER TRUCKS, Inc.

3141 S. Wabash Ave. Chicago, Illinois



Sell the MASTER of them all—Master in power, strength, economy and performance. Make sure of prompt, continuous deliveries when you need them most.

2 Ton $2190 5 Ton $4490

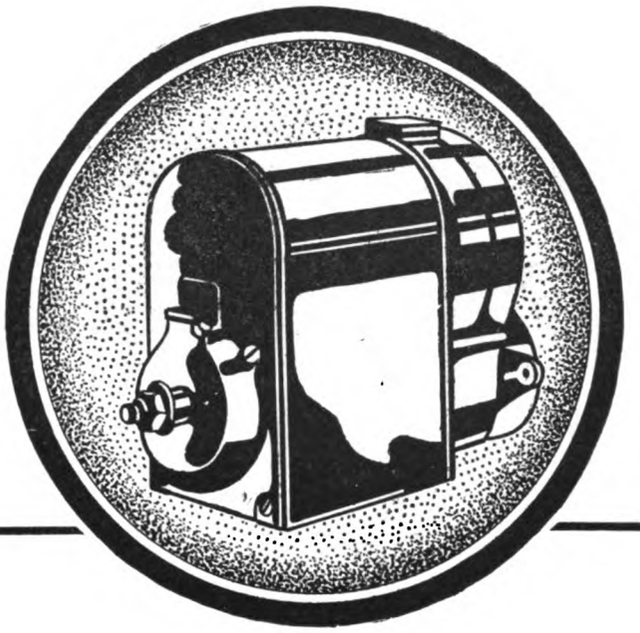
3½ Ton $3390 Tractor $2450

MASTER TRUCKS

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When Mr. Edison Speaks—

When he discusses electrical innovations, we listen to him with respect.

When Signor Marconi speaks of wireless, every word has weight.

When Mr. Schwab discusses the steel situation, he is sure of an interested audience.

Whenever recognized authority expresses itself, we can rely upon its opinions and judgment.

So, when the motor manufacturers who are known to maintain the highest structural standards adopt Eisemann Magnetos as standard equipment, isn't it conclusive evidence of superiority?

In the truck field, where the hardest tests come, 81 manufacturers have done so. Most of the recognized leaders are included in that number.

THE EISEMANN MAGNETO CO.

Sales and General Offices: 32-33d St., Brooklyn, N. Y.

Chicago, Ill., 910 South Michigan Ave.
Detroit, Mich., 802 Woodward Ave.

THE

EISEMANN

MAGNETO

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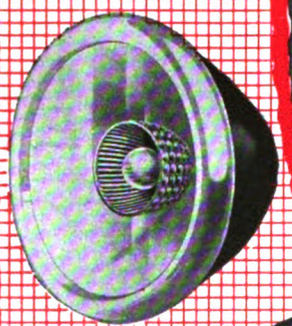
Stewart PRODUCTS



Stewart Motor Driven Warning Signal
Hand Operated Type $3.50



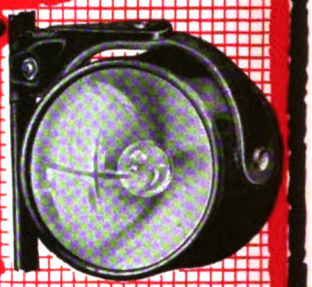
$10
Stewart Vacuum System



Stewart Lens $2 per pair



$25 Stewart Speedometer



Stewart V-Ray Searchlight $5



$1
Stewart V-Ray Spark Plug

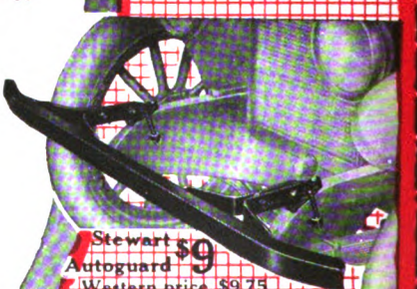
Progressive Dealers Know It Pays to Sell Leaders Only

LIVE dealers everywhere—men who do a big business and are making big money—know by experience that it pays to sell *Leaders Only*. They stock, sell and feature Stewart Products. The wide demand for Stewart Products is extremely significant to the wise dealer. It points out to him the unmistakable trend of public opinion—the tremendous demand for the best known and most widely advertised automobile accessories on the market.

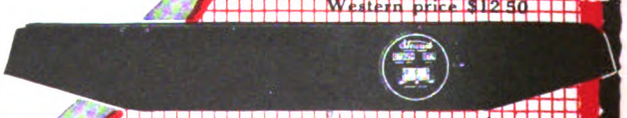
The dealer who has achieved really big success does not waste his time, energy and money in trying to "put across" unknown accessories. He banks on a steady, consistent "turnover." He handles the one established line—the one that is universally accepted as a standard. He carries a complete stock of Stewart Products.

Determine right now to sell nothing but Leaders for 1918. Concentrate on, "boost", feature and sell Stewart Products—the fastest-selling and easiest-to-sell of all automobile accessories.

Stewart-Warner Speedometer Cor'n
Chicago U. S. A.



Stewart Autoguard $9
Western price $9.75
Ford Model $7.50
Western price $8.25
Ford Rear Autoguard Tire Carrier $11.50
Western price $12.50



Stewart Speedometer and Instrument Board for Fords $12
Western price $12.50

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Immediate Deliveries

WISCONSIN AXLE

WORM DRIVE

Act NOW to provide against a possible shortage of worm-drive axles in 1918.

Protect yourself against a curtailment in your present source of supply.

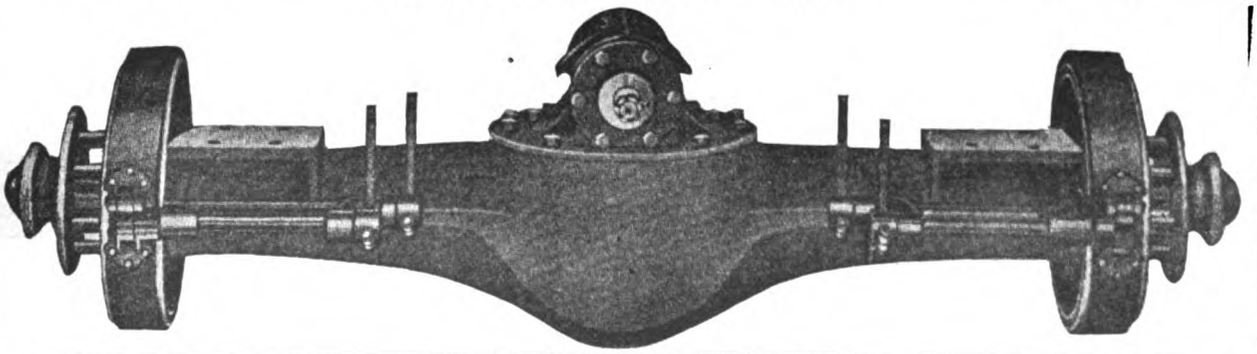
We have increased our facilities to accommodate you—and a few other foresighted truck manufacturers.

Let us show you what the six truck concerns we are now serving think of our product and service. Write us.

Sales Representative of
E. B. Hayes Machinery Corporation
Oshkosh, Wis.

Engineering & Sales Corporation
122 South Michigan Avenue, Chicago, Ill.

4 Models — 2½, 2, 1½ and 1 ton Capacity.



Please mention Automotive Industries when writing to Advertisers

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What the Laboratory Decrees the Foundry Must Execute

Determining the right formula in making alloys for bushings and bearings is a task worthy of man's best skill and talent, yet the work the laboratory does is simply a beginning.

So, in *Lynux* plants, when the metallurgist has finished his task, when he has decided what physical properties the bearing should have and has prepared the "mix," it is up to the foundry to follow his instructions to the letter.

How Certainty is Assured

In this, as little as possible is left to chance — so little, in fact, that when the laboratory decrees, the foundry must execute.

The laboratory's instructions go to the foundry in chart form. By this chart, the metal room is guided in weighing up the charge. And right here an important factor — bonus — steps in.

Those who weigh the metal — those who melt it — those who pour it into the molds — all are "on bonus," earning extra rewards for work well done and paying the penalties for their failures.

Every Worker an Inspector

Therefore, the natural desire of every good workman to do his work well is sharpened by the desire for the bigger pay that goes with good work, and he watches sharply to protect himself against possible mistakes by others.

The man at the melting pots keeps his eyes open lest an error in mixing the charge make trouble for him. The man at the mold is quickly heard from, if by any chance the melting room burns the metal and he gets a "scrap" casting as a result.

To individual bonuses are added bonuses for departmental efficiency, and the correctness of every foundry operation is further insured by frequent and thorough inspections.

It is this kind of practice that distinguishes *Lynux* foundries from ordinary foundries, that makes *Lynux* alloys differ from ordinary alloys.

Lynux for Every Purpose

There are more than a hundred *Lynux* Alloys. We will help you pick the right one for the particular bushing or bearing job in question and supply the bearings rough or machined. Also, we can follow your own specifications as to alloy, if you desire.

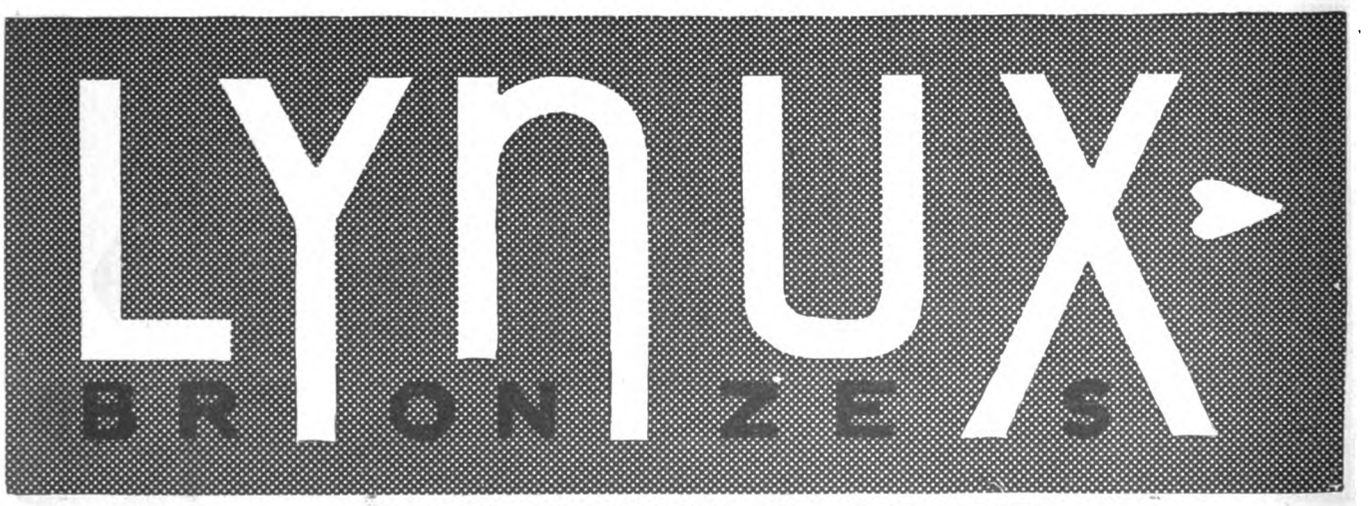
Let us send you our monthly mailings on bearings. Address Dept. 45, Cleveland, Ohio.

Are you using LYNITE? If not, let us tell you about this group of aluminum alloys, which have proved so effective where light weight without sacrifice of strength is desired.

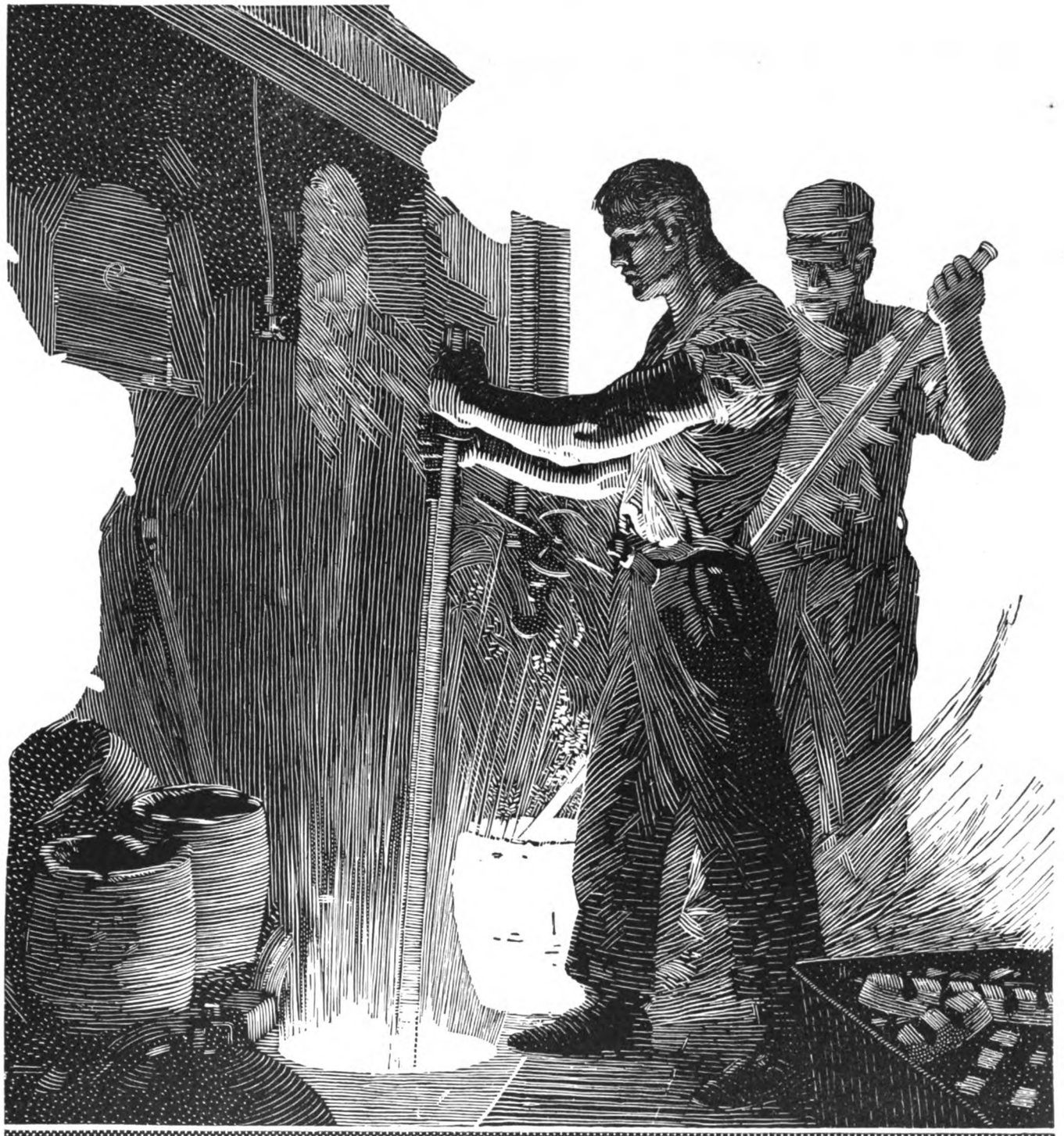
THE ALUMINUM CASTINGS COMPANY

LYNUX and LYNITE Castings

Cleveland Detroit Buffalo Manitowoc, Wis. Fairfield, Conn.



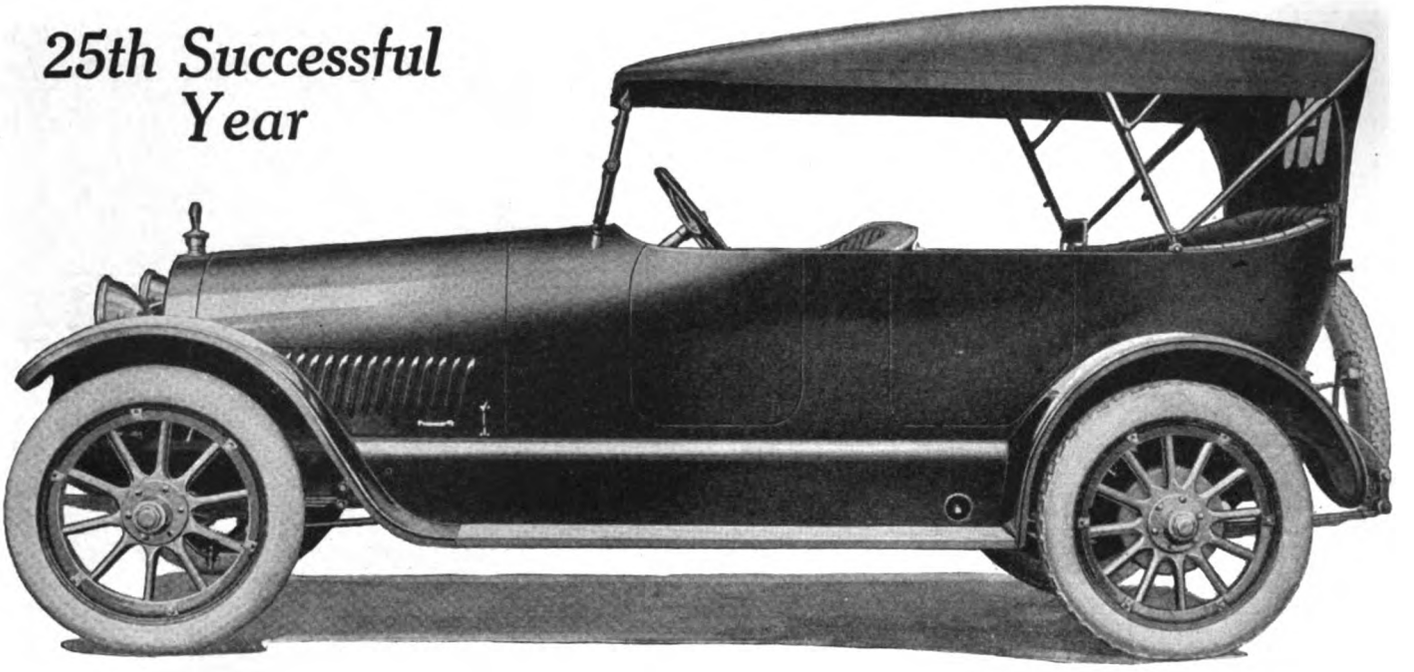
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BUSHINGS BEARINGS

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25th Successful Year



The New Haynes Open Car for Seven

LONG, low-swung and straight-lined, with high-arched, broad-chested hood, rakishly tilted weather-tight windshield, double cowl and wheel-form fenders, this new Haynes offering in a seven-passenger open car is proving a strong contender for the title of the season's favorite.

Front springs measure 39x2¼ inches. Rear springs are 58x2¼ inches. Their generous size and resiliency afford the extreme in riding comfort.

Six-inch frame side members preserve rigidity on uneven roads, avoiding squeaks, rattles, binding doors and sagging.

The finishes are beige brown, deep carmine and royal green. The upholstery is modishly fashioned in French pleats.

The center cowl panel is beautifully grained American walnut. Large auxiliary seats disappear within it. A parcel compartment and cowl light with switch are centered therein.

The motive power is the famous Haynes Light Six engine—that *mature* engine which has required no vital changes in three and a half years.

—The complete Haynes line includes eleven new settings for the Haynes "Light Six" and "Light Twelve" engines. National advertising is being extensively used. Live dealers have a live proposition awaiting their wires or letters. Address

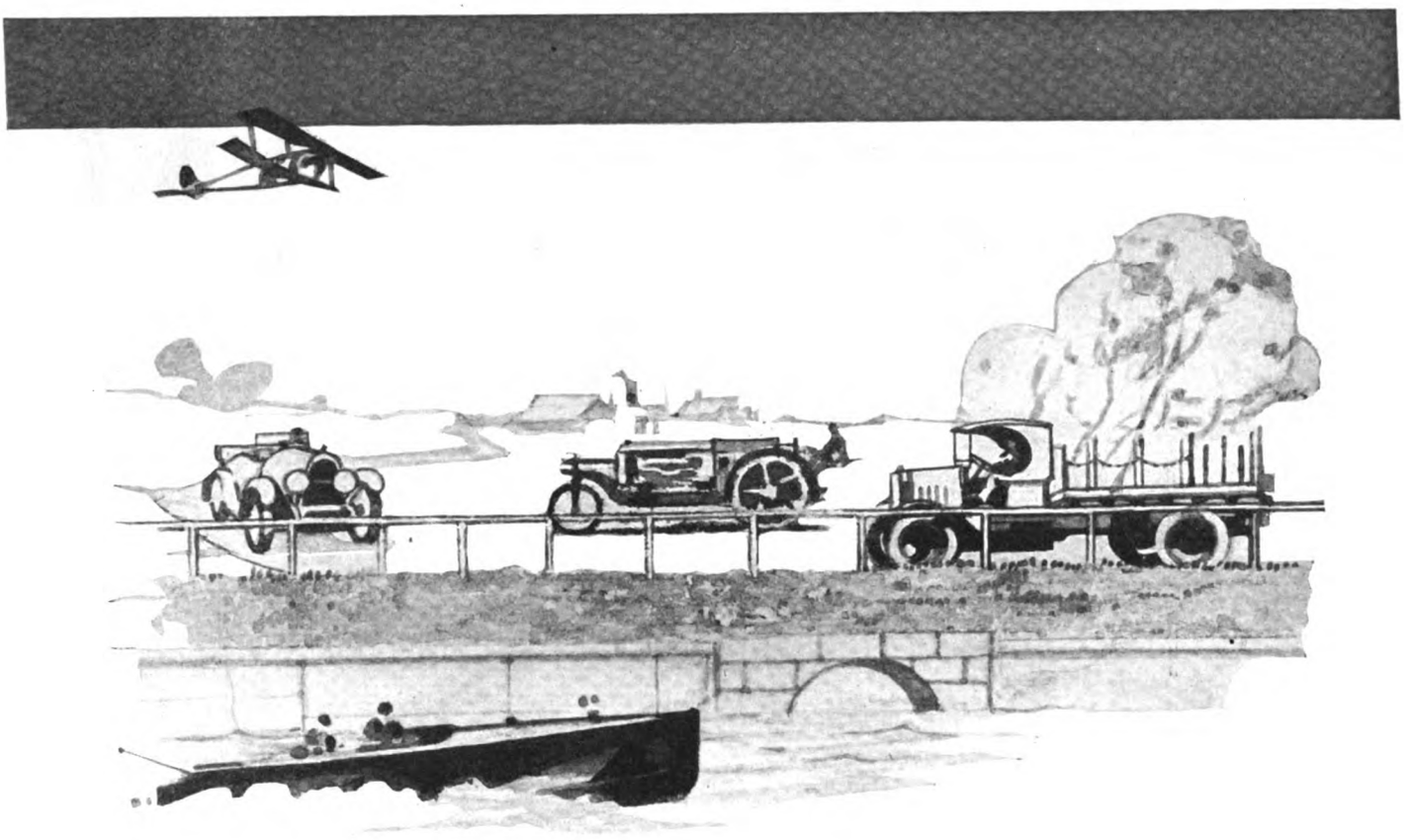
THE HAYNES AUTOMOBILE COMPANY, 3 S. Main St., Kokomo, Ind., U. S. A.

See the Haynes Exhibit at the Chicago Show. Space A-1

HAYNES

"America's First Car"

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Special Service To Manufacturers

The best equipment may be rendered ineffective by poor finishes. Many manufacturers lose time and money on this account.

To correct such conditions we established our "Better-the-Finish" Laboratory for the solution of individual finishing problems.

We will study your special necessities, make actual tests under conditions approximating those in your own work shops, and tell you just what finish will best fill your requirements.

We have been doing this very thing to the great satisfaction of many manufacturers for a number of years.

Why not see if we cannot better your finish? It will cost you nothing and may help you greatly.

Manufacturers handling government work should bear in mind that our experience in co-operating with firms handling similar work is at their disposal.

Museum of Finished Products illustrating the diversity of problems solved by "HILO" Laboratory.



The Whole Automotive Industry

—comes to us with its finishing problems.

Motor Car — Truck — Tractor — Trailer — Airplane and Motor Boat—are all exposed to the Common Enemies, Rust and Rot.

The Motor Car, Truck and Tractor are bumped and scratched, streaked with mud and oil, twisted and strained—they need a tough coating.

HILO

Enamels—Japans—Varnishes

The Airplane meets quick changes of temperature, leaves the ground in summer heat and in a few minutes is breasting a wintry storm—that requires extremely elastic finishes.

The Motor Boat is in constant contact with water—often entirely covered with spray and always subject to extreme moisture—a moisture-proof varnish is needed here.

It pays the manufacturer to protect his product with properly prepared varnishes, enamels, or japans. "HILO" finishes are made to fit each individual case. "HILO" Special Service tells the manufacturer how to correctly apply his finishes. It saves him those expensive experiments.

Write for our Bulletin No. 1. It contains information you can use—whether you buy from us or not.

MOLLER & SCHUMANN CO.

54 years making Enamels, Japans, Varnishes

3-13 Gerry Street Brooklyn, N. Y.

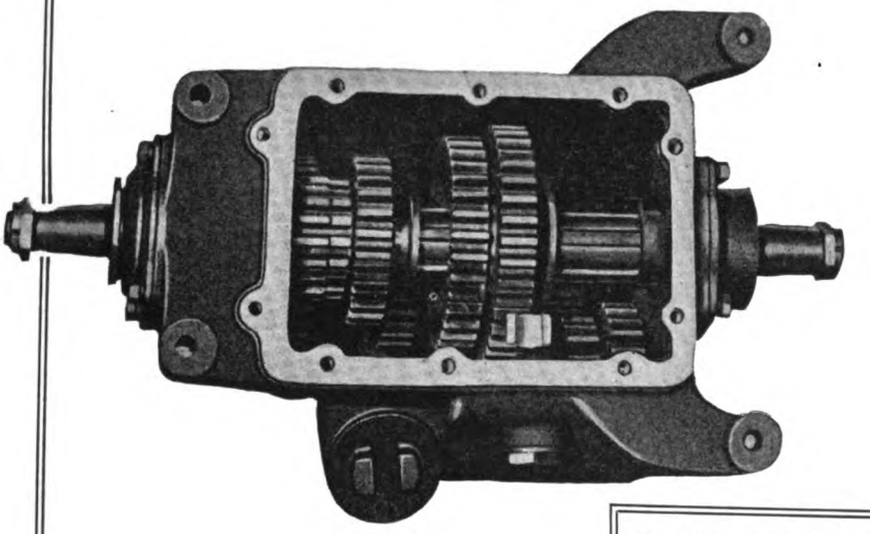
Branch Office: 110 N. Desplaines Street, Chicago, Ill.

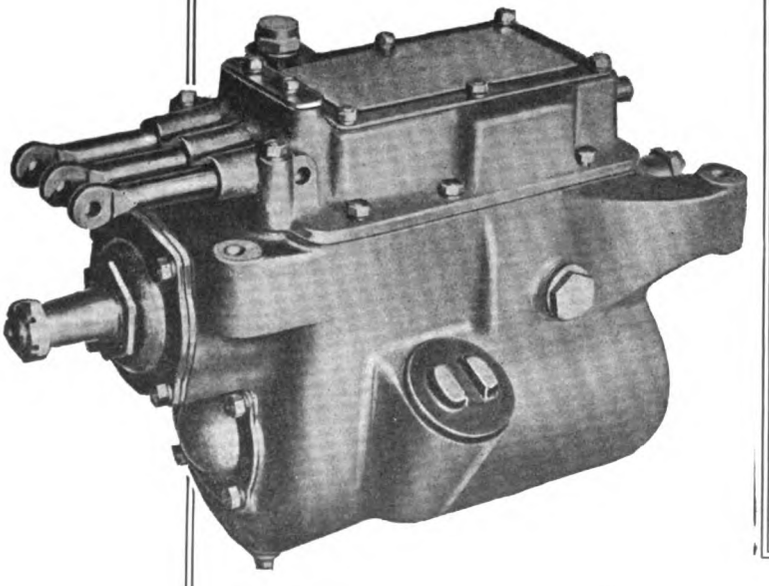
Pacific Coast Representative: The Brininstool Co., Los Angeles, Calif.

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DETROIT TRANSMISSIONS

DETROIT GEAR & MACHINE CO.





MODEL H TRANSMISSION

Amidship Type Truck Transmission for 1½, 2 and 2½-Ton Trucks
4 Speeds

A new design transmission of the amidship type which carries 4 speeds forward and one reverse. It makes possible a more even distribution of the weight of the truck and eliminates the whipping of a long drive shaft. Mounting is on cross members, permitting easy inspection and removal.

The logical transmission for 1½, 2 and 2½-ton trucks of the better class that are designed for strength. The transmission is in production and ready for immediate delivery.

Gears are 6-8 pitch, 1" width face, made from drop forged, heat treated high carbon 3½% nickel steel. Shafts are heat treated and carbonized alloy steel, mounted on ball bearings. Gear ratios are as follows:

High—Direct	Second—3.08 to 1
Third—1.76 to 1	Low—4.4 to 1

Weight, as shown, 145 lbs.

DETROIT GEAR & MACHINE COMPANY

Detroit **Michigan**

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RAYFIELD CARBURETOR

The High Cost of Some Savings

PRUNING the pay-roll is often expensive. A cheap clerk makes costly mistakes. The extra expense of supervising him makes him a further liability.

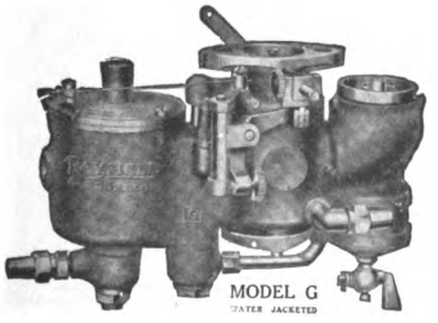
Same with an inefficient carburetor: it wastes gasoline. And it needs endless supervision—*adjusting.*

If you're worrying along with a gasoline spendthrift—a carburetor not up to its job—you'll be interested in the Rayfield.

The Rayfield Carburetor is an expert in its line—guaranteed to give you from 20 to 50% more miles per gallon; and better all-'round performance.

Test one on your car; winter is a good time to do it. The Rayfield costs a bit more; but it's worth it. If you don't think so your money will be refunded; cheerfully.

Findeisen & Kropf Mfg. Co.
2117 Rockwell St., Chicago



It is guaranteed the best:
for all makes of cars,
with all grades of fuel,
in all kinds of weather.

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★Hartford

THROUGHOUT motordom, here's a name to conjure COMFORT by —and SAFETY, CONVENIENCE, ECONOMY too, for that matter.

"Accessories" fails to adequately describe Hartford Automobile Equipment; "Essentials" is the more fitting term.

★Hartford SWIVEL TYPE SHOCK ABSORBER

A necessity for all who wish to render the range of motoring unlimited. It kills off road shocks, jolts and jars. It makes country byways as accessible and comfortably negotiable as city boulevards. In a word, it causes an automobile's springs to behave and that's the real secret of smoothly riding automobile.

★Hartford BUMP ABSORBER —more than a Bumper

It defines its function by its name, for it **absorbs the bump** of collision, effectively parrying the blow accompanying it. Thus, it protects not fittings alone but all the car from strain and damage and, its passengers, from jars. A formidable, flexible car guard that is just as necessary as collisions are inevitable.

★Hartford AUTO JACK

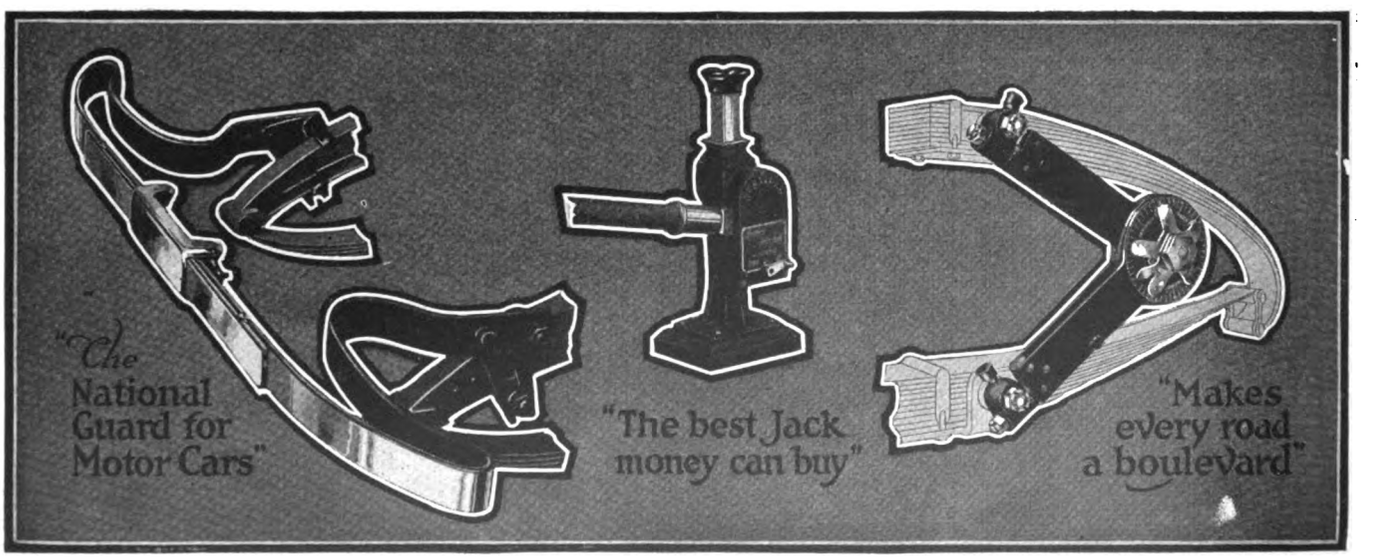
So conveniently efficient that no motorist who has seen it work has failed to mark it for immediate preference. A jack de luxe. Its smooth-working mechanism is turned on precision machinery from solid steel; its casing is tough, wear-proof malleable iron; its handle is long; its stroke is short. And yet more—it's handsome, too.

Let your visit to the Chicago Show include an inspection of these motoring essentials. All will be practically demonstrated

EDWARD V. HARTFORD, Inc. 144 Morgan St., Jersey City, N. J.

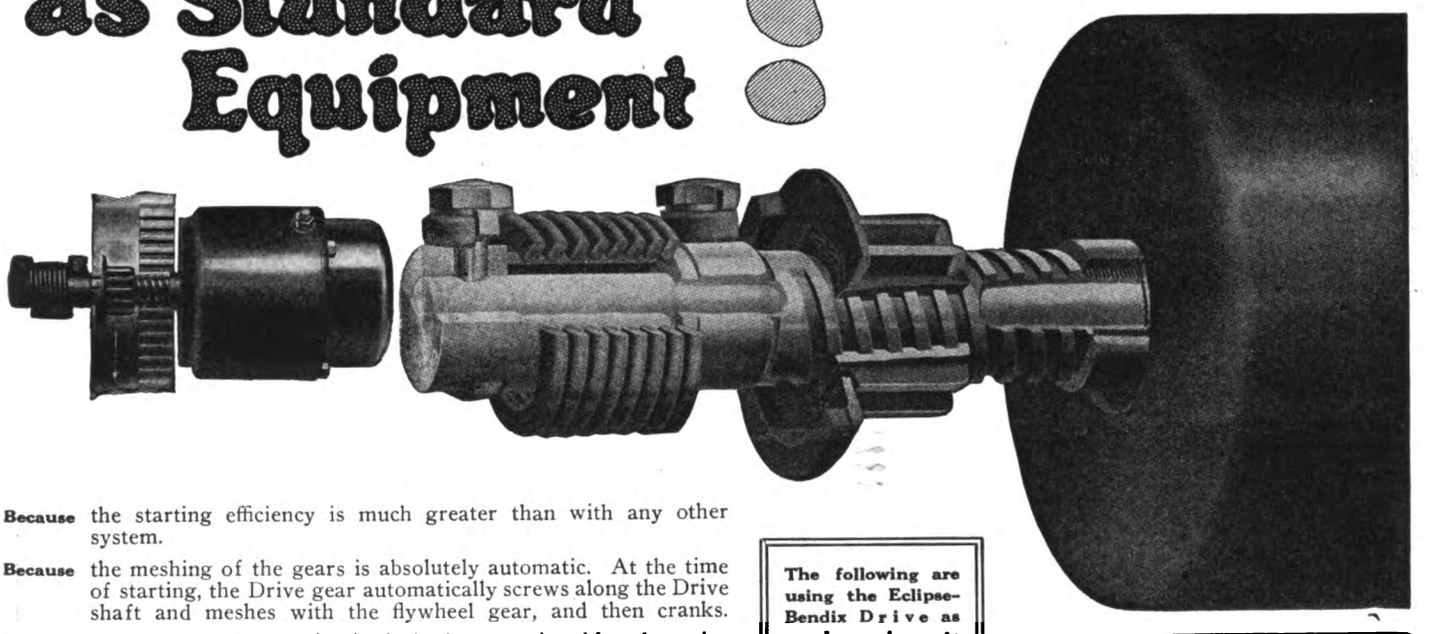
Branches: NEW YORK, BOSTON, CHICAGO

Distributors in Principal Cities. Dealers Everywhere



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Why have 150 Car Builders adopted the ECLIPSE-BENDIX DRIVE as Standard Equipment?



Because the starting efficiency is much greater than with any other system.

Because the meshing of the gears is absolutely automatic. At the time of starting, the Drive gear automatically screws along the Drive shaft and meshes with the flywheel gear, and then cranks.

Because the demeshing after starting is absolutely automatic. After the engine is started the flywheel gear turns faster than the Drive gear and screws the latter back on the Drive shaft until it is out of mesh.

Because cast iron teeth without any chamfer not only make a great saving in cost, but are actually superior, being the simplest, most efficient and durable construction possible. The teeth are cut in the flywheel which is a natural gear blank. Stripping of these teeth by accidental starting when the engine is running is impossible, because of the automatic demeshing action.

Because back-fires are automatically protected by the shock-absorbing spring Drive.

Because there is no over-running clutch to stick or slip.

Because there is no resistance or two-point switch to burn out.

Because there are no shifting levers and pedals, with their complications.

Because it is simpler and has fewer parts than any other starting system.

Because it eliminates chains, which stretch, break and get noisy.

Because it minimizes gear noise in cranking by driving through a spring.

Because it is absolutely silent when the engine is running, being absolutely disconnected.

Because it permits of using a simple, small generator for constant running.

Because it permits of cranking the engine with the most efficient of all starters—a separate electric starting motor—and also more evenly.

Because it makes the two-unit type of starting and lighting system superior to any other and the most popular of all.

Because it requires the minimum of care and attention during the life of car.

Because it is regularly supplied and used as standard equipment with the following starting and lighting systems, on over 150 different makes of motor cars; and also on a large number of marine and aeroplane motors.

A-B-C	Duesenburg	Leece-Neville	Splitdorf
Allis-Chalmers	Dyneto	North East	Sterling
Auto-Lite	Fay Bowen	North Western	Van Blerck
Delco	Gray & Davis	Remy	Wagner
Detroit	John O. Heinze	Robbins & Myers	Ward-Leonard
Disco	Kemco	Roth Bros.	Westinghouse

Chicago Show Headquarters
Coliseum Gallery, Space 48

ECLIPSE MACHINE CO. Elmira, N. Y.

Sales Agents: BRANDENBURG & CO.; NEW YORK, 57th & Broadway; DETROIT, Dime Bank Bldg.; CHICAGO, 1112 Mich. Ave.

The following are using the Eclipse-Bendix Drive as regular equipment:

PASSENGER CARS				TRUCKS
Abbott	Gray-Dort	Page		American-LaFrance
Allen	Gray-Eagle	Pan-American		All Steel
American Six	Hal-Twelve	Paige		Atterbury
Anderson	Harroun	Patterson		Bell
Apperson	Harvard	Pathfinder		Briscoe
Auburn	Hatfield	Peerless		Collier
Austin	Haines	Penny		Corbitt
Alter	Halliday	Phianna		Concord
Biddle	Hassler	Pilgrim		Dixie
Bimel	Henry	Pilloid		Dorris
Bour-Davis	Hispano-Suiza	Partin-Palmer		Duplex-Power
Briscoe	Interstate	Pilot		Federal
Bush	Imperial	Premier		Geneva
Canadian-Overland	International	Princess		Garford
Canadian-Regal	Jackson	Pullman		G. M.
Case	Jones	Renault		G. V.
Chalmers	Jordan	R. C. H.		Gramm-Bernstein
Chandler	King	Regal		Grant
Chevrolet	Kissel	Remington		Higrade
Campbell-Four	Kline	Reo		Indiana
Cole	Lenox	Riddle		Jeffrey-Quad
Columbia	Lexcina	Rors		Kerno Truck
Commonwealth	Lexington	Roamer		Kearns
Crawford	Liberty	Russell		Kissel
Crow-Elkhart	Lozier	Saxon		Kelly-Springfield
Coey	Lancia	Scripps-Booth		Lippert-Stewart
Cummings	Madison	Service		Little-Giant
Daniels	Marion-Handley	S. G. V.		Mack
Davis	McFarlin	Singer		Martin
Dixie	Meteor	Stearns		Nash
Dorris	M. H. C.	States		National
Dort	Mitchell	Standard		Overland
Denmo	Moline-Knight	Stephens		Peerless
Detroiter	Monitor	Stewart		Rush
Dile	Monarch	Sun		Republic
Drexel	Monroe	Stegeman		Reya
Drummond	Moon	Shadwyck		South Bend
Eagle	Murray	Stearns-Knight		Stegemen
Economy	Moore	S & S		Tiffin
Elcar	Malbohn	Thomas		Turnbull
Elgin	Metz	Touraine		U. S.
Empire	Nash	Trumbull		Velie
Erie	National	Union		White
Enger	Napoleon	Velie		Wealthy-Heights
Fiat	Norwalk	Vulcan		
Fostoria	Nelson-LaMoon	Westcott		
Ghent	Nusco	White		
Glide	O. S.	Willys-Six		
Grant	Oakland	Willys-Knight		
Gerlinger	Oldsmobile	Winton		
	Overland	Wolverine		
	Ogran	Yale		
	Olympia			

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PARK INTEGRALLY

COUNTER BALANCED CRANK SHAFTS

Patented July 10th, 1917



Quick Get-a-way
Higher R. P. M.
Reduced vibration
Smoother running motor
Eliminated bearing troubles

We have shipped 59,984 Counterbalanced Crankshafts to Jan. 19th, 1918

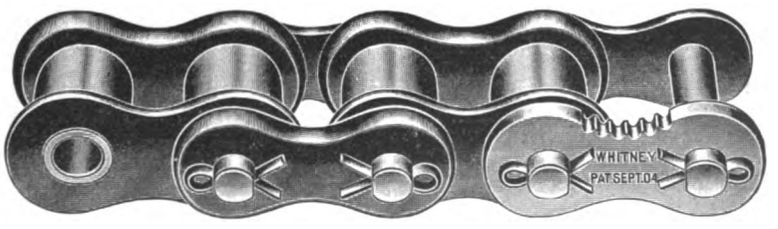
The Park Drop Forge Co.
Cleveland

"WHITNEY"

COTTER TYPE TRANSMISSION CHAIN

For MOTOR TRUCKS and TRACTORS

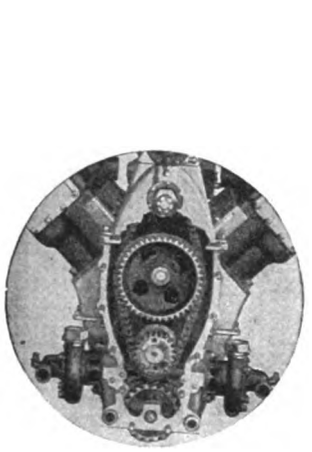
Our years of experience in chain making combined with the care taken in the various processes of manufacture and our rigid system of inspection make "Whitney" Chains accurate, strong and reliable.



"Whitney" Chains are "doing their bit" on the battle fronts of Europe, where dependability is the all-important factor and where failure may spell disaster.

THE WHITNEY MFG. CO., Hartford, Conn.
Chains **Keys and Cutters** **Hand Milling Machines**

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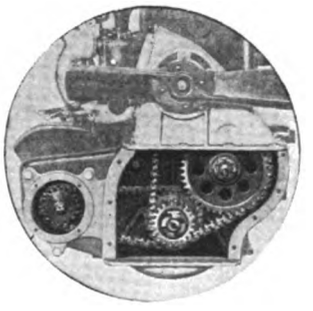


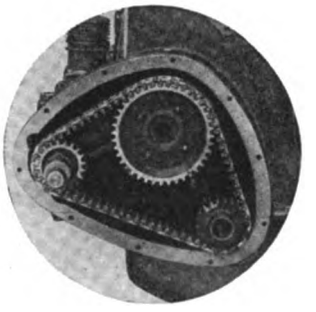


MORSE SILENT FRONT END DRIVES









Morse Silent Chains are now driving the cam and accessory shafts on over thirty of America's finest cars—the actual leaders of national motordom.

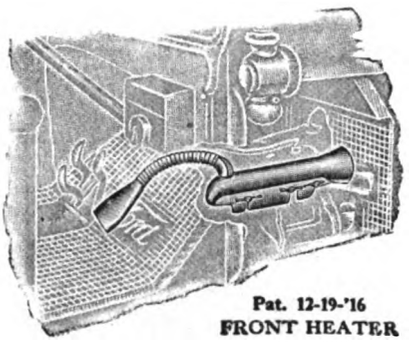
Let us send you our latest catalogue on Morse Equipped Cars. Whether you are car builder, dealer or owner, you will be inerested in this highly illustrated automobile book. You will probably find your car there.

MORSE CHAIN COMPANY, Ithaca, N. Y.

Largest Manufacturers of Silent Chains in the World



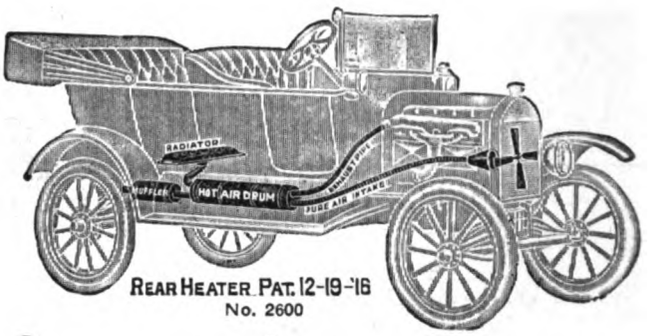
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Pat. 12-19-'16
FRONT HEATER
No. 2500

The New *Presto* Pure Air Heater for Fords

Front Heater . $5.00
Rear Heater . . 6.50



REAR HEATER PAT. 12-19-'16
No. 2600

Presto Specialties

set the pace, in introducing many new products it pays to stock.

Practically all jobbers catalog PRESTO Specialties.
Practically all live dealers sell them.

METAL SPECIALTIES MFG. COMPANY, Inc.
338-352 N. Kedzie Avenue CHICAGO

Eastern Branch: 16-24 W. 61st St., N. Y. City
Western Branch: 149 New Montgomery Street, San Francisco, California



No. 2100—Patented. Presto Electric Under - the - Hood Heater.



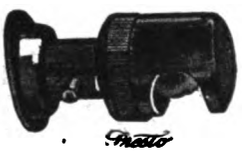
No. 3-P Double outlet Y Plug Socket For Dash



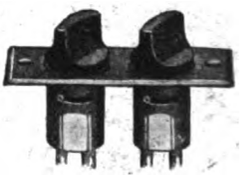
No. 252 — Complete Combination Automatic Cord Winder and Cigar Lighter. One of 6 styles.



No. 8—Elbow Plug for Ford Headlight.



No. 647-8—"Bull Pup" Dash Lamp. (One of 24 different styles.)



No. 417—Dash Turn Button Switch—made single, double, triple and quadruple.



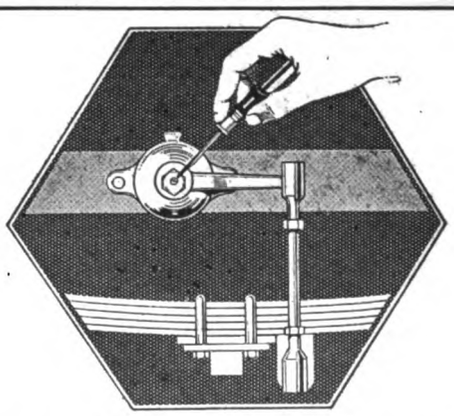
PERFORMANCE

That's what the truck prospect is interested in most of all. If he knows your truck is powered with a Wisconsin Consistent Motor, a big step has been made in its sale. Wisconsin Motors are champions of the world on road and speedway—why not link their reputation to your product?

Write for specifications of different types and sizes.

WISCONSIN MOTOR MFG. CO.
Station A, Dept. 310 Milwaukee, Wis.

DISTRIBUTORS:
New York Branch: 21 Park Row, T. M. Fenner, Factory Rep. Pacific Coast Distributor: Earl P. Cooper Co., 1428 Bush St., San Francisco, Cal., and 1310 S. Los Angeles St., Los Angeles, Cal.



Just One Adjustment

A HYDRAULIC SHOCK ABSORBER built on the principle of recoil check on cannons. A PROVEN SHOCK ABSORBER of unerring precision, carrying the unqualified indorsement of leading automobile engineers.

IT LEVELS ALL ROADS
Installed: $50 per half set of two instruments.
$100 per full set of four instruments.
Time: 1½ Days

The HOUDAILLE SHOCK ABSORBER CO., Inc.
1737 Broadway, New York City

Philadelphia: *Auto Equipment & Service Co.* 1435 *Vine Street*
Chicago: *The Arthur Jones Electric Co.* 55 *East 28th Street*

HOUDAILLE
(PRONOUNCED HOO-DIE)

HYDRAULIC SUSPENSION

When ordering Shock Absorbers for your car specify "Houdaille Suspensions"

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"NORMA"

During Chicago Automobile Show Week (January 26th to February 2nd, inclusive) our representatives will be at the La Salle Hotel, Suite 810, where they will be glad to see you.

THE NORMA COMPANY OF AMERICA
1790 Broadway, New York City

REG. U.S. PAT. OFF.
GTD

Look for the GTD trade mark when you want the best Taps and Dies

Every garage and repair shop should be equipped with "LITTLE GIANT" Combination Screw Plates. Furnished both in U.S. and S.A.E. Standards.

Each die is contained in its own collet and adjusted to size. There is also a Bit Brace Die Holder for cleaning up battered threads in out-of-the-way places.



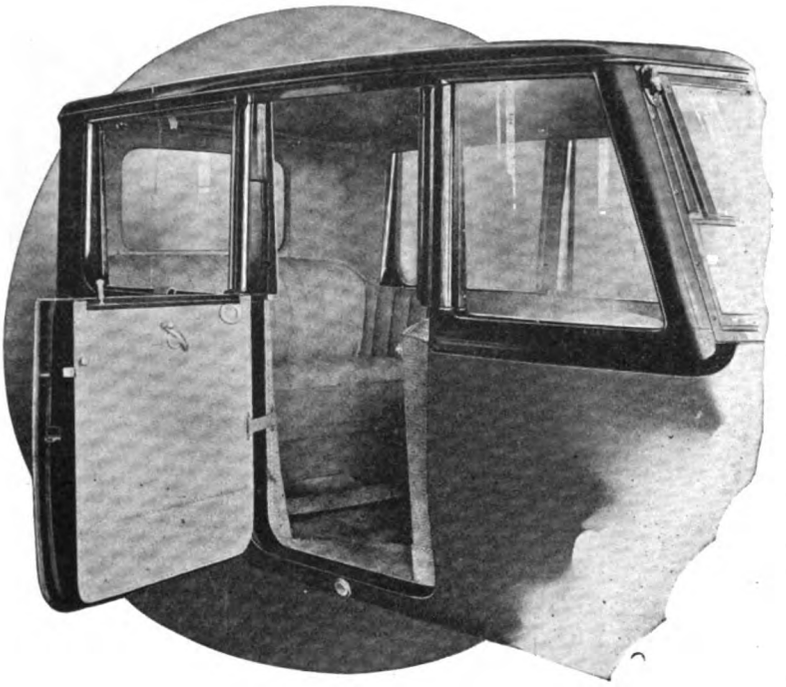
If you are a manufacturer, garage or repairman—or a car owner who makes his own repairs—you can be supplied from our big established line.

Write today for the No. 37 Catalog

Greenfield Tap & Die Corporation
Greenfield Mass.

New York, 28 Warren St.
Chicago, 13 S. Clinton St.
Canadian Factory: Wells Brothers Co. of Canada, Ltd., Galt, Ontario.

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During Chicago Show Week, our headquarters will be located at the Blackstone Hotel where our representatives will cordially welcome your visit, and be prepared to consider any matters connected with our Automobile and Metal Stamping lines.

ENCLOSED CAR BODY MODE

More beautiful and luxurious than ever before, have been pronounced the H & K body designs, in hardwood-framed steel, under active production at the works in Philadelphia.

Illustration shows the latest H & K Steel Body for the Paige Sedan. The daring yet graceful lines, luxuriously upholstered interiors, the smartness and individuality displayed in this work, equals that of the most expensive custom-made, and appeals to all lovers of the beautiful in automobiling.

Our great works at Philadelphia are engaged on the finest enclosed body work for several of the foremost cars of the country—reflecting the buyer's keen appreciation of a really valuable and enduring product, made entirely complete, ready for application to the chassis, and now being shipped in large quantities daily.

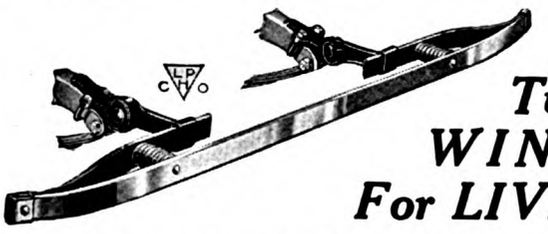
Suggestion is made for your engaging space here for producing your requirements in the most successful steel enclosed bodies; steel stampings of all kinds; complete cushion and back springwork, etc. Inquiries and drawings to the nearest office.

Hale and Kilburn Company

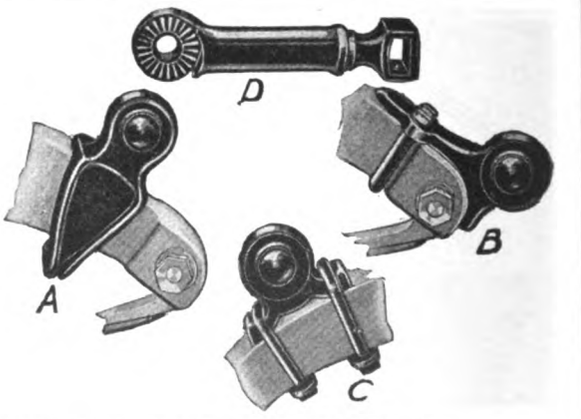
Philadelphia

New York *Washington* *Detroit* *London* *Chicago*

HALLADAY BUMPERS



Two Big WINNERS For LIVE Dealers



MULTIPLE SPRING BAR BUMPER

The last word in bumper efficiency.
Supplied with all HALLADAY fittings for all cars.
Shock absorbing, noiseless, unbreakable.

HALLADAY STANDARDIZED UNIT

Solves the bumper problem by enabling the dealer to fit practically all cars with a stock of only four parts.

Write for new catalog fully describing the HALLADAY line

L. P. HALLADAY COMPANY, Streator, Illinois

DISTRIBUTORS: Asch & Co., 16-24 W. 61st St., New York City; E. L. Thompson Co., 817 Boylston St., Boston, Mass.; Gray-Heath Co., 1440 Michigan Ave., Chicago, Ill.; Sanford Brothers, Chattanooga, Tenn., Southern Distributors; Hughson & Merton, Inc., San Francisco, Los Angeles, Portland and Seattle, Pacific Coast Distributors.

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GALVANIZE RIMS AUTOMATICALLY IN MEAKER UNITS

Deposit a heavy, bright, uniform coating of pure zinc on all rims for your cars—the galvanized finish that looks good and is good.

Well galvanized rims are bright when they come from our machines and just as bright after they have made many thousand miles on your machines.

Superior Meaker Galvanizing will not cost you as much to produce as out-of-date, inferior, dark-colored, thin zinc coatings that do not even protect rims from rusting while they lie in storage.

Forward us a set of rims and felloe bands and we will give you some interesting figures.

MEAKER GALVANIZING COMPANY
1249 Fulton Street Chicago, Illinois



Save Extra Auto Tax

Every ounce of energy wasted by leaky cylinders is an *extra* tax on your auto or truck. And that tax grows with advancing gasoline prices.

Stop this costly leakage with Ever-Tight Piston Rings.

Accurately machined from fine-grained, springy grey iron, they hug the cylinder wall closely without binding. Conform exactly to out-of-round cylinders, saving reboring. Gas can't leak through or by them.

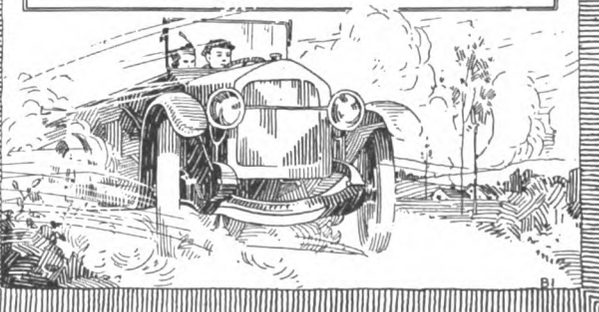
Ever-Tight Piston Rings are safeguards against imperfect combustion with resultant carbon deposits; against smoky exhaust resulting from oil leaks. They increase engine efficiency from 15% to 25%, thus reducing running expense.

Demand Ever-Tight Piston Rings of your dealer or repair man.

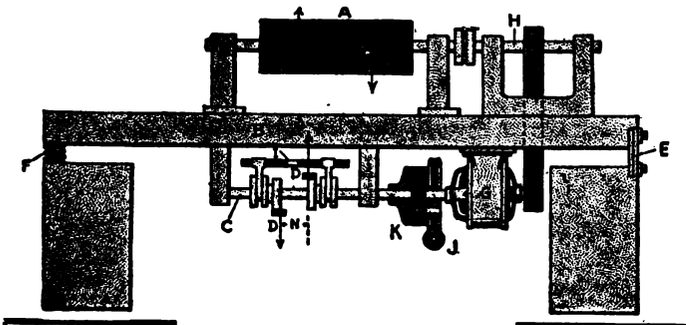
EVER-TIGHT PISTON RING CO.
1428 Chestnut Street :: :: Saint Louis



This perfect three-piece construction justifies the name—EVER-TIGHT. These close fitting right angles are absolutely gas tight.



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a scientific short-cut

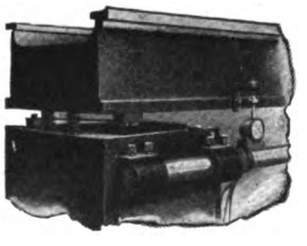
What the slide rule is to the engineer, the adding machine to the bookkeeper, the pyrometer to the metallurgist, the cutting-tool chart to the production manager—

Such is the Carwen Dynamic Balancing Machine to the process of balancing motor crankshafts.

It substitutes the precision of a machine for the fallibility of human brains—rapid measurement for tedious cut-and-try.

One Carwen machine will measure the running unbalance of 100 crankshafts in an 8-hour day. All the other work required to put the shafts in balance amounts to but 15 minutes per shaft.

With every day paid for in lives, the value of this scientific short-cut for airplane crankshafts is beyond estimation.

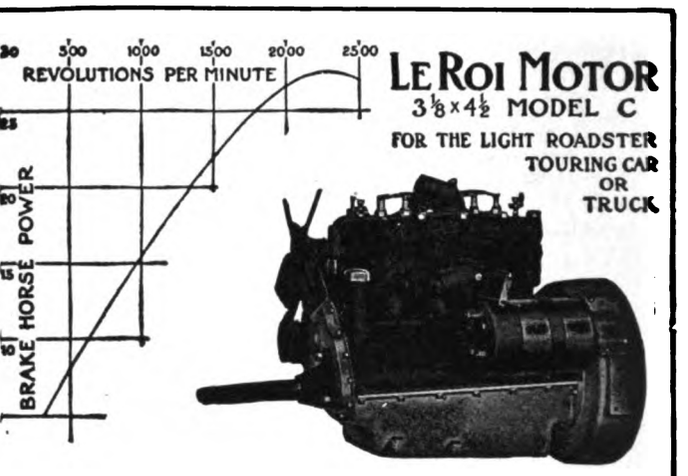


Supporting Springs and micrometer indicator at left end of bed, by which the slightest vibration due to running unbalance is shown.

THE CARLSON-WENSTROM CO.
Erie Ave. at Richmond St.
Philadelphia, Pa.

Makers also of Carwen Ball Bearings

CARWEN
Dynamic Balancing Machine
(Akimoff Patents)



LE ROI MOTOR
3⅛×4½ MODEL C
FOR THE LIGHT ROADSTER TOURING CAR OR TRUCK

Used by leading manufacturers of best-known American-made light trucks.
The business of manufacturing Le Roi Engines, formerly conducted by Milwaukee Machine Tool Co., is now carried on by

LE ROI COMPANY

Mitchell St. and 60th Ave.
MILWAUKEE, WIS.

Write for Complete Information

CABLE LE ROI MILWAUKEE

LIBERTY AXLES

A worm drive truck axle combining extreme light weight with exceptional driving power and load carrying capacity

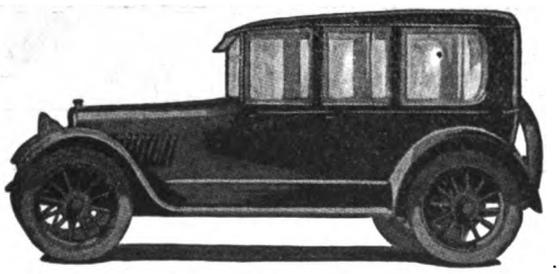
WAGNER AXLE COMPANY
ANDERSON INDIANA

STEEL TUBING
AND STEEL PRODUCTS
Exhaust Pipes - Carburetor Hot Air Tubes - Ignition Wiring Manifolds
Muffler Outlet Tubes
SIZES ¼" O.D. to 3" O.D. GAUGES #9 to #22
Send Us Your Blue Prints. Let Us Figure on Your Requirements
AMERICAN TUBE CO.
37th and Rockwell Sts. Chicago Ill.

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District Representatives

The manufacturer of a well known automobile accessory will have several desirable District Agencies available very soon. Established business with jobbers and garages awaits a few high grade men with moderate capital and the ability to create and maintain aggressive selling organizations. Possible curtailment in automobile production means greater demand than ever. Our National advertising and liberal dealer helps will get this business for you. Address Box 13, Accessory Manufacturer, care of Motor World, Mallers Bldg., Chicago, Ill., for particulars.



Save Money Without Sacrificing Appearance

In this time of nation-wide economy, are you finding ways of cutting costs—and still retain quality? One item of saving—and it's no inconsiderable part of motor equipment either—is

GLASS

We have a mighty acceptable substitute for polished plate; and whether you use it on closed cars, windshields, clock faces, oil gauges or what-not, you will find it optically perfect. It looks well, too—and of course it's very moderately priced.

Write us your requirements, and let us tell you why this glass will serve your needs so well, why it costs less—and all about it.

AMERICAN WINDOW GLASS CO.
World's Largest Producer
General Offices, Farmers' Bank Building
Pittsburgh, Pa., U. S. A.

BOSSERT

Sheet Metal Stampings



Axle Housings
Brake Drums
Wire Wheel Hubs
Hub Caps
Ball Cups
Ball Retainers

There's twofold economy in pressed steel parts. Economy in weight—for they're *lighter*. Economy in price—for they're *cheaper*. And they're every bit as *strong* as the heavier and costlier product.



Clutch Discs
Clutch Cones
Step Hangers
Torque Arms
Fan Blades
Felt Retainers

Here's the Service You Want

The Bossert Corporation has the most efficient plant in America for looking after the metal stamping needs of manufacturers. This plant is equipped with the largest presses in use today. Its workmen are highly trained—its whole organization is thoroughly capable. Every order, whatever its size, is given prompt and skillful attention.

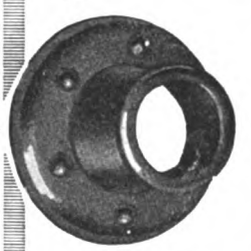
In addition, we have a splendid up-to-date equipment for annealing, case hardening, nickel plating and electric and oxy-acetylene welding.



Brake Bands
Housing Covers
Wrenches
Running Boards
Washers
Clutch Spiders
Etc.

Parts of Every Description Made Here

More than 200 parts are made in the Bossert plant. Every pressed steel requirement of the automotive industries is fully met, as indicated by the list of specialties printed here.



You'll find us measuring up to your standards in every detail of material and workmanship — and living up to our promise of early deliveries.

Let us furnish estimates on your metal stamping needs

THE BOSSERT CORPORATION
UTICA, N. Y.

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GREY IRON **CASTINGS** SEMI-STEEL

Quantity production and immediate delivery of castings for cylinders, gas engine parts and kindred work up to one ton in weight.

The most exacting physical and chemical requirements are complied with and constant inspection and tests of raw material, work in progress and finished product insure a minimum of defective castings and a saving of machine shop losses.

Daily Capacity 200 Tons

Campbell, Wyant & Cannon Foundry Co.
Muskegon Michigan

HLB The Quality Mark of Good **LEATHER**



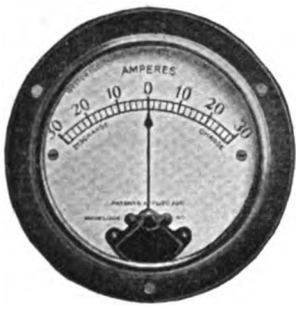
LEATHEROUND

is adopted especially for light drives. Made of oak tanned leather in full round or regular in 100 ft. reels.

HIDE, LEATHER & BELTING CO.
237 S. Meridian St., Indianapolis, U. S. A.

Are You Sure of Your Lights?

Or are you running the risk that lights, spark, starter may fail you suddenly—perhaps on a dangerous road, on a black night? Don't guess! Make sure of your electrical equipment by putting a



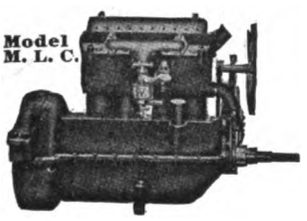
Weston
MODEL 354 AMMETER
On Your Dashboard or Cowl

It is the reliable means of determining the proper rate of charge or discharge of your battery for various speeds. It enables you to determine that the generator is working and that the storage battery is receiving its proper charge. ***Write us.***

Weston Electrical Instrument Co.
8 Weston Ave., Newark, N. J.
28 *Branch Offices in the Larger Cities*

"THE MASTER MOTOR"

There are BEAVER motors in a variety of sizes, suitable for TRUCKS, TRACTORS and PLEASURE CARS. Several new sizes for 1918 have been brought out and tested this summer. It will be worth your while to write us for full information on our line.



4-Cylinder—4-Cycle

BEAVER MFG. CO.
Milwaukee Wisconsin

Kales Stampings

Sheet Metal Stampings
of all kinds
Washers, Shims, Hind View Auto Mirrors

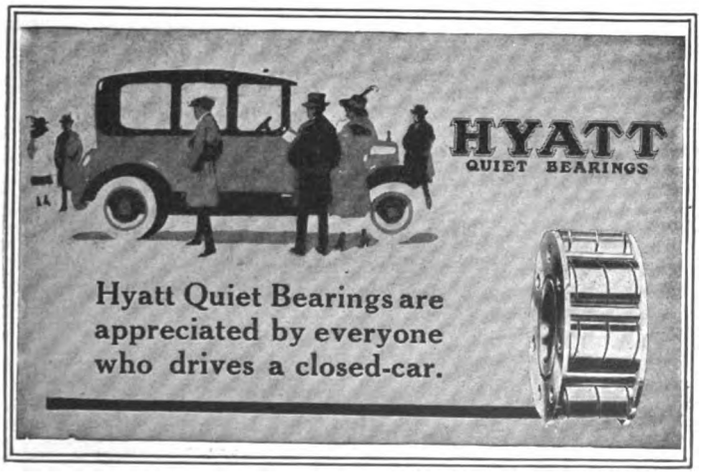
Our complete plant, superior equipment and efficient organization means quick and satisfactory service. Send us your blueprints.

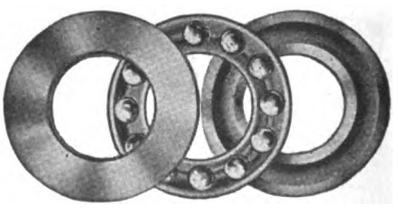
Kales Stamping Company, 441 Lafayette Blvd., Detroit.

Sexton's
CASTOR MOTOR OIL

Keeps your motor young with a perfect film of oil around *all* working parts.
Greater viscosity—perfect heat resistance—two to three times more mileage—
At your dealer's
Send for Booklet A-108

SEXTON OIL CO., North Chicago, Ill.





BALL THRUST BEARINGS

RETAINERS FOR CUP AND CONE, THRUST AND MAGNETO TYPE BALL BEARINGS.

Western Office, FORD BLDG., DETROIT
THE BEARINGS COMPANY OF AMERICA LANCASTER, PA.

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Starts the Engine Cold

Ford cars are difficult to start in cold weather without

Red Head

PRIMING PLUGS

A few drops in the cylinder through the priming plug—and the engine hums. $1.50 everywhere.

EMIL GROSSMAN MFG. CORP'N
Bush Terminal No. 20, Brooklyn, N. Y.
Chicago, 1253 Michigan Avenue

Do You Want PERFECT Winter Lubrication?

Then fill the transmission case, differential and all compression cups with

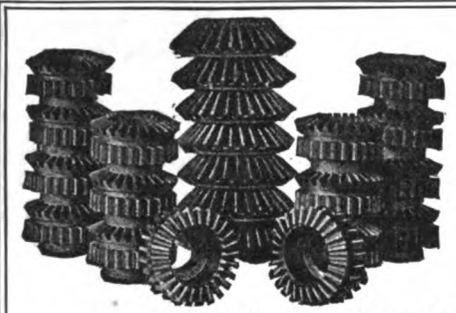
NON-FLUID OIL

It'll mean a smooth-running car even in zero weather. Unlike grease NON-FLUID OIL *does not freeze.* It guards gears and bearings against friction. It lubricates *instantly* and *always.* NON-FLUID OIL lasts longer than grease and *costs less.*

Get "K00 Special" grade for gears; "K000" grade for bearings. Packed only in orange-colored cans.

Write for booklet "Lubrication of the Motor Car."

New York & New Jersey Lubricant Co., 165 Broadway New York



GEARS

COMPLETE DIFFERENTIALS

GEARS for transmissions; spur bevel and helical.

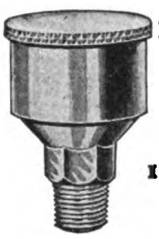
GEARS FOR ANY SERVICE

MADE TO ORDER — IN ANY QUANTITIES

NEW PROCESS GEAR CORPORATION
SYRACUSE, N.Y.

Complete Line of

GREASE CUPS, OIL CUPS AND OIL HOLE COVERS



SPRING SHACKLE BOLTS
HUB CAPS
METAL STAMPINGS
IN LARGE QUANTITIES



Manufactured by
Bowen Products Corporation

Plain Sectional

Successors to THE WINKLEY COMPANY
866 Warren Ave. W. Detroit, Mich.

VULCAN QUALITY

AUTOMOBILE SPRINGS

SPRINGS IN STOCK FOR ALL CARS
90,000 Springs. 588 Types.
6—FACTORY BRANCHES—6
St. Louis, Mo. 1402 Chestnut St. Minneapolis, Minn. 1024 Hennepin Ave.
Reading, Pa. 533 Franklin St. Ft. Worth, Tex. 708 Commerce St.
Sumter, S. C. 29 Caldwell St. Richmond, Ind. Colonial Bldg.
FACTORY RICHMOND, IND.
JENKINS VULCAN SPRING CO.



STOP!
DETOUR to RIGHT

This sign can be seen perfectly with an E & J Spotlight No. 94, and the dangerous ditch that will upset you can also be avoided.

The E & J Spotlight has been approved by more drivers than any or all of the others.

See your source of supply or write the

Edmunds & Jones Corporation
437 Lawton Ave., Detroit, Mich.

Models—FOURS
Model N.....3½x5
Model N.....3¾x5
Model C.....3¾x5¼
Model C.....4⅛x5¼
Model E.....4½x5½

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Model 7W ...3¼x4½
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Model 6P 3¾x5¼

"America's Standard Motor"

Continental Motors Corporation
Offices: Detroit, Michigan
Factories: Detroit—Muskegon
Largest exclusive motor manufacturers in the world.

Continental Motors

BEST PERFORMANCE

Miller Carburetor performance has proven its worth in every field. Greater simplicity and dependability—increased engine efficiency and economy—instant response to control—ability to use cheaper fuels of lower gravity than gasoline — all of these desirable features are to be found only in the Miller.

Ask your dealer—Literature on request.

Miller Carburetors

Miller Carburetor Distributors, Inc.
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256 Broadway, New York
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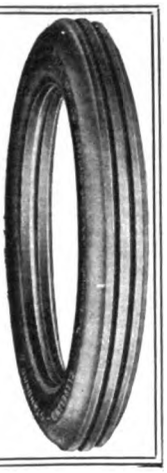
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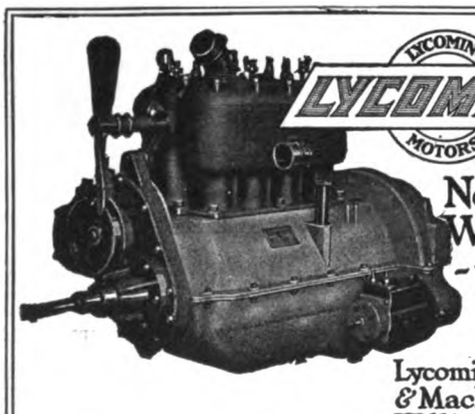
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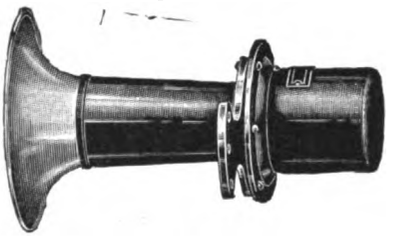
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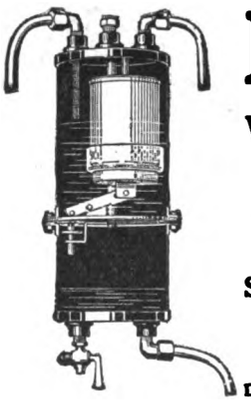
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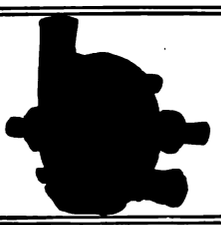
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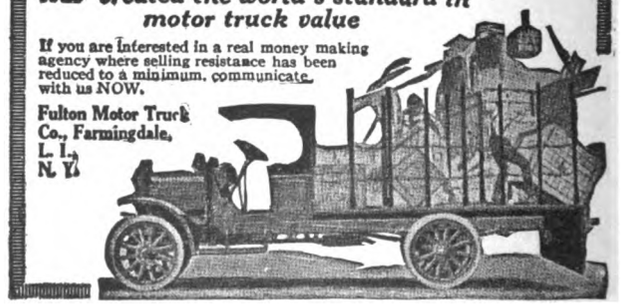
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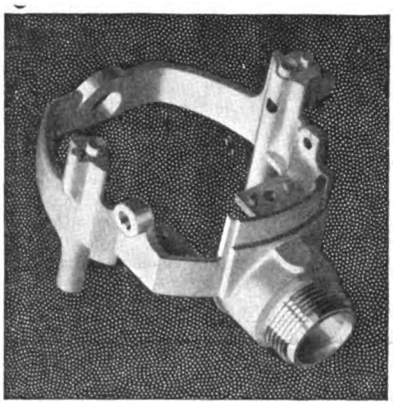
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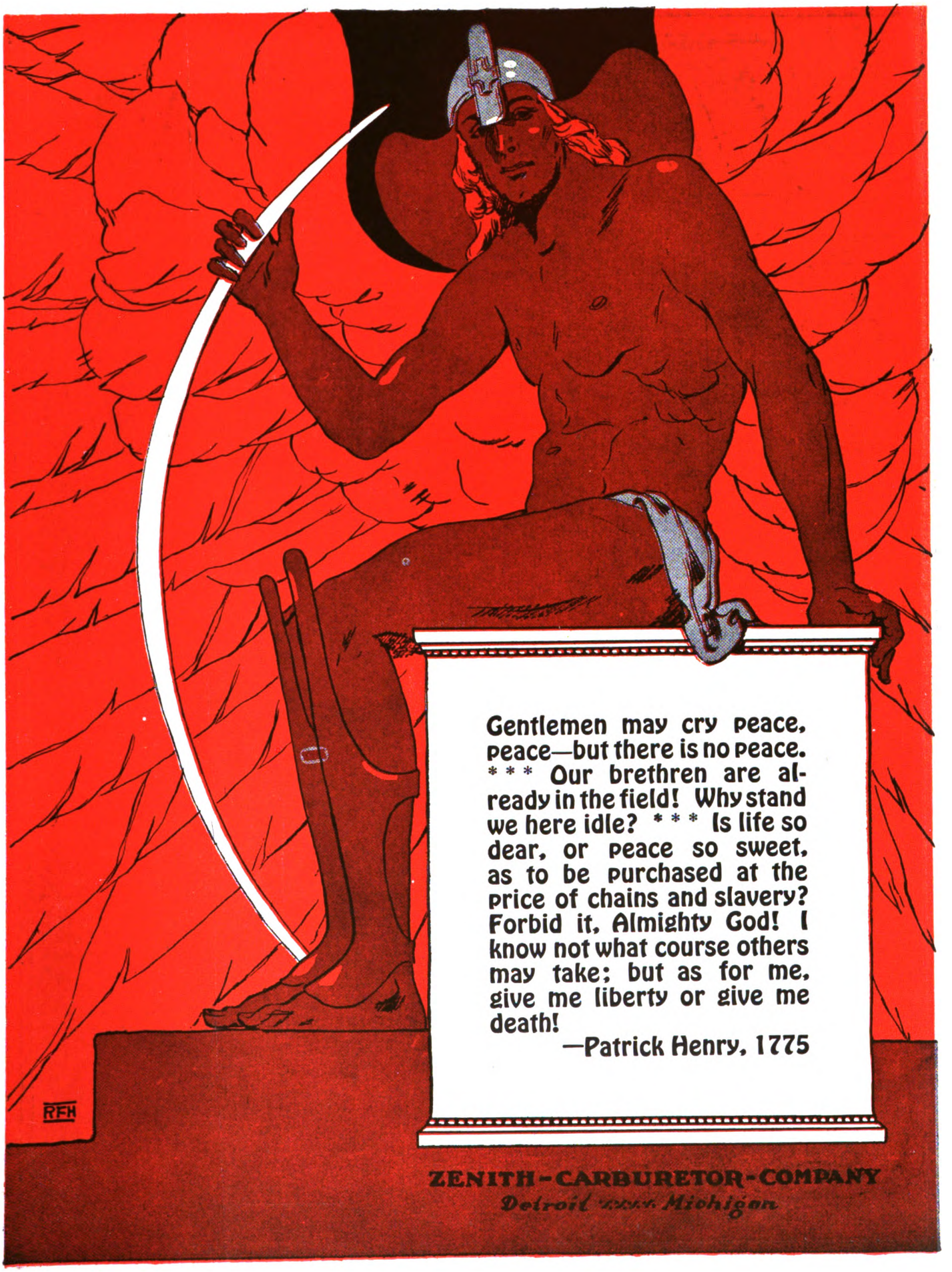
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TRADE MARK

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"AGATHON" Chrome Vanadium
"AGATHON" Nickel Steels
"AGATHON" Special Analyses
"AGATHON" Vanadium
"AGATHON" Chrome Steel
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Tillotson

CARBURETOR

THE economy and efficiency of a carburetor depends upon its ability to produce a perfect power-giving mixture of gasoline and air at all times and at all engine speeds, ranging from the highest to the lowest.

Engineers who have made exhaustive tests of the Tillotson will vouch for its ability to produce such a mixture under all conditions of service.

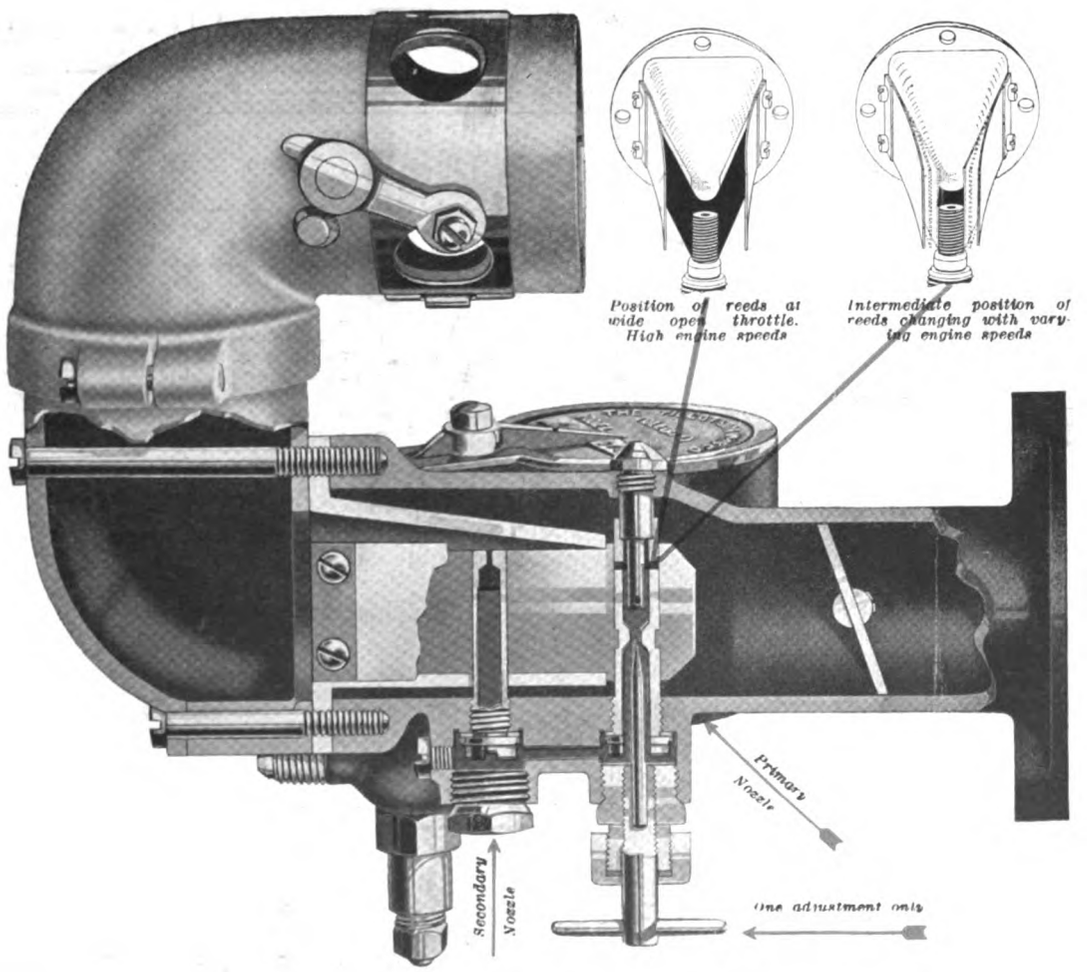
Model "C" shown below is equipped with the same automatic air valve arrangement that features all Tillotson models and is also provided with both Primary and Secondary fuel supply nozzles.

The Primary nozzle furnishes fuel at *all* engine speeds but at the *slower* engine speeds is the *only* one in operation and is the *only* one provided with an adjustment.

The Secondary nozzle gives the added amount of fuel for *high* engine speeds and furnishes fuel at the *higher* engine speeds *only*.

Too rich a mixture or too lean a mixture is unknown to users of Tillotson Carburetors.

The Tillotson Manufacturing Company
Toledo Ohio



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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Vol. XXXVIII
No. 5

NEW YORK, JANUARY 31, 1918

Ten cents a copy
Three dollars a year



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INSURE YOUR RADIATOR



THE only way you can be positive that your radiator won't freeze up this winter is to use a non-evaporating, anti-freeze preparation. The present high cost of alcohol—its low boiling point—and quick evaporation make it impractical. Besides, you are asked to conserve the supply of alcohol for use in explosives.

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Johnson's Freeze-Proof does not evaporate so one application is sufficient for the whole winter unless the solution is weakened by leakage of the radiator or hose connection, through the overflow pipe, or by boiling over.

JOHNSON'S FREEZE-PROOF

Johnson's Freeze-Proof should be used wherever you wish to prevent water from freezing—in automobiles, gas engines, tractors, electro-lighting and heating plants, traction companies, etc. One box will prevent 3½ gallons of water from freezing at 5° below zero. For lower temperatures increase the portion of Freeze-Proof.

Absolutely Harmless

Johnson's Freeze-Proof contains no oil and does not interfere with the cooling system. It will not injure rubber, cloth, packing, or metal of any kind. It does not rust or corrode any metal. Johnson's Freeze-Proof is economical and easy to use and it raises the boiling point of water 12° to 25°.

Johnson's Freeze-Proof is put up in packages containing 6½ lbs. net which retail at $1.50 each in the U. S. A. One package will protect a Ford from freezing at 5° below zero. For larger cars use two packages to protect to 5° below zero, and three packages to protect to 20° below zero.

Write for our new booklet, entitled "Keep Your Car Young". — We will send it to you free and postpaid. — The information in this book will enable you to greatly improve the appearance and the performance of your car.

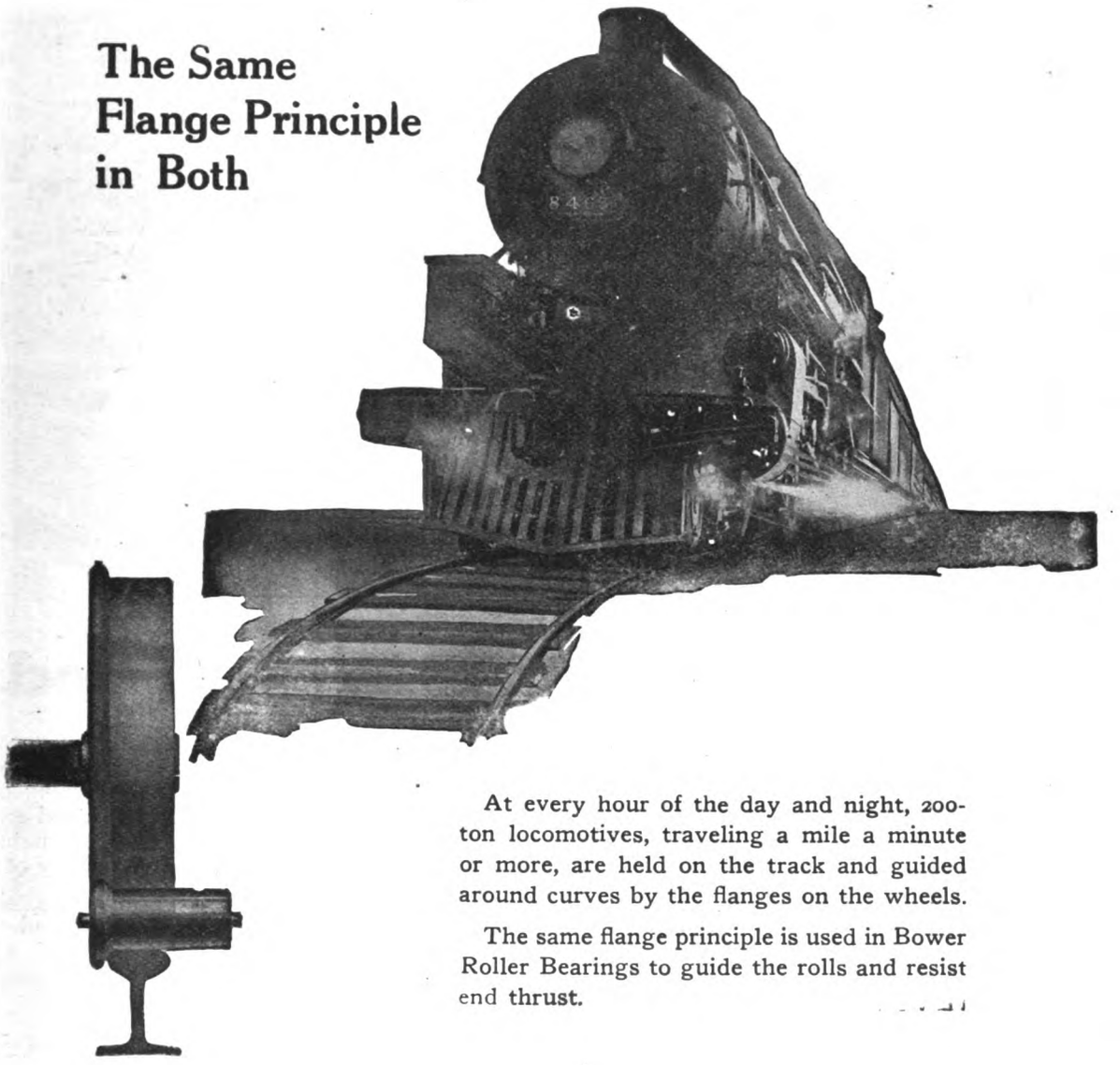


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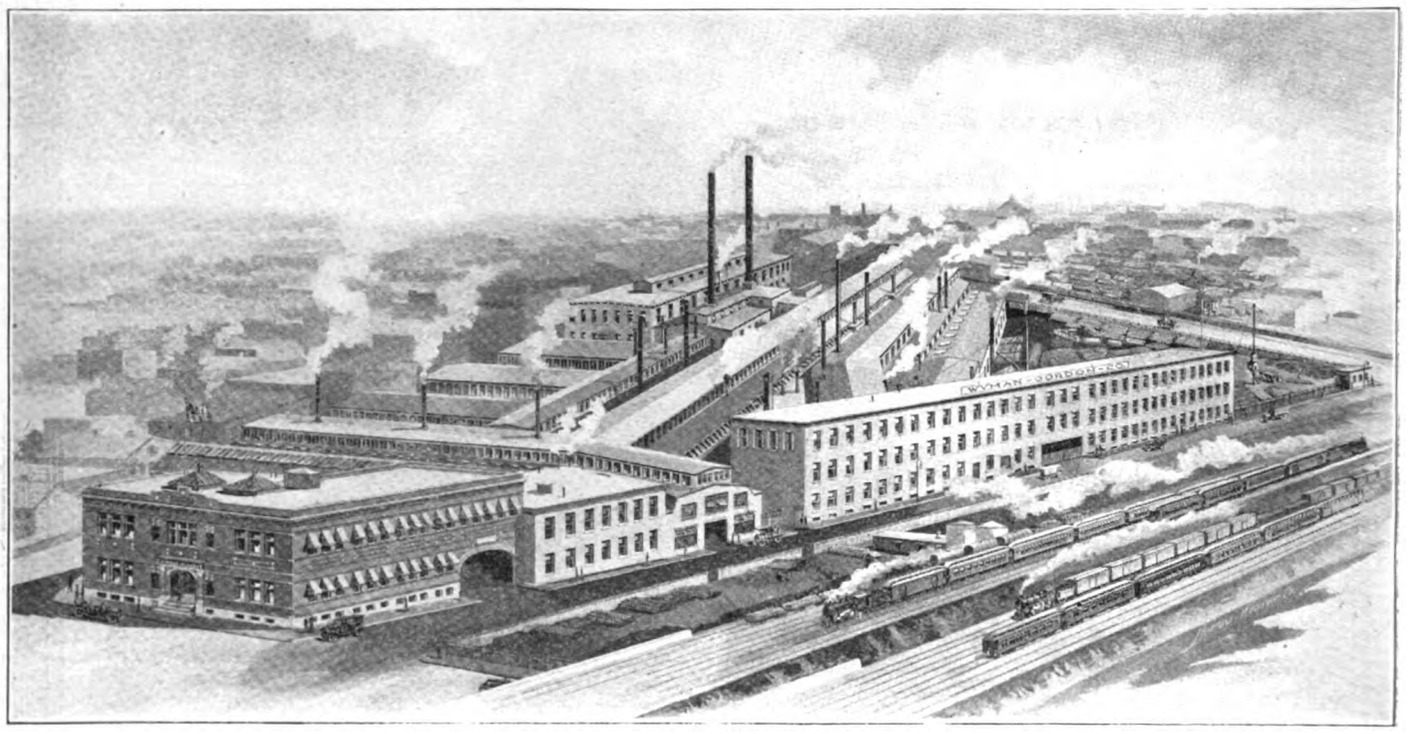
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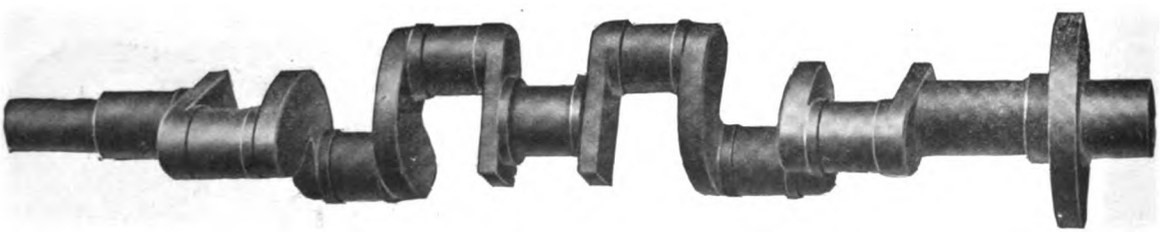
TRUCKS and ENGINES now building will be called upon for long, hard service. Both here and abroad the demand is for those that can survive the severest requirements. The "Survival of the Fittest" is being exemplified as never before. Trucks that stand up, engines that last and make good under these trying conditions, will make a reputation for themselves that will be very valuable after the war.

Get the Wyman-Gordon Guarantees on your Crankshafts and other forgings. It is a guarantee that means the fullest co-operation in working out your own particular problems in an efficient and economical manner. It covers Design, as well as material and workmanship, and guarantees you delivery of forgings that "stand up."

It will give you certainty of quality, and will save you time, money and worry.

Leading Manufacturers as well as the National and Allied Governments have availed themselves of our Special Facilities. We shall be glad to place the same facilities at your disposal.

WYMAN-GORDON COMPANY - - - Worcester, Mass.



WYMAN-GORDON

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AUTOMOTIVE INDUSTRIES
THE AUTOMOBILE
THE CLASS JOURNAL COMPANY
231–241 W. 39th STREET NEW YORK CITY

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BALL BEARINGS
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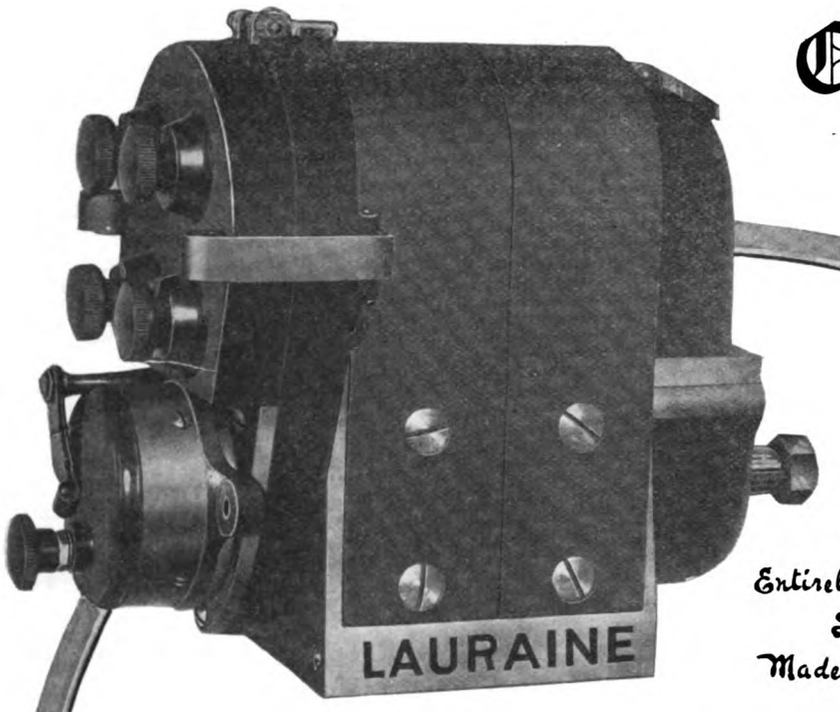
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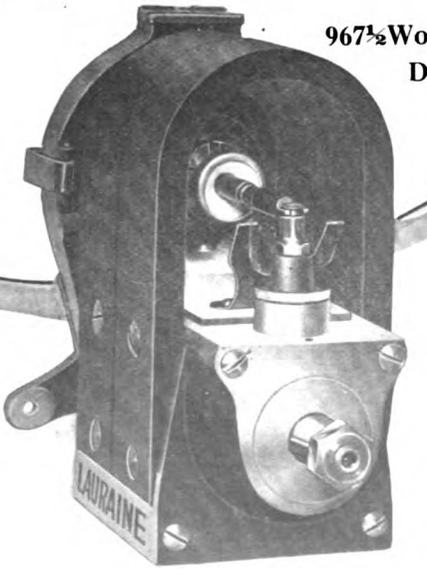
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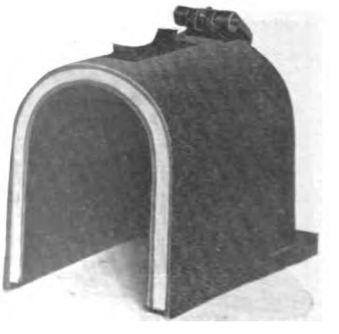
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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XXXVIII NEW YORK—THURSDAY, JANUARY 31, 1918—CHICAGO No. 5

Chicago's War Show

Big Business Gathering

Leaders of Industry, Makers, Distributers and Dealers, on Hand in Greater Force Than Ever—Exhibit Carries Conviction of Its Institutional Value and Essential Need

CHICAGO, Jan. 29—Chicago's eighteenth annual automobile show and its first war show which opened Saturday afternoon is in full swing, and while the crowds are not so large as last year, the enthusiasm is equal to that of former years. The thousands of dealers and distributers are arriving and the show carries the conviction that war shows in America are not only institutional but a part of the war business that is not only essential but highly desirable.

The automobile and parts makers were not just satisfied with the New York show as a national show this year, describing it, as many do, as a show of glitter and attraction rather than a big, broad business enterprise; and with that verdict running through their minds, they have been waiting for the Chicago show to see if it would, under war conditions, swing into the channels of former years and demonstrate that it is the national and the essential show of the year and that big business conclave which the manufacturers want it to be.

Fuel Order Hurts Attendance

Those who have waited are not feeling disappointed and as the week progresses the feeling that Chicago is making good is bound to increase.

Closing the show on Monday, in accordance with the fuel order, set back the attendance a day over former years and dealers who would have been arriving on Monday were not registering until this morning. To-day each train has brought in large quotas of distributers and dealers. Nearly all large companies are convinced that all distributers and dealers of importance will be here as in former years, but that there will not be such a large representation of very small dealers as in former years.

These small dealers will scarcely be missed, and with the same representation of distributers and large dealers as last year there will be practically as complete representation from the country as in former years. Thus the show is already giving conclusive testimony that war shows are to be with us and that they will carry on the work of former exhibitions.

Cold Weather and Snow Interfere

The attendance has been good to-day and it was good on Saturday. If it falls quite below that of last year there is not any serious disappointment for Chicago is still in the midst of the longest spell of cold weather that it has had in the memory of many of the oldest citizens. In addition to having lived through a long spell of cold weather, the city is veritably snowbound.

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A conservative estimate places 40 per cent of the city automobiles out of commission because of snow. Normally this percentage was in active use, but this year it is impossible to use them. Having 40 per cent of the cars out of commission is bound to cut down the city show attendance and this reduction is quite irrespective of anything connected with war activities and represents a condition entirely due to the snow.

The crowds surging through the Coliseum and Armory are more substantial than in former years. The crowd is much more largely made up of men. The men average somewhat older than formerly; there are fewer young men; in fact, their absence is quite conspicuous. There is also a perceptible absence of young girls and boys. The children with arms filled with catalogs are not present as in other years.

There are hundreds, and we hope thousands, of good inquiries for cars and while sales are few—the show is just in its second day—there is a better average of prospects than a year ago. The inquiries are not all for low-priced cars, but for the medium-priced machines as well. The percentage of inquiries is much larger in proportion to the attendance than it has been in former years, a condition which is quite natural.

Many Dealer Meetings

This week is listed up with dinners for dealers in about the same proportion as in former years, and owing to the show being closed on Monday the program of dealers' luncheons and dinners does not start until Wednesday noon, but continues regularly with every meal up to the climax, which will be the Society of Automotive Engineers' War Dinner on Friday evening at which 1500 diners are expected.

The program of manufacturers in general at these dinners is not known at this time but a spirit of optimism is generally expected to prevail. It is unfortunate that some enormous manufacturers' dinner had not been scheduled for Tuesday night, virtually the opening night of the show so far as dealers are concerned. There is in Chicago a hall capable of accommodating 3000 diners. With that number of dealers and three good speakers talking on the interpretation of present conditions there would be an opportunity for the manufacturers to do a united service to the dealers which cannot possibly be accomplished by the companies individually at their respective luncheons.

The makers have let a golden opportunity slip by of delivering that type of backbone lecture which the dealers are much in need of.

If one criticism might be lodged against the show, it is the fact that nothing has been done by the manufacturing industry to inject into the merchandising end a needed stimulant.

A chapter might be taken from the example of the Cleveland show last week in which they had a luncheon attended by over 400 dealers and at which Hugh Chalmers delivered a message which the dealers of Ohio were in need of. A great dealers' dinner by the manufacturers would have given a backbone argument to the dealer which he quite needs to-day.

Attitude Hard to Judge

It is too early to state just what is the mental attitude of dealers from all of the 48 States present, because some States are not yet represented.

It is too early in the show week to say just what is the attitude of the dealers. Some of them are a little glum and downhearted and need a mental stimulant. The good ones are generally very optimistic and the weak ones pessimistic.

Never was it easier to classify the weak from the strong. The strong believe there is good business and are going after it with a will to get it. The weak talk about the bankers who are shortening up on credit, about the railroads and about conditions in general.

It is with these weak ones that the maker has to do his strong arm work this week. It is a case of need and we hope that those makers who are here to take charge of their dealers will deliver a message that will eclipse those of former years.

Meetings with dealers this year should be more than a mere jollification.

They must be business talks. They must analyze business and financial conditions.

They must get to the very nerve center.

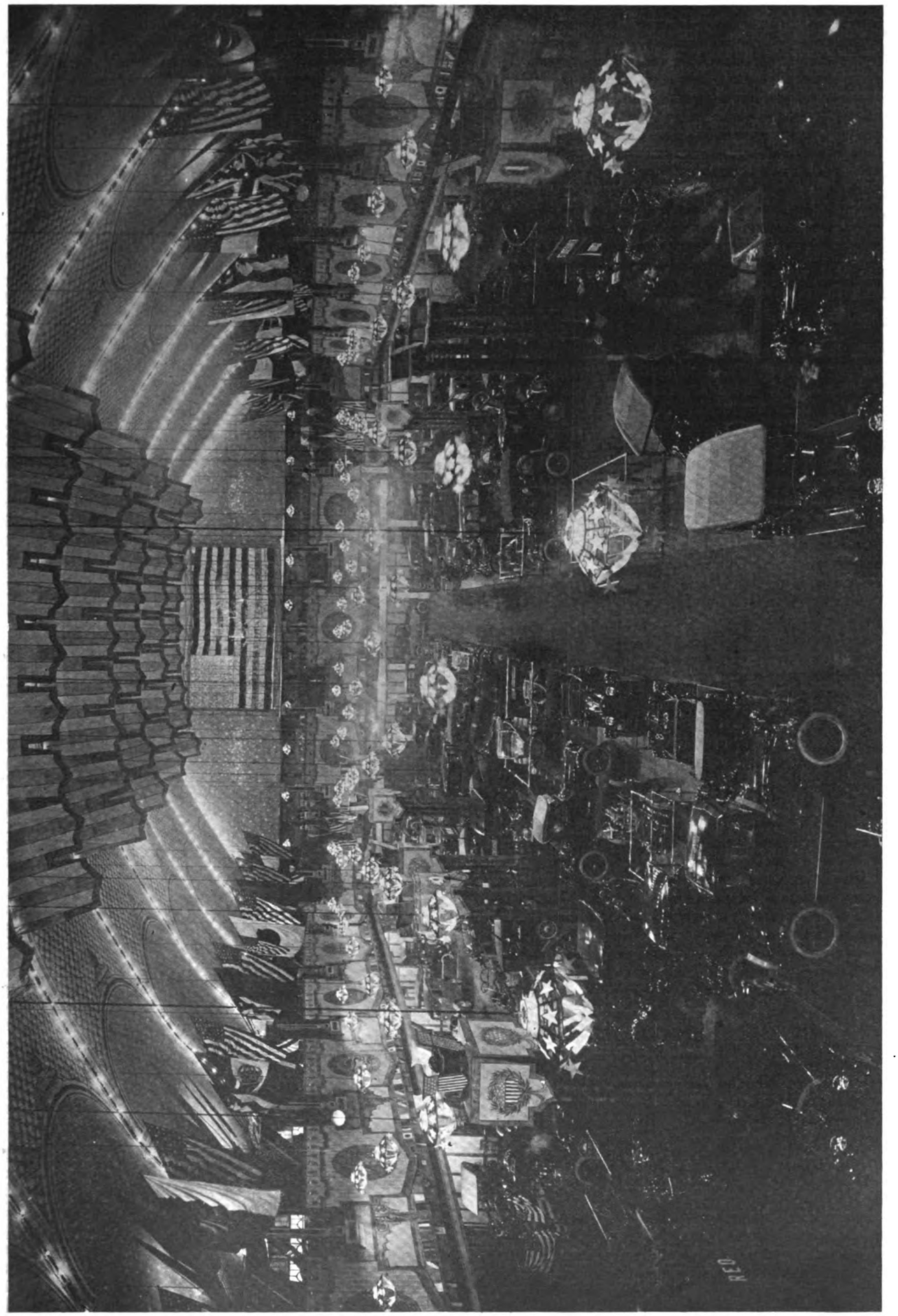
Show is Proving Greatest of Business Exhibitions

INDICATIONS that there will be a shortage of automobiles soon, and that the price of used automobiles will increase are brought by every dealer arriving at the show here from the South. The South has had the greatest crop in its history, and the people are going to spend their money. The automobile as a means of transportation is the first thing that appeals to them. There are dealers arriving here from every town in many Southern States, and all bring the same story of an unprecedented demand for automobiles.

Negroes are buying $2,000 cars and sporting runabouts. Already the used-car trade in these States is growing by leaps and bounds. The possibility of not getting all of the new automobiles needed is right now influencing the used-car buyers. In the South it is not a question of how many automobiles can be sold but how many can be obtained to sell.

After really only one day of the show—that is Tuesday—the volume of business to be done and the amount of interest in the automobile and its parts was indicated last night, when one accessory maker declared that in one day—literally Tuesday afternoon—he had done more business than he did in the first three days of the New York Show. The Chicago Show is still maintaining its reputation as being the business show of the country, and is, in this first war year, distancing the New York show in this respect. Some of the big accessory jobbers in Chicago have their places of business crowded from morning until night. This is true not with one jobber only but with several.

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Eighteenth Annual Automobile Exhibition in the Coliseum, Chicago

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Never before has all Chicago taken on the show spirit as it has done this week. Chicago is passing through a veritable automotive industry week. While the exhibits in the Coliseum and Armory, figuratively speaking, represent the reason for the great week, still the entire city is given over to automotive ideas. Several of the largest department stores are staging automobile accessory exhibits, and they are being well patronized.

Every person engaged in business associated with the automotive industry is reaping the results of the great show week. With Chicago it is no longer an automobile show week but a great automotive industry week. It is too bad that there is not a tractor show running at the same time. The time is ripe for a motor cycle exposition. It is the best week for the motor boat interests to be displaying their wares.

Great Transportation Week

In fact, every branch of the automotive industry is profiting by this great transportation week, and by another year all of these several industries should be staging their individual exhibits and placing them in the greatest exhibition atmosphere that exists in the world.

For several years the two national shows, Chicago and New York, have been getting closer and closer together, so far as the actual exhibits are concerned, so that to-day the line of car exhibits is practically the same in one as in the other, Chicago perhaps having two or three local makes not seen at New York, and having perhaps one or two new body styles that were not ready for the New York show week. The days are past when Chicago had twenty-five or thirty exhibitors of automobiles that were not seen in New York.

Those were the days when Chicago staged a motor buggy show, and when literally scores of new concerns in the West made their début in the Coliseum. Now the ground covered by both shows is practically the same; the body styles seen at the two are practically the same; but still Chicago holds premiership in its show, even under war conditions, being the great gathering ground for dealers from the 48 States.

As to the display of accessory exhibits, Chicago is losing ground as compared with New York, the number of accessory exhibitors this year being less than that of a year ago, and many less than the number this year in Grand Central Palace, New York. Chicago should have the greatest accessory show of the two, and it is probable that the poor space for accessory exhibits is largely responsible for the fewer exhibitors. The accessory space rambles around the four sides of the Coliseum gallery, then it is squeezed into the four narrow balconies around the Armory, and its only free space is in the small second floor of the Coliseum annex and the basement.

New York has the ideal setting for the accessory maker on the upper floors of the Grand Central Palace with an elevator service from the ground floor to the top accessory floor, so that those who use the elevators must pass entirely through the accessory exhibit space. The accessory exhibitor has not as good a space in Chicago as he deserves, but there is nothing else for him.

Hotel Exhibits Well Populated

Each year finds the Chicago show dividing itself into two divisions, those exhibiting in the Coliseum and Armory and those opening offices in the Congress Hotel, where several floors are literally filled with offices of different makers of parts and accessories, who prefer to show their goods in the privacy of an office or in a hotel room rather than in a public exhibit space in the Coliseum. Each year this hotel show has gained in importance, so that this year one would be getting a quite incomplete conception of show week if he investigated only those exhibitors in the Coliseum and Armory. You must make the rounds of floors in the hotels before you discover all the developments in the different factories. Here in these rooms are being shown devices developed for Government use and which are being kept in secrecy but which after the war, or perhaps before that, will find their place in commercial lines.

Then, too, the Salon which is being held in the Congress Hotel in the large Elizabethan room on the first floor is attracting a great deal of attention and fits in wonderfully well with the big displays of parts throughout the hotel. In other hotels are many other parts makers who are showing some new developments, so that in a dozen places is the annual Automobile Show being staged in the Windy City. It is this widespread ramification of the show that leads to the conclusion that the Chicago show is to-day an institution of the automobile industry—an institution for the manufacturers, and should be an institution for the dealers.

More Than Mere Car Show

Unquestionably the time is not far distant when show week in Chicago will literally be automotive, instead of merely automobile. Literally speaking, it is more than an automobile show to-day, yet it is scarcely automotive. The time may not be far distant when a big farm tractor show will be held in the city the same week as the automobile show. The city has good facilities for such a show in the pavilion at the stock yards.

There is a reason why a national tractor show should be held in Chicago during the same week as the automobile show. There are many reasons for it. The dealers who have been selling automobiles are now selling tractors. The tractor will reach the farmer through the same channels that their automobile does. In the Middle West, or in all of our agricultural States, nearly 90 per cent of the automobiles go to the farmers. The farmer has established connections with the automobile dealer, and this dealer is the logical channel of tractor sales. The tractor maker is looking for agents, and he wants his show staged in a national atmosphere. Chicago offers such a setting.

Still a further reason for Chicago becoming a national show center, and holding an automotive show week. The thousands of parts makers who sell to the automobile maker, the truck maker, the tractor maker, the motorcycle maker and the airplane maker, can all meet these makers in this common center. The one week will give them the opportunity of exhibiting to all instead of two, one or two or three of them. The spark-plug maker is interested in all branches of the automotive industry, so is the maker of castings, the maker of forgings, the maker of stampings and the maker of bearings, electrical equipment and scores of other lines. There is no reason why Chicago, which has for years been such a generating center, should not carry forward to its fruitful completion this automotive show germ.

Sentiment for Big Dealer Show

Each year hears the rumor gaining around Chicago that the Coliseum show should be a big dealer affair managed by the dealers and distributers of Chicago and run for their special benefit. It is true the Chicago dealers are literally done out of a show which their fellow dealers in Boston, Minneapolis, St. Louis, Kansas City, and two dozen other cities stage to their own advantage and remuneration. Dealers feel that the time has arrived when the national show movement in Chicago should be handed over to them.

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The argument goes to show how the Boston show, run by dealers, is a larger display than either New York or Chicago. It goes on to show that Minneapolis this year will have a larger exhibit than either New York or Chicago, so that the time has arrived when dealers' shows are excelling national shows in volume of exhibits. If the Chicago show were given over to the dealers, the show would be very little, if any, different, and the Chicago dealers, representing the largest distributing center in the world, would be given a participation in the industry which they have been denied for years but which is rightly theirs.

The present trend in the last few years of makers of parts preferring to show their devices in rooms in the Congress Hotel points to the fact that display spaces in the Coliseum and Armory are not entirely suited to these makers, and that, in a word, the public exhibit is really more for the retail trade than for the manufacturer. With the Chicago show in the hands of the Chicago dealers and distributers and with Chicago staging a complete automotive show week, the makers would be left free to carry on their business from the hotels and other places as they prefer to, and the public would have the same attention from the dealers which they are receiving to-day.

It now seems certain that many makers of parts and accessories consider the public exhibit space not entirely satisfactory for their needs. The exhibit space does not provide that seclusion which many of them desire. The big show is, so to speak, the billboard advertising for the great show week. It is the centerpiece of the week, in short, the reason for the automotive show week. The industry must get together, and Chicago show week has in years past demonstrated that this is the one suitable time of the year for such a rendezvous of transportation makers and merchandisers.

Several New Cars at Chicago Show

Deering Magnetic

DURING the week of the show the new Deering magnetic made its début at the Congress Hotel. This car is to be produced in four different types for the 1918 season, including a road car, seven-passenger, an all-season sedan, a four-passenger sport roadster and a coupe. However, it was impossible to get the last two ready in time for the show, and so only the seven-passenger road car and the sedan were exhibited. No definite announcement as to prices has yet been made, but it is understood that the seven-passenger road car will sell at $3,950. This will place it in a somewhat different price class from the Owen Magnetic, which sells at $5,300.

A six-cylinder engine is used, of the overhead valve type, the valves being inclosed and the cylinder heads removable. The engine was specially designed for use in this car by George P. Dorris, one of the pioneers of the American automobile industry. It has a bore of 4 in. and a stroke of 5 in., and though its S. A. E. rating is only 38 hp., actually it develops 70 hp. In order to eliminate all chance of whipping, both the crankshaft and the camshaft are supported in seven bearings. A hot-spot type of manifold is employed, which is said to be of such design that although it insures thorough vaporization of the fuel, it will not expand the air to such an extent as to excessively reduce the volumetric efficiency. The engine, of course, has been especially designed with a view to the use of the Entz magnetic transmission.

The five-passenger sedan, with two auxiliary chairs of the disappearing type, is finished in two-tone mole skin, with black fenders, wheels and running gear. The upholstery of mole skin velour mohair extends only to the window line, the interior above that point being painted in a harmonizing shade, and the flexible, bevel-edged roof is provided with a beamed ceiling to eliminate rumble. In summertime the glass may be dropped into the body and seat covers used to protect the interior against dust and rain.

Maibohm Shows New Six

THE Maibohm six-cylinder six-passenger sport phaeton is one of the few entirely new models revealed at the Chicago show. The exhibition model is finished in powder blue with khaki top. This new car is the product of the Maibohm Motors Co., Racine, Wis., which has hitherto specialized on a four-cylinder sport roadster.

The new Maibohm Six has a valve-in-head Falls engine of 3⅛-in. bore by 4¼-in. stroke, with detachable cylinder head. A Wyman-Gordon counterbalanced crankshaft, 2¼ in. in diameter, with three 2-inch bearings, is used. Valves are 1⅛ in. in diameter and lift 9/32 in. The valve adjustment is at the cylinder head and directly accessible. The Stewart vacuum tank is supported on brackets in an elevated position so that there is no interference with the adjustment of any of the valves. The engine is rated at 23.4 hp., but develops 40.6 hp. at 2290 r.p.m. Its maximum speed is 3510 r.p.m.

The equipment consists of a Wagner two-unit, six-volt starting and lighting system, Atwater Kent ignition, Willard battery, Stromberg carbureter, Perfex radiator for thermo-syphon cooling, Borg & Beck clutch and Mechanics three-speed transmission, the latter forming a unit with the power plant. By overhanging the levers of the transmission they are brought within easy reach of the driver. A worm and pinion speedometer drive is inclosed in the transmission case and drives the Stewart 60-mile speedometer. The storage battery and the adjusting turnbuckles on both brake rods are located directly under the front floor boards. The battery is thus easily removed from its steel cradle, and the large turnbuckles make brake adjustment a simple matter.

On the left-hand side of the engine are located the oil gage and filler, the electric generator driven through a universal joint type coupling and the ignition distributor, the latter an independent unit on the rear deck of the crankcase, this location permitting a simple wiring layout. Both manifolds are cast integral with the cylinder head, making for simplicity of pipe connections. An instrument board plate carries all necessary connections and is installed with four wood screws. Six bolts through the frame hold the body to the chassis.

Hotchkiss drive is used. The power is transmitted through two 4½-in. universal joints and a tubular propeller shaft. Both sets of brakes are lined with asbestos fabric and act on rear wheel drums, 12 by 2½ in., internally and externally. A Maxim silencer is fitted and the steering gear is of the Jacox, split-nut type. A 17-in. notched-grip hand wheel carries the spark and gas quadrant and horn button.

The rear axle is full floating, with 1⅛-in. shafts, a Brown-Lipe-Chapin differential and Hyatt roller bearings. Two Bock taper roller bearings are in the third member, which has an external adjuster. The gear ratio is 4.5 to 1. The front axle is a drop forging of 2-in. I-beam section.

All springs are semi-elliptic, the front ones being 36 by 1¾ in. and the rear ones 49 by 1¾ in. All three cross girders of the frame are straight. Wheels are artillery type with Stanweld rims. Houk wire wheels cost $100 extra for the set of five. The tire equipment is Goodyear, 32 by 3½ in. The wheelbase is 115 in., the road clearance a full 10½ in., and the complete car weighs 2375 lb. The price of both four-passenger and six-passenger touring models is $975 at the factory. Finish is optional with the purchaser.

The six-passenger job is long, low, narrow and rakish in appearance. The body does not project into or over the rear fenders, which extend a full 10 in. on each side. There are two folding auxiliary seats in the tonneau.

The khaki top is of Victoria shape. Gypsy curtains completely cover the top bow sockets, and have a round, bevel-

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edge plate glass curtain window in each side. There is also an oval plate glass window in the rear.

Six Cylinder Comet an Illinois Product

THE Comet, which is made by the Comet Automobile Co., Decatur, Ill., is a six-cylinder car developing 50 hp. at approximately 2400 r.p.m. The cylinders are cast in block and surrounded entirely by waterjackets. Cylinder dimensions are 3½ by 5 in. Lubrication is by combination force feed and splash with individual constant level trough for each crank. Intake ports cast in the exhaust manifold provide for preheating the gas mixture before entering the cylinders. Cooling is by a centrifugal water pump with large cellular radiator and ample waterjacketing. A roller bearing fan with five double blades is used. The flywheel is inclosed in a bell-type housing.

Starting and lighting are by the Dyneto two-unit system with Bendix drive to the flywheel. Ignition is Delco. A dry-plate clutch is used, and the three-speed selective gearset is in unit with the engine. Two universals and a tubular propeller shaft take the drive to the rear axle.

The front axle is an I-beam type with Elliot knuckles. A three-quarter floating rear axle is fitted, the gear ratio of which is 4½ to 1. Hyatt and Bock bearings are used on the pinion shaft, differential and wheels. Brakes are internal and external on the rear hub drums. Semi-elliptic front springs, 2 by 36 in., and cantilever self-oiling rear springs, 2½ by 50 in., are used.

The frame is of pressed steel, heat-treated, with a kick-up over the rear axle. All cross members, gussets, hangers, etc., are hot-riveted. Wood wheels with 33 by 4-in. tires are fitted, while wire wheels are optional. Firestone demountable rims are stock. The wheelbase is 125 in., and a road clearance of 10½ in. is given. A 22-gal. gasoline tank is mounted under the frame in the rear with a sight gage and large end filler.

Auburn

ONE of the new cars at the show was the Auburn Sport Model, equipped with a six-cylinder engine and mounted on a 120-in. wheelbase. This car is an unusually roomy four-passenger model and has the front seats divided by a wide aisle. The upholstery is leather and done in the flat French pleat style. The body is of the straight line design with the windshield placed at quite a pronounced angle. The chassis follows the general Auburn construction with such features as semi-elliptic springs, unit power plant, etc.

One of the features on this car is the attention paid to details. For instance, there is a locker under the rear deck to which access is gained by removing part of the rear seat upholstery, which comes out in a rectangular block form. Thus it is possible to conveniently carry packages in this compartment. The price of this car is $1,395. To meet the demand of those who want extra large power and high speed the Auburn Sport Model is also built on a large chassis, with 131-in. wheelbase and 55-hp. engine. This model is priced $1,685. These cars are products of the Auburn Automobile Co., Auburn, Ind.

Hackett

THE Hackett Motor Car Co., Jackson, exhibited three models, all using the same chassis. There were a two-passenger roadster in olive green, five-passenger touring in brown, and collapsible sedan, finished in maroon. This concern also had on exhibition one of the new Guy rotary valve engines, with which the Hackett line is to be equipped later on. This engine incorporates some unique features. The valves are of the simple disk pattern, with only one surface in contact with the seat. For this reason also the valve is free to expand and contract without danger of binding, it is claimed.

The valve driving mechanism is by means of spur gears which are attached directly to the stems of the valve and driven by a small master gear. The latter drives the two middle gears attached to the two middle valves, and these in turn operate the outer cylinder valves by being in mesh with them. The disks which constitute the valves are cut with eight ports, which means there are four intakes and four exhausts per cylinder. There are only three working parts to each cylinder. The gears operate in a bath of oil and are noiseless. The valve driving mechanism operates ⅛ crankshaft speed, and, due to the rotating motion of the valves, the latter are said to be self-grinding, thus making them carbon proof. The top of this engine has an aluminum head plate, the removal of which exposes the valve.

The chassis has a 112-in. wheelbase and a unit powerplant. The engine is a four-cylinder, having a bore of 3¾ in. and stroke 4½ in. Hotchkiss drive is used, the torque being taken through long semi-elliptical springs. The gears in the rear axle are of the plain bevel type. The roadster and touring car sells for $985, while the all-season car or open sedan is priced at $1,165.

Elgin

THE Elgin Six Sedan exhibited by the Elgin Motor Car Corp., Chicago, is of the Springfield type, having two doors, one on each side, and constructed so that it can be entirely closed for winter or open for summer. The chassis is the same as used on previous models and incorporates such features as a unit powerplant, Borg & Beck dry plate clutch, Wagner lighting and starting system, etc. The steering wheel can be adjusted so as to bring it out of regular driving position, providing plenty of room for the driver in getting to and from his seat. The floor is covered with Brussels carpet, held in place by snap fasteners. There is an interior electric dome lamp. The car is finished in black with silver striping on the body and wheels. The price is $1,645.

Pan-American

THE Pan-American Motors Corp., Decatur, Ill., exhibited three cars and a chassis in the Greer Building. Beside the regular five-passenger touring car there was a four-passenger close-coupled car and a four-passenger sedan. All of these models use the same chassis, which is powered with a six-cylinder 3⅛ x 5 Pan-American Rutenber engine. The standard wheelbase is 120 in. Gasoline is served to a Rayfield carbureter by a Steward vacuum tank, drawing from a 20-gal. tank at the rear. The main tank has a large filler cap with gage and drain plug at the bottom.

The frame has a double kickup at the rear and is reinforced by four independent cross members, which with the rear engine support are said to eliminate all frame wearing, body squeaks and hood climbing. Springs are all semi-elliptic, with the rear 58 in. long, underslung and suspended directly under the frame. There are wick oiling devices for all spring shackle bolts and also for the steering knuckle pins. Drive is through a Borg & Beck clutch to a Warner gearset in unit with the engine.

Chalmers

A CAR which attracted unusual attention was the race-about exhibited by Chalmers Motor Co., Detroit. This car was a duplicate of the one in which Joe Dawson established a new 24-hr. record at Sheepshead Bay, N. Y., last fall. Essentially the chassis of this car is the same as used on all Chalmers models, with the exception that the engine is placed a little farther back. The body is aluminum and fashioned to reduce wind resistance. Only 25 of these cars are to be made.

Jordan

A NEW show model is the Jordan Suburban, which is really a larger edition of the Jordan Sport-Marine, but with seven-passenger capacity. It is mounted on the standard 127-in. wheelbase, but the body design is so worked out that a heavily raked steering column is used. The chassis is 2 in. lower than the standard Jordan chassis, accomplished by improved spring susupension, and the body is 3 to 4 in. lower. It is sold in two color options, namely, Liberty blue with black running gear and Brewster green with black running gear. As a complete seven-passenger job it sells at $2,375, this figure including complete equipment, consisting of 33 x 4½ Firestone cord tires, wood wheels, Burbank top, clock, tonneau light, traffic bumper, Macbeth lens and extra tire and rim. Production will begin Feb. 1.

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Marine Engineers Discuss Standardization

Standardized Fittings and Construction of One-Design Vessels in Large Numbers Chief Topics at Show Week Meeting Under S. A. E. Auspices—A Series of Marine Standards Adopted

EVIDENTLY the motor-boat and shipbuilding industries are at a critical point in their respective histories. Heretofore all of the larger vessels, and most of the smaller ones, have been built individually to order—custom made, as it were—but owing to the urgent demand for various classes of vessels created by the war regular manufacturing methods have been introduced permitting of making the parts in different plants, often located at great distances apart, and merely assembling them in the yards. This is the main thought that was put forward at the motor-boat meeting of the S. A. E., held at the Automobile Club of America on Friday evening. The plan proved a complete success in manufacturing a lot of 550 submarine chasers for the British Government in 1915-16, and is now being applied also to the production of cargo ships.

The meeting was preceded by a dinner, participated in by about 400 men, a goodly proportion of them naval militia officers. At the conclusion of the dinner the assembly proceeded to the large meeting room of the clubhouse, where four speakers enlightened them on subjects connected with ocean-carrying problems of the present day, and where they were entertained by the display of motion pictures of various automotive events.

Sutphen Talks on Cargo Ship Program

Although last on the program, the most important talk of the evening was that of Henry R. Sutphen, who gave an account of his experience in building 550 one-design submarine chasers for the British Admiralty, and of preparing to turn out one-design cargo steamers for the U. S. Government in large numbers. Mr. Sutphen said we had now had 1 year of standardization in marine work and had about finished beginning. There was a good deal of misconception of the real objects of standardization as carried on by the S. A. E. The object was not to absolutely standardize design but to harmonize design already made. Never before had the opportunity existed in the marine trade to carry through standardization to the extent that it was possible now. Formerly, boats were built instead of being manufactured, as the boat builders have to meet the wishes and whims of the public.

The first opportunity for real standardization came when the firm with which the speaker was connected received an order from the British naval authorities for 550 submarine chasers, all to be built according to the same plan. Some had said that the company would "blow up" in trying to do the job, but the order was completed ahead of time, in 488 days. This was in 1915-16, when the United States was still a neutral, and in order to comply with the laws of neutrality the boats had to be assembled in Canada. The plan was to so standardize the whole design that the assembling of the parts called for very little skill, and it was worthy of note that of the men employed in assembling work not 5 per cent could speak English, and not more than 2 per cent had ever been near a boatyard before.

Standardized Cargo Ships

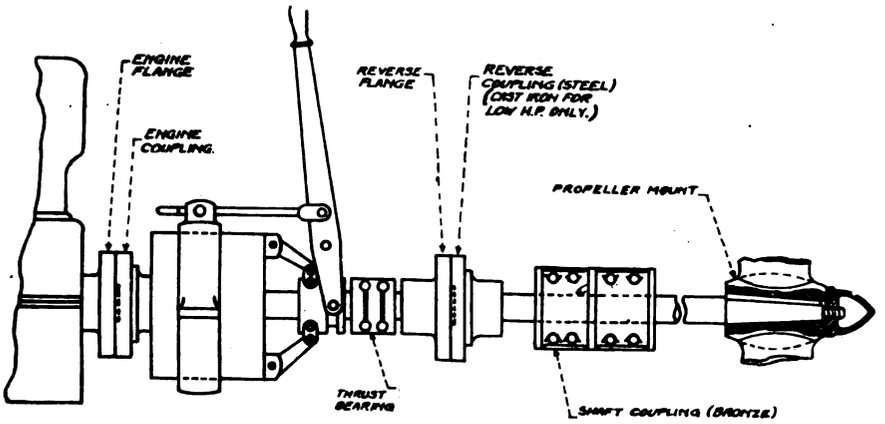
At the present time the speaker's firm was building 150 steel cargo ships of 5000 tons each for the U. S. Government. These will be built also on standardized lines. It was at one time believed that to win the war it was necessary for us to build as quickly as possible 1000 wooden ships. However, standardization is not possible in wood construction to the same extent as in steel construction; consequently it was suggested to the Government early in the war to build steel ships rather than wooden ships. The question then arose where to get the steel, as the U. S. capacity for producing ship plate was limited. It was then decided to develop an entirely new design of cargo vessel, employing structural shapes, and after the design was completed it was passed by Lloyd's as A1; that is, equal to the very highest type of construction.

To secure the necessary large organization the company turned to the trades that it believed would be idle as a result of the outbreak of the war, including the building trades, the bridge builders and tank manufacturers. Contracts for parts were let with, and parts are now being manufactured in forty-six different shops scattered all over the country. So far, four keels of 5000-ton ships have been laid, and it is intended to build 150. Every worker, not only in the yards but also in the different structural shops, knows that he is working on parts to go into ships, and takes an interest in his work. Fully 90 per cent of the work in building the ships will be done in the shops throughout the country.

Turbines and Water-Tube Boilers

When it came to the selection of the machinery the use of turbines instead of reciprocating engines was decided upon, although turbines had never been used before in cargo ships. The reason for selecting the turbine was that it is a better manufacturing proposition than the reciprocating engine, and for the same reason the water-tube boiler was given preference over the tubular boiler.

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Showing standard couplings and propeller mount assembled

Arrangements had been made which would result in the machinery being turned out quicker than the hulls. Altogether, 225,000 hp. would be required. An ultimate capacity of one 5000-ton ship every 2 days was being aimed at in the Newark yards, where twenty-eight ways have been established so far.

Man power, Mr. Sutphen said, was one of the vital things in the war, and it was a most fortunate thing that at the Newark yards each gang took great pride in its way and made every effort to excel the other gangs. The company would employ anybody who stood on two feet and was healthy, and would try him in six different departments before letting him go as unfit. They would teach him to drive rivets tight and to calk joints—just one detail—and it was remarkable the efficiency which was developed in a short time.

Some of the old iron shipbuilders had questioned the practicability of the new method, and all naturally wondered how it would work out—how the parts built in forty-six different shops would come through in the proper order and then fit together. After laying the first keel the plates began to come in, and they fitted together to a hair's breadth, although these plates had been cut in a shop 1000 miles distant from where the keels had been made.

Hearty Co-operation

In addition to the Newark yards, two other yards have been established and will soon be in full swing. The public realized we must have the ships, and the spirit which had come over the country was most encouraging to him and his associates. As their representatives were sent to different large manufacturers throughout the country they met with a cordial reception everywhere, and the general tone of the officials of these companies in negotiating with the representatives was: "The best that we have you can have."

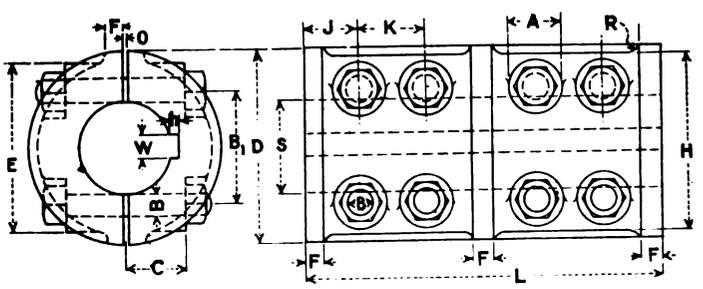
All of the talks were more or less informal, and there was no discussion. Later in the evening a number of reels of moving pictures were run off showing tests of the Class B motor truck and its engine, aviation activities behind the fighting front in France, activities in the U. S. Navy, and scenes in the building and testing of submarine chasers.

Irwin Chase, talking on standardization of motor-boat construction, said that prior to the building of 550 80-ft. submarine chasers it had always been considered impossible to standardize boats or their fittings. The order for this fleet of chasers made possible the first serious attempt at standardization.

In consequence of this work it is considered economical to standardize the shape of the hull and the lines as well as the various fittings. The advantage of standardizing lines was well brought out in these chasers. For example, it was not found necessary to make extensive tests with models, because of the known characteristics of the lines chosen. However, several models were towed as a check. Furthermore, the use of standardized lines required no experimenting to determine the power needed for certain speeds.

The standardization has been carried with great success even into the propeller field, propellers being designed of standardized size, shape, and section of blade. Although it is not possible to standardize fittings which shall be applicable to all boats, some fittings can be so standardized that they may be made to perform a number of functions. For example, shaft struts have been standardized so that it is no longer necessary to have lefts and rights.

The particular advantage of standardization becomes most apparent where a large number of boats are fabri-



SHAFT COUPLING

Coupling No.	Shaft Dia. S	Coupling Dimensions										Bolts			Keyway	
		D	F	H	L	J	K	C	O	R	A	No.	B	B-1	W	h
20M	1	2¾	¼	2	5	1 3/16	1	¾	⅛	⅛	⅞	8	⅝	1 1/32	¼	1/16
21M	1 1/16	2¾	¼	2	5	1 3/16	1	¾	⅛	⅛	⅞	8	11/16	1 1/32	¼	1/16
30M	1¼	3	5/16	2⅛	6	1 5/16	1 3/16	1 3/16	⅛	3/32	1 5/16	8	11/16	1 9/16	5/16	3/32
31M	1 3/16	3	5/16	2⅛	6	1 3/16	1 3/16	⅞	⅛	3/32	1 5/16	8	11/16	1 1 5/16	3/8	5/16
32M	1½	3⅜	5/16	2½	6	1 3/16	1¼	⅞	⅛	3/32	1 3/16	8	⅝	1⅞	⅜	5/16
33M	1 5/16	3½	5/16	2¾	7	1⅜	1½	1	⅛	3/32	1 3/16	8	⅝	2	5/16	3/32
40M	1¾	4	5/16	2⅞	7	1⅜	1½	1 3/16	⅛	3/32	1 3/16	8	15/16	2 5/16	5/16	3/32
41M	1⅞	4	5/16	3⅛	8	1 5/16	1⅝	1⅛	⅛	3/32	1 5/16	8	⅞	2⅜	½	¼
42M	2	4⅜	5/16	3⅜	8	1 5/16	1⅝	1 3/16	⅛	3/32	1 5/16	8	⅞	2½	½	¼
50M	2 1/16	5¼	5/16	3⅞	9	1 5/16	1⅞	1 5/16	⅛	3/32	1½	8	¾	2 13/16	5/16	3/32
51M	2½	5½	⅜	4¼	10	1 9/16	2⅛	1 5/16	⅛	5/16	1½	8	¾	3 1/16	⅜	5/16
60M	2¾	6	1 1/16	4⅝	11	1¾	2 5/16	1 5/16	⅛	⅜	1¾	8	⅞	3⅜	⅜	⅜
61M	3	6¼	¾	5	12	1 13/16	2½	1 1 1/16	5/16	⅜	1¾	8	⅞	3⅜	⅜	⅜
62M	3 1/16	6¾	1 1/16	5¾	12½	2 1/16	2 5/16	2 1/16	3/16	7/16	1¾	8	⅞	3⅜	⅜	3/16
70M	3½	7	⅞	6	14	2¼	3 11/16	2⅜	3/16	7/16	2	8	1	4¼	1 5/16	1 5/32
80M	4	8¼	⅞	6¾	18	2⅞	2⅞	2⅞	¼	½	2	12	1	4¾	1	½

Dimensions given in inches. Bolts are S. A. E. Standard.
NOTE: The material for these couplings shall be manganese bronze conforming to S. A. E. specification No. 29. For low horsepower or two cycle engines, the material may be cast iron.

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cated in one place and the assembly work is carried on elsewhere. Such manufacturing methods require interchangeability, not only of the fittings but of the hull and all its various parts, including the frames, keels, planking and trim.

There is one important disadvantage connected with standardization, viz., the danger of slight mistakes, which, in the case of quantity production, quite obviously are multiplied by the number of boats built. Furthermore, with standardization carried to a high degree, it is impossible to make slight changes in the middle of a job.

Interchangeability has been found of tremendous advantage with these 550 chasers in service abroad. It has facilitated replacement of parts and greatly simplified repair work.

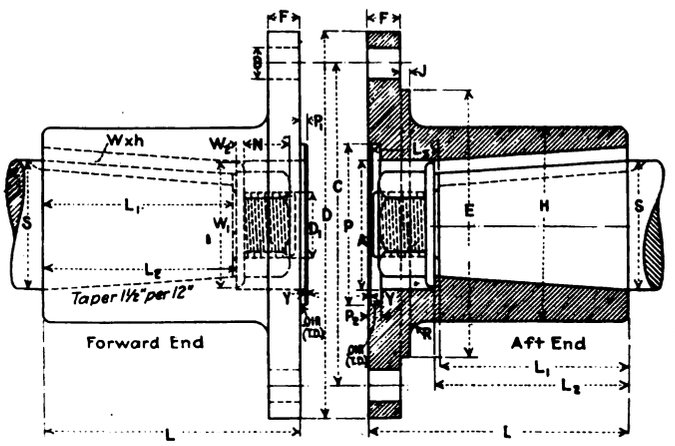
The greatest need at the present moment, from the viewpoint of the designer, is for standard specifications of materials. At present much time is consumed and a handicap imposed on designers by the necessity for drawing up individual specfications for many of the materials used.

W. S. Howard, a member of the marine division of the S. A. E. Standards Committee, spoke on "Standards." The Division had a meeting on Friday afternoon, at which the standardization work so far accomplished by the S. A. E. in this particular branch of the automotive industry was reviewed. He pointed out the difference between specialization and standardization, which is often lost sight of. Reducing the number of models turned out by a manufacturer is not standardization, but rather specialization.

How Standardization Began

The advantage of standardization to an industry, Mr. Howard said, was clearly shown by the progress made by the automobile industry. Standardization began with screw threads. Early in the history of the automobile it was found that the old U. S. S. standard screw thread was unsuitable, and that finer pitches were required. Progressive manufacturers began to develop their own fine pitches. This led to chaos, and so an attempt was made, and successfully carried through, to develop a new fine-thread screw standard, known as the A. L. A. M. standard. This was practically the beginning of the standardization work which was carried on first by the A. L. A. M. Mechanical Branch and then by the S. A. E.

About 2 years ago last November Mr. Howard said he sent a circular letter to a large number of engine and boat manufacturers urging them to organize for the purpose of standardization. A meeting was finally arranged to be held at the time of the motor-boat show, with the co-operation of the National Engine and Boat Manufacturers' Association. Among the representatives of firms of the latter association present at the meeting were Messrs. Sutphen, Van Blerck, Clayton, Milbrath, Riotti, Tuttle and Howard. Another meeting was held early in the season, and those in attendance remained in session from 10 a. m. to 4 p. m. One of the first things that was done was to go over the standards which had been established by the S. A. E. for automobile work and pick out those which were suitable for marine practice. In this way a list of thirty-odd standards were selected. Plans were also laid for the future work of the division, it being decided to consider first of all the subjects of batteries, shaft couplings, en-



REVERSE COUPLING (Steel)

No.	Shaft		Flange Dimensions						Bolts			
	S	L-1	D	E	F	H	J	L	L-2	B	No.	C
40S	1	1 3/16	4	2 13/32	3/8	1 7/8	1/16	2 1/2	1 7/8	3/8	4	3
41S	1 1/8	1 3/16	4	2 13/32	3/8	1 7/8	1/16	2 1/2	1 7/8	3/8	4	3
50S	1 1/4	2 5/16	5	3 1 1/32	3/16	2 3/8	3/32	3	2 1/4	1/16	6	4
51S	1 3/8	2 5/16	5	3 1 1/32	3/16	2 3/8	3/32	3	2 1/4	1/16	6	4
52S	1 1/2	2 5/16	5	3 1 1/32	3/16	2 3/8	3/32	3	2 1/4	1/16	6	4
53S	1 5/8	2 5/16	5	3 1 1/32	3/16	2 3/8	3/32	3	2 1/4	1/16	6	4
60S	1 3/4	2 1/16	6	4 1/16	1/2	3	1/8	4	3	5/16	6	5
61S	1 7/8	2 1/16	6	4 1/16	1/2	3	1/8	4	3	5/16	6	5
62S	2	2 1/16	6	4 1/16	1/2	3	1/8	4	3	5/16	6	5
70S	2 1/4	3 1/16	7	4 1/2	5/8	3 1/4	1/8	5	3 1/8	3/8	6	5 1/2
71S	2 1/2	3 1/16	7	4 1/2	5/8	3 3/4	1/8	5	3 1/8	3/8	6	5 1/2
80S	2 3/4	4 1/8	8	5 3/8	3/4	4 3/8	1/8	5 1/2	4 1/4	3/4	6	6 1/2
81S	3	4 1/8	8	5 3/8	3/4	4 3/8	1/8	6	4 3/4	3/4	6	6 1/2
90S	3 1/4	5 3/16	9	6 1/16	7/8	5	1/16	7	5 1/8	1/8	6	7 1/8
91S	3 1/2	5 3/16	9	6 1/16	7/8	5	1/16	7	5 1/8	1/8	6	7 1/8
100S	4	6 1/4	10	6 1/2	1	6	1/16	8	6 1/2	1	6	8

No.					Nut				Washer			Keyway		
	P	Y	P-1	P-2	D-1	L-3	N	Thds.	W-1	W-2	A	W	h	R
40S	1 3/8	1/64	1/16	1/8	9/16	5/8	3/16	18	1 3/16	1/8	1 3/8	1/4	1/8	3/16
41S	1 3/8	1/64	1/16	1/8	9/16	5/8	3/16	18	1 3/16	1/8	1 3/8	1/4	1/8	3/16
50S	2	1/32	1/8	3/16	3/4	3/4	1/16	16	1 5/16	1/8	1 3/4	5/16	5/32	5/32
51S	2	1/32	1/8	3/16	3/4	3/4	1/16	16	1 5/16	1/8	1 3/4	3/8	3/16	5/32
52S	2	1/32	1/8	3/16	3/4	3/4	1/16	16	1 5/16	1/8	1 3/4	3/8	3/16	5/32
53S	2	1/32	1/8	3/16	3/4	3/4	1/16	16	1 5/16	1/8	1 3/4	3/8	3/16	5/32
60S	2 1/2	1/32	1/8	3/16	1	1	1/4	14	1 1 5/16	1/8	2 3/16	3/16	3/32	1/4
61S	2 1/2	1/32	1/8	3/16	1	1	1/4	14	1 1 5/16	1/8	2 3/16	1/2	1/4	1/4
62S	2 1/2	1/32	1/8	3/16	1	1	1/4	14	1 1 5/16	1/8	2 3/16	1/2	1/4	1/4
70S	3	1/32	3/16	1/4	1 1/8	1 1/8	1 3/16	12	2 3/16	3/16	2 1/2	9/16	9/32	5/16
71S	3	1/32	3/16	1/4	1 1/8	1 1/8	1 3/16	12	2 3/16	3/16	2 1/2	3/8	5/16	5/16
80S	3 3/4	3/64	1/4	5/16	1 3/8	1 1/4	3/8	12	2 1 5/16	1/4	3	3/4	3/8	3/8
81S	3 3/4	3/64	1/4	5/16	1 3/8	1 1/4	3/8	12	2 1 5/16	1/4	3	3/4	3/8	3/8
90S	4 3/4	3/64	1/4	5/16	1 1/2	1 3/8	3/8	12	3 3/16	1/4	3 3/4	3/8	3/16	3/16
91S	4 3/4	3/64	1/4	5/16	1 3/4	1 3/8	3/8	12	3 3/16	1/4	3 3/4	1 3/16	1 3/32	3/16
100S	5	3/64	5/16	3/8	2	1 1/2	1 5/16	12	3 1 5/16	5/16	4 1/4	1	1/2	1/2

Nuts, Nos. 90 and 91 from 2¾ in. hex. stock. Nut No. 100 from 3-in. hex. stock. Dimensions given in inches.
(T. D.) Tooling dimensions.

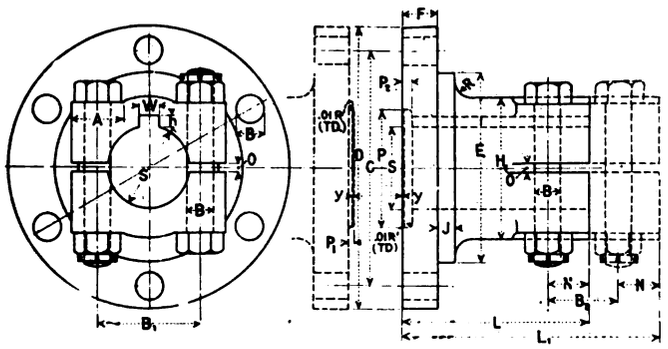
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gine couplings, reverse couplings and propeller mounts.

Mr. Howard then outlined the underlying thoughts which led to the formulation of the standards herewith reproduced, which were accepted by the Standards Committee at its last meeting. One difficulty that was encountered was due to the fact that some of the smaller boat builders do not appear to be quite ready for standardization. In the case of propeller shafts, for instance, it has been their custom to order the shafts a little long and then to cut them off to suit. Therefore, tapered seats cannot be turned on the shaft at the factory, and inasmuch as the boat builders have not the necessary equipment for turning such tapered seats there has been some opposition to the adoption of this standard. This difficulty was met by making a straight seat optional. Mr. Howard further pointed out that all the standards so far adopted had been submitted to interested Government departments, and had met with their full approval.

The division next will take up the subjects of batteries and engine supporting arms.

A. P. Lundin, who has been devoting his efforts for many years to the development of lifeboats, was slated to talk on the subject of fitting power boats to transports. Mr. Lundin said that the average man did not realize the great difficulties connected with the problem of transporting our army and all the necessary supplies abroad. Most people regarded the design of such boats as a very simple matter, chiefly "because you really never intend to use them." He started out some years ago with a model of a new type of lifeboat which he showed to shipbuilders in different parts of the country. They were all very much interested, but when they learned that the cost of this boat would be from three to four times as much as the equipment they were then providing their interest lagged. Looking at the financial side of the matter, Mr. Lundin wanted to know whether any one in the audience had ever heard of a builder of lifeboats, either in this country or abroad, who had become rich. It was his positive conviction that there were none. He said that the subject of lifeboats and life rafts had not received the consideration they deserved. Even among seafaring men there were as many ideas regarding the proper construction of lifeboats as there were stars in the sky. Besides the construction of the boat there is the problem of the proper placing on the ship and of properly daviting them. When he first went to sea he remembered an instance where it took a whole day to get a single boat into the water, it being frozen tight and the davits too short. Just to show how little attention was being given to the subject, he mentioned that some years ago, when a law was passed that all ships should have sufficient lifeboats to accommodate everybody on board, pontoon boats were adopted, made up of metal tanks and canvas, but they were entirely too flimsy. In his construction another boat was placed on top of a pontoon. It was only necessary to launch the other boat and to release the pontoon or raft, which, if the ship sank, would float away. One of the difficulties of the ordinary lifeboat is that it capsizes easily, and if it is then righted again it is half full of water, which makes it very unstable.



Reverse Coupling (Cast Iron for Low Horsepower)

Coupling No.	Shaft Dia. S	Flange Dimensions (Continued)									
		A	B_2	D	E	F	H	J	L	L_1	N
40C	⅜	¾		4	2 1⅜₃₂	½	2	⅛	2		⅝
41C	⅜	⅜		4	2 1⅜₃₂	½	2	⅛	2		⅝
42C	1	⅜		4	2 1½₃₂	½	2	⅛	2		⅝
50C	1⅛	⅜		5	3 1½₃₂	⅝	2½	5⁄16	2½		¾
51C	1¼	⅜		5	3 1½₃₂	⅝	2½	5⁄16	2½		¾
52C	1⅜	⅜		5	3 1½₃₂	⅝	2½	5⁄16	2½		¾
60C	1½	1⅛	1½	6	4 1⅛₁₆	¾	3	⅜		4	⅞
61C	1⅝	1⅛	1½	6	4 1⅛₁₆	¾	3	⅜		4	⅞
62C	1¾	1⅛	1½	6	4 1⅛₁₆	¾	3	⅜		4	⅞
70C	1⅞	1⅛	2	7	4 1½	1 5⁄16	4	7⁄16		5	1
71C	2	1⅛	2	7	4 1½	1 5⁄16	4	7⁄16		5	1
80C	2¼	1½	2½	8	5⅜	1⅛	4¾	½		6	1⅛
81C	2½	1½	2½	8	5⅜	1⅛	4¾	½		6	1⅛
90C	2¾	1⅝	3	9	6 1⅛₁₆	1⅛	5¾	⅝		7	1¼
91C	3	1⅝	3	9	6 1⅛₁₆	1⅛	5¾	⅝		7	1¼

Coupling No.	Flange Dimensions						Bolts				Keyway	
	O	P	P_1	P_2	R	Y	No.	B	B_1	C	W	h
40C	⅛	1⅜	1⁄16	⅛	¼	1⁄64	4	⅜	1 3⁄16	3	3⁄16	3⁄32
41C	⅛	1⅜	1⁄16	⅛	¼	1⁄64	4	⅜	1 3⁄16	3	3⁄16	3⁄32
42C	⅛	1⅜	1⁄16	⅛	¼	1⁄64	4	⅜	1 9⁄32	3	¼	⅛
50C	1⁄32	2	⅛	5⁄16	5⁄16	1⁄32	6	7⁄16	1 15⁄32	4	¼	⅛
51C	1⁄32	2	⅛	5⁄16	5⁄16	1⁄32	6	7⁄16	1 5⁄16	4	5⁄16	5⁄32
52C	1⁄32	2	⅛	5⁄16	5⁄16	1⁄32	6	7⁄16	1 11⁄16	4	5⁄16	5⁄32
60C	3⁄16	2½	⅛	5⁄16	⅜	1⁄32	6	9⁄16	1 13⁄16	5	⅜	3⁄16
61C	3⁄16	2½	⅛	5⁄16	⅜	1⁄32	6	9⁄16	2 1⁄16	5	3⁄16	3⁄32
62C	3⁄16	2½	⅛	5⁄16	⅜	1⁄32	6	9⁄16	2 3⁄16	5	3⁄16	3⁄32
70C	3⁄16	3	3⁄16	¼	7⁄16	1⁄32	6	⅝	2⅜	5½	½	¼
71C	3⁄16	3	3⁄16	¼	7⁄16	1⁄32	6	⅝	2½	5½	½	¼
80C	¼	3¾	¼	5⁄16	½	3⁄64	6	¾	2 13⁄16	6½	5⁄16	5⁄32
81C	¼	3¾	¼	5⁄16	½	3⁄64	6	¾	3 1⁄16	6½	⅜	5⁄16
90C	5⁄16	4⅜	¼	5⁄16	⅝	3⁄64	6	⅞	3⅜	7⅜	⅜	⅜
91C	5⁄16	4⅜	¼	5⁄16	⅝	3⁄64	6	⅞	3⅜	7⅜	⅜	⅜

(T.D.) Tooling dimensions.

Motor Life Boats

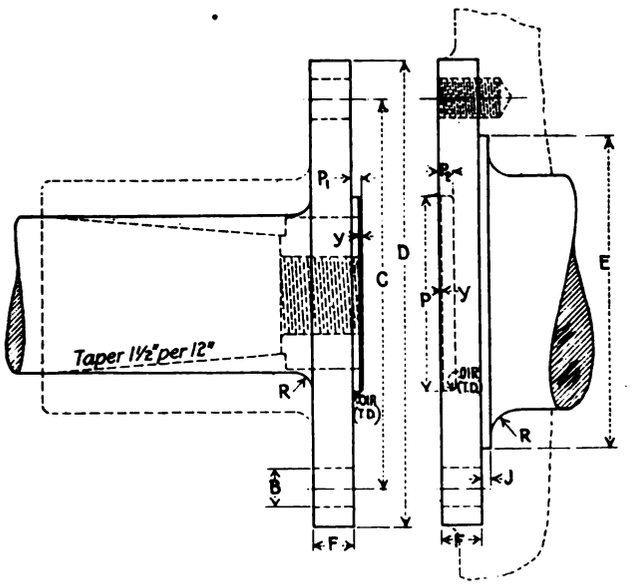
In Mr. Lundin's opinion it is strange that motor-propelled lifeboats did not come into general use long ago. His only explanation was that men in general were slow to adopt innovations. In his opinion a motor-propelled lifeboat was as far ahead of the ordinary lifeboat as a motor truck is ahead of a

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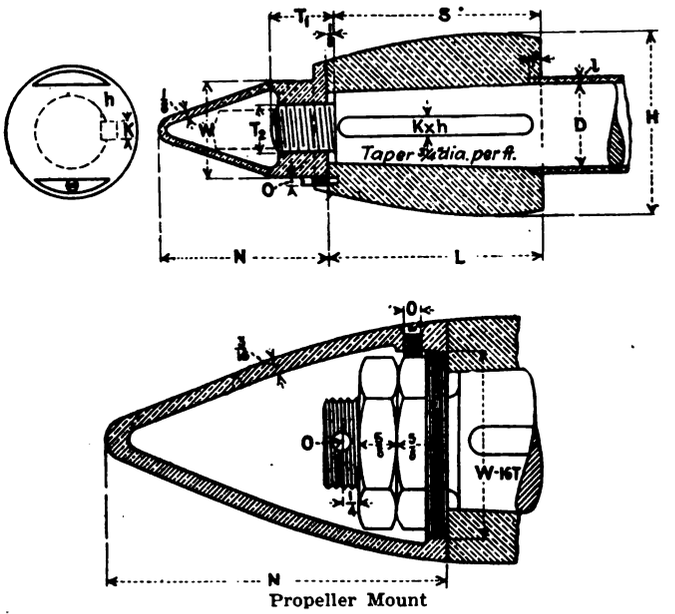
ENGINE COUPLING (Steel)

Coupling No.	Flange Dimensions									Bolts			
	D	F	P	P-1	P-2	Y	E	J	R	No.	C	(Bolt Dia.) B	Tapped* Holes
4	4	⅜	1⅜	1/16	⅛	3/64	2 1/32	⅛	5/16	4	3	⅜	24
5	5	5/16	2	⅛	5/16	1/32	3 1/32	5/16	5/16	6	4	5/16	20
6	6	½	2½	⅛	5/16	1/32	4 1/16	¼	¼	6	5	5/16	18
7	7	⅝	3	5/16	¼	1/32	4½	5/16	5/16	6	5½	⅝	18
8	8	⅝	3⅜	5/16	¼	1/32	5⅝	⅜	⅜	6	6½	⅜	16
9	9	⅞	4⅜	¼	5/16	3/64	6 1/16	⅜	5/16	6	7⅜	⅞	14
10	10	1	5	5/16	⅜	3/64	6½	½	½	6	8	1	14

Dimensions given in inches. *Threads, U. S. forms.
NOTE—The male flange, when integral with engine shaft, is shown in full lines in the cut. When separate, the shaft taper and dimensions are the same as for Steel Reverse Couplings of the corresponding size.
*The female flange, when designed as shown by full lines in cut, will have drilled bolt holes. When designed integral with reverse parts as shown by dotted lines, they will be drilled and tapped for S. A. E. Standard bolts.
(T. D.) Tooling dimensions.



Engine Coupling (Steel)



Propeller Mount

forty to sixty people, and double that number in emergency. Engines should be of the heavy-duty type, of about 24 hp., and the tankage should be such as to provide a cruising radius of 200-300 miles at 6 to 7 m.p.h. Speed is not an important consideration, but substantial construction is. The engine should be encased in a steel trunk, so as to be fully protected from the water. Such lifeboats would cost much more than is now spent for the purpose, but think of the advantage of making adequate provision for saving the lives of the most valuable people we have—captains, officers, sailors and soldiers. He had observed people having relatives in the Army and had noted that many were much more concerned regarding the dangers afloat than the dangers of the trenches.

wheelbarrow. A real lifeboat ought to be built on the principle of Noah's ark. If the ship sinks, all you have to do is to get into the ark and close the door behind you. Noah, unfortunately, was unable to secure a motor for his ark, otherwise he probably would not have been hung up on the mountain peak where he landed.

Quite a number of motor lifeboats have been built for the transport fleet. In Mr. Lundin's opinion not only every transport steamer, but also every cargo ship, should have at least one motor lifeboat, especially under present conditions of navigation on the Atlantic. If this practice were followed not only would more people be safe when a ship sank, but the danger of getting lost on the ocean would be greatly reduced. With one motor lifeboat it would be much easier to keep the rest of the boats together, and also sufficient provisions could be carried for the whole crew. Also if any one got sick he could be taken into the motor lifeboat, where he would be better protected from the elements. For cargo boats, Mr. Lundin recommends lifeboats 28 to 30 ft. in length, with a capacity for carrying

PROPELLER MOUNT

D	H	L	N	S	T1	T2	Thds.	K	h	f	W	l	o	D1
* ⅜	1½	2¼	1½	2⅛	1	½	13	5/16	3/32	⅛	⅜	3/32	5/16	.629
* ⅞	1¾	2⅝	1⅝	2½	1	⅝	11	5/16	3/32	⅛	3 1/32	5/16	.711
*1	2	3	2	2⅞	1	⅝	11	¼	⅛	5/16	1 1/16	3/32	5/16	.813
1⅛	2¼	3⅜	2⅛	3⅛	1⅛	¾	10	¼	⅛	5/16	1¼	3/32	5/16	.914
1¼	2½	3¾	2½	3⅜	1¼	¾	10	5/16	5/32	5/16	1 5/16	3/32	5/16	1.016
1⅜	2¾	4⅛	2⅝	4	1¼	⅞	9	5/16	5/16	¼	1⅜	⅛	5/16	1.117
1½	3	4½	3	4⅜	1½	1	8	⅜	5/16	¼	1⅜	⅛	5/16	1.219
1¾	3½	5¼	3½	5⅛	1¼	1	8	5/16	3/32	5/16	2	⅛	¼	1.422
2	4	6	4	5⅞	1⅜	1⅛	7	½	¼	5/16	2 5/16	5/32	¼	1.625
2¼	4½	6¾	4½	6⅝	1⅝	1⅜	6	5/16	5/32	⅜	2 5/16	5/32	5/16	1.829
2½	5	7½	5	7⅜	1⅞	1½	6	⅝	5/16	5/16	2¾	5/32	⅜	2.031
2¾	5½	8¼	5½	8⅛	1⅞	1¾	5	¾	⅜	5/16	3⅛	5/16	⅜	2.234
3	6	9	6	8⅞	2	2	4½	¾	⅜	½	3½	5/16	⅜	2.436
†3½	7	10½	7	10¼	2½	2	4½	1 5/16	1 5/32	½	3⅝	¼	⅜	2.844
†4	8	12	8	11⅜	2½	2	4½	⅞	5/16	½	3¾	5/16	⅜	3.250

NOTE: All hubs bored small end (D-1) dimensions.
*¾ in., ⅞ in., 1 in. shaft nuts cast solid and drill hollow.
†See note on drawing.
NOTE: When shaft and propeller hub are bronze for use in salt water, the propeller hub key, set screw (0)-shaft-nuts, and fairwater assembly should also be bronze.
NOTE: The bronze for these parts having the following physical properties is recommended for use:
Tensile strength, 60,000 lbs. per sq. in.
Elongation, 28% in 2 inches.
The chemical properties of a bronze which conforms approximately is as follows:
Copper, 62%
Tin, 1%
Spelter, 37%
This is similar to the bronze known by the trade name of Tobin.

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Specifications for Class B Chassis Assemblies

1. **Trucks**—All trucks furnished under these specifications must be assembled complete by the chassis builder, to drawings and parts list furnished by the Motor Transport Section, O. Q. M. G. This will include bodies, tires, tools, spare parts and all equipment specified in parts list. All assembled units must bear the approval mark of the inspector before it is mounted in place.

2. **Front Axle**—Spring seats must be properly centered on axles, and all spring leaves must be in proper alignment. Spring clips must be tight. All spring bolts must be securely locked to prevent them from turning in the spring shackles, and must be lubricated before being set. All nuts must be drawn up tight and locked as specified by drawing. All rebound clips must be in place. Front springs must be assembled with long end to the rear.

3. Wheel bearings must be greased and kept covered until ready to mount wheels.

4. **Rear Axle**—The spring pins and bolts must be well lubricated during assembly and all nuts locked as per drawing. Spring clips must be tight. It is important that the springs be properly seated on the axle and rebound clips must be in place.

5. Housing shall contain the proper amount of lubricant and not leak at any place. Hub bolts shall be drawn tight.

6. **Engine.**—All bolts holding engine to frame must be tight and nuts locked as per drawing. Gasoline line and connections are to be free from all leaks. All wiring connections must be tight to insure proper contact. Spark control rods are to be adjusted and of such length that the full advance and retard of spark can be obtained by the lever on the steering column. All connections are to be oiled. Throttle control rods must be adjusted so that the full throttle opening may be obtained by both hand and foot throttle. The foot accelerator pedal must be far enough adjusted to give the full opening of throttle. All control rods must operate freely.

7. Intake manifold gaskets shall not leak and must be shellaced in place. All manifold nuts must be tight.

8. Valve tappets must be set to standard openings: Inlet, .003 to .006; exhaust, .005 to .008.

9. No oil leaks will be permitted in any part of the engine. The crank case shall be thoroughly inspected for oil leaks after road test while engine is running.

10. The radiator and water connections must not leak after road test with the engine running.

11. **Clutch Mounting**—The clutch must engage gently but shall not slip under full load. Adjusting nuts and springs must be tight and locked. Clutch and foot-brake pedals must be in center of floorboard slots. Pedal shaft is not to bind and all connecting link pins are to be a proper fit. All connections and bushings are to be lubricated. The front propeller shaft must run true between centers and be properly lubricated.

12. Particular care must be taken in the assembling of annular bearings that the pressing force is not transmitted through the balls nor races injured.

13. **Transmission**—Transmission must be in proper alignment. Transmission case shall not be damaged or strained by assembling. All bolts holding transmission to frame must be tight with nuts locked as per drawing.

14. Shifting rods must be properly connected and pins must be cottered and oiled. The transmission must contain the proper amount of lubricant and gears are to shift easily. The case shall not leak at any point, with special attention to glands.

15. **Drive Shaft**—Drive shaft must run true between centers. Universal joints must be properly lubricated.

16. **Brakes and Brake Rods**—All yoke pins must be lubricated when assembled and must be cottered. Lock nuts at turnbuckles must be tight. Rods must have the proper length of thread for adjustment. All equalizer bars must work properly and all pin connections free. Brake bands must be concentric with brake drum. Brake lining must have a good surface and touch drum at all points. Lining must not be ruffed up when wheels are mounted. All linkage must be well lubricated in order to have free action and prevent any dragging of brakes. Brake equalizer must be adjusted properly. Foot-brake pedal must be .. inches from dash when wheels are locked and .. inches when brake is off. Hand-brake lever must pull .. notches when wheels are locked.

17. **Wheels**—All wheel bearings must be loose enough to allow wheel to revolve freely, but must be tight enough to prevent any wabbling or side motion. Bearings and hubs must be packed with specified grease. Hub caps must be tight. Front wheel caps must be packed with grease. Bolts in driving flange of rear wheel must be tight with nuts locked.

18. **Radiator**—The radiator must be perpendicular to the frame at proper distance from dash line. Fan must clear radiator at all points. All water connections must be free from leaks with hose clamps tight and in place. Brace rod from dash to radiator and radiator hold down bolts must be secure and properly locked.

19. The radiator guard must be perpendicular to frame at the proper distance from radiator with all bolts tight.

20. **Dash**—The dash must be set at the dash line perpendicular to frame. All bolts must be tight and locked as specified.

21. Side lamps must be securely fastened to dash, completely connected and in operating condition.

22. Floorboards must be properly fitted to dash so that all openings come in the proper place.

23. **Seat**—The seat must be securely fastened to frame so that it does not interfere with the operation of any part.

24. **Hood**—The hood must be a good fit at both dash and radiator. Hood clamps must be in the proper place and shall grip hood securely to prevent rattling.

25. **Steering Gear**—All steering post bolts must be tight and dash brace must clamp and hold it securely. All steering connections must be lubricated during assembly and securely fastened and locked.

26. Front wheels must be lined up and have the same amount of throw each way. Steering pivots must be tight fit and properly lubricated. Steering wheel must be securely fastened to column. Steering arms shall not interfere with axle at any point. All connections must be packed in grease and covered by leather boots.

27. **Fuel Tank**—The tank straps must be very tight to insure tank against any vibration. Tank must fit dash properly and must not leak.

28. **Bumper, Tow Hooks, Etc.**—Bumpers must be in place with springs at proper compression. All nuts must be locked.

29. Tow hooks must be tight with nuts locked.

30. Fenders must be free from vibration and tightly bolted in place.

31. **Electrical Equipment**—All connections must be properly made and all contacts free from dust. Wiring shall be made in such a manner as to make a short circuit impossible.

32. The battery must be securely fastened to its support and filled with the proper amount of electrolyte of the proper gravity.

33. Ammeter on dash must show 7 to 8 ampere charge.

34. The lighting and ignition switch must operate properly.

35. Dash lights must be properly connected and operate properly.

36. Tail light must be securely fastened to bracket and operate properly.

37. **Muffler and Exhaust Pipe**—The muffler must be securely fastened to frame by brackets.

38. Exhaust pipe joints at muffler and

(*Continued on page* 285)

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The Technical History of the Airplane*

Three Classes of Flying Machines Possible, but the Airplane the Only One Which Has Reached a Practical State—How the Various Elements of the Airplane Have Been Gradually Developed

By Capt. F. M. Green

THE history and development of mechanical flight may be confined almost entirely to the present century. In the last century some success had been achieved in gliding flight, model aeroplanes had been made and flown, and at least two man-carrying aeroplanes had actually left the ground, but it was not until the year 1903 that the Wright Bros., having ended a painstaking research in gliding flight, earned for themselves the honor of being the first men to fly.

Directly the success of the Wright Bros. became known, or rather when people began to believe that what the Wright Bros. claimed was actually true, the development of flying became rapid in the extreme.

Directly mechanical flight was possible, full scale experiments were carried out, often at the risk of the life of the experimenter, and the more obvious problems became apparent. In the short space of 14 years our scientific knowledge of aeronautics compares very favorably with the world-old science of navigation of the sea.

It is the intention of this paper to discuss the progress that has been made in dynamic flight and to consider the chief factors that have made this progress possible. An attempt will be made to state in a general way the standard of development as it exists to-day, and to consider the possible direction of progress in the future.

Definition

The flying machine is an apparatus in which an arrangement of surfaces is moved in such a way that the reaction of the air provides a vertical component of the force on the surfaces equal to the weight of the apparatus. An aeroplane, as we know it, has its supporting surfaces fixed relative to itself and is driven forward by the reaction of one or more airscrews.

Besides an aeroplane, two other sorts of flying machines have offered possibilities to the inventor. One is known as the Helicopter, in which the lifting surfaces are revolved in a horizontal plane. The second is called an Ornithopter, and in this the supporting surfaces are moved in a way to imitate a bird flapping its wings. Although both these types are conceivably possible, their usefulness and practicability appear doubtful and it is only proposed in this paper to consider the aeroplane as we know it.

Aeroplane Performance

Nowadays we make careful measurements of the characteristics of each new aeroplane at various heights, and the word "performance" is used to refer to the speed, rate of climb, and load carried. A good performance is one of the important essentials of usefulness of an aeroplane, and we will now consider the factors that have enabled us to improve so much on the early aeroplanes.

There are four main factors that govern the performance of an aeroplane. They are: I. The wing surface that supports the weight. II. The total weight supported in flight. III. The resistance of the aeroplane to forward motion. IV. The thrust available from the airscrew or airscrews.

These factors are very intimately connected, and each in turn will be considered, its effects discussed, and the possibility of improvement outlined.

*Lecture delivered before the Aeronautical Society of Great Britain.

As to the wings, it is necessary to know how to express the value of any particular arrangement of surfaces. The result at which to aim is to obtain the maximum vertical reaction or lift for the minimum horizontal reaction or drag. The term lift-drag ratio is, therefore, a measure of the effectiveness of a plane. Another attribute is, however, desirable, viz., that the lift per square foot of plane shall be high, so that as little surface as possible need be used for a given minimum speed of flight.

Planes vary in curve, plan form, and arrangement and number of surfaces. The designer will vary these factors according to the sort of aeroplane he wishes to make.

Wing Section

The Wright Bros. did not know if they would be able to fly at all. They chose deeply cambered wing sections so that the maximum lift could be obtained at the minimum speed. The lift-drag ratio of their planes was probably about 12 to 1, very much better than still earlier experimenters could obtain with flat planes. Present-day wing sections enable us to get a lift-drag ratio of 17 to 18, while model tests have shown as good a ratio as 23.

For a given minimum speed we need more surface to support a given weight than with a more cambered plane with a worse lift-drag ratio. It would be an advantage if we could vary the camber of a plane to suit the speed, and many attempts to do this on an aeroplane in flight have been made. Unfortunately, apart from increased complication, the increased weight is likely to cause greater loss than gain.

Shortly before the war an experimental aeroplane was made at the Royal Aircraft Factory, which was fitted with wing flaps nearly the whole length of the plane. These flaps could either be turned down for low speed, or up for high speed, or they could be used differentially for balancing. It was, in fact, rather a crude way of varying camber. Although it achieved the distinction of being possibly the fastest aeroplane of the day, it was eventually considered that the extra weight and complication did not justify the device.

From many considerations it appears that much improvement in lift-drag ratio is unlikely, but when the speed of aeroplanes becomes very much greater than it is to-day, it is quite possible that some device for changing the section of a plane during flight will be found necessary to obtain a reasonably slow landing speed.

Plan Form

Planes are generally made nearly rectangular in plan but with the ends more or less rounded. The ratio of span to chord is called aspect ratio and the higher this is made the better will be the lift-drag ratio. Here, again, it is necessary to compromise, as the bigger the span of the aeroplane the heavier will be the wings, the greater the resistance of the necessary bracing and the rapidity of the maneuvering of the whole aeroplane will be decreased. From practical consideration, therefore, the aspect ratio of an aeroplane is generally from 5 to 8; recently some large aeroplanes have gone considerably beyond this figure, but it is very doubtful if anything has been gained.

Little is known as to the effect of using planes other than roughly rectangular, but it is not very likely that much improvement will be found with planes of other shapes.

The original aeroplane of the Wright Bros. was a biplane,

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consisting of two planes separated by about the width of the chord. Shortly after, monoplanes, triplanes and quadruplanes were made and flown. It is fairly certain that the most efficient plane is the monoplane, for there is no possibility of interference of the planes as there is on the multiplane. A biplane, however, is probably only a little worse than the monoplane, while a triplane is a little worse than a biplane and so on. Structurally, the biplane is very much easier to make than the monoplane and, owing to this, the biplane construction has been almost universally adopted. Triplanes and quadruplanes have not had very much success, although it is quite possible that for very large aeroplanes the advantages gained in construction may outweigh the disadvantages of their somewhat low effectiveness.

From time to time suggestions have also been made that the amount of wing surfaces should be varied. This again is a complicated thing to do, and with modern wing sections there is practically never any gain in reducing wing surface; in fact, most aeroplanes would fly faster and not slower by having more surface if such surface could be introduced without extra weight or external resistance. This applies particularly to flying at heights.

Weight

The total weight that is carried on an aeroplane is obviously all-important, and it will, therefore, be useful to see what prospects we have of decreasing the weight of aeroplanes of any given type. We will divide the aeroplane into the following components: (1) Useful load; (2) motor unit; (3) fuel, oil and tanks; (4) remainder, being aeroplane parts proper.

For the purpose of general analysis it is assumed that the motors consume the same amount of gasoline per b.hp. per hour and the figure 0.7 lb. per hp. hour is sufficiently accurate to cover the weight of fuel, oil, tanks and pipes. There are, of course, engines which do better than this, and many which do considerably worse. It is, however, a fairly good average.

Analyzing a number of aeroplanes that have been used under active service conditions, it has been found that, apart from the useful load, the motor unit, and the gasoline, oil and tanks—the remainder representing the aeroplane proper—is very nearly one-third of the whole weight—32 per cent being rather nearer. This weight includes the wing structure complete, the body complete with its fairing, floor, seats, controls, instruments, etc., the tail plane, elevator, rudder and fin, and the landing gear and tail skid. This weight is on the average made up as follows:

	Percentage of aeroplane parts, Per cent	Of total weight, Per cent
Wing structure complete	41	13
Body complete	41	13
Tail plane, elevator, rudder and fin	6	2
Landing gear	12	4

If we take 32 per cent as the weight of the aeroplane proper we have the balance of 68 per cent to divide up among the motor unit and its fuel and the useful load.

We have now only to decide what percentage of useful load we shall carry, and for what time it is to be carried, and we can find at once the weight per horsepower of the complete machine. We shall see that from the figure of pounds per horsepower of the loaded aeroplane we can get a very good idea of its probable performance.

Possibilities of Reduction of Weight

The weights of the aeroplane parts have now been fined down to a considerable extent and except for the use of the newer materials, progress in saving weight is not likely to be very pronounced. Undoubtedly as time goes on we shall learn to make equally strong structures for less weight and the development of aluminum alloys and pressed metal construction may help to a marked extent. At the present moment wood is used very largely in the construction of both the bodies and wings. To a great extent this is due to war urgency, and no doubt aeroplanes of the future will be made of more durable materials.

The chief particular in which it is probable that weight will be reduced is in the weight per horsepower of the motor. Although progress in this respect has been remarkable, it is probable that we have not nearly reached the limit of weight in internal-combustion motors. At the present day the complete motor unit, i.e., the motor itself, the airscrew, water and radiator if water-cooled, exhaust pipes, and so on, weighs generally from 3 to 4 lb. per horsepower. Certain very light motors have been made in which the weight is very little more than 2 lb. per horsepower. It is quite conceivable that in the next few years motor units of 1½ lb. per horsepower will be available, and in all possibility with the improvement in material will enable us to make motor units weighing not more than 1 lb. per horsepower in the more distant future.

With regard to fuel consumption the best gasoline motors have a brake thermal efficiency of about 30 per cent. It may be this will be improved, and here again saving of weight may be effected.

The only motive power used to-day is supplied by internal-combustion engines. Some day no doubt a lighter form of motive power will be developed, and it is in this respect that the most startling progress may be expected.

Resistance of the Aeroplane to Forward Movement

The resistance of the aeroplane is made up of two factors. The first is the resistance of the main planes. The second is made up of the resistance of the body, the struts, wires and fittings of the wings, the landing gear, tail plane, rudder and so forth. These can all be grouped together under the general term of body resistance. It is in respect to the reduction of this resistance more than anything else that the modern-day aeroplane owes its superiority over that of the original Wright machine.

The first man who seems to have understood the importance of reduction of resistance was the late Edouard Nieuport, who in 1909 produced an aeroplane with a very fat body which almost completely inclosed the pilot and succeeded in making a big improvement in speed on an aeroplane of comparative small power. Since that day all modern aeroplanes have been inclosed as completely as the requirements of the pilot's view allows.

Details of Resistance

The resistance of the external parts of the aeroplane has now been fined down to a considerable extent. The various components of the aeroplane will generally be found to have the following proportional resistances:

	Per cent
Body	62
Landing gear	16
Tail plane, fin, rudder and elevator	7
Wires, struts and fittings of the wing structure	15

It will be noted that by far the larger part of this resistance is made up of the body itself. A large part of the body resistance, however, is really used in providing cooling for the engine, whether it is an air-cooled or water-cooled engine. Whether the radiator is let into the body or is external to it does not appear to make a great deal of difference. The body is also of greater resistance than it need be, as it is necessary that the pilot shall have a good view and shall not be entirely inclosed. Bodies round in section are somewhat lower in resistance than the square bodies, but the difficulties of manufacture generally make their use undesirable. It is not likely that we shall be able to reduce the body resistance to a very great extent unless we can use a motor which does not require external cooling. It is true that it would be possible to use the complete surface of the body or of the wings as a radiator and by this means the waste of power would be negligible, but in order to do this the radiator becomes an impracticable and heavy piece of apparatus.

The resistance of the landing gear is considerable and it is difficult to see how this can be much reduced. It has been suggested by many people that the landing gear could be stowed away inside the body while the aeroplane is in flight, and no doubt in the future this may be done. It is, however, very difficult to design a folding landing gear without an undue sacrifice of weight.

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Another factor which influences the resistance of the aeroplane to a considerable extent is the increased resistance of the parts of the aeroplane that are in the slip stream of the airscrew. The allowance to be made for this is not known very definitely, as in either a tractor or pusher aeroplane the resistance of the body itself tends to increase the efficiency of the airscrew.

Thrust Available for Flight

The thrust available from the airscrew varies directly as the horsepower of the motor, directly as the airscrew's efficiency, and inversely as the forward speed of the aeroplane. If the efficiency is constant the thrust available at any speed will depend upon the horsepower of the motor, consequently the weight per horsepower of the whole aeroplane is an expression for the ratio of thrust to weight of aeroplane. As in practice the efficiency of the airscrew does not vary very much, and as the resistance of modern-day aeroplanes per pound of weight is fairly similar, it is possible to predict rather roughly the performance of the aeroplane simply from the weight per horsepower figure.

There is considerable difference between the best attainable efficiency and that obtained under certain conditions.

As Lanchester has shown in *Aerodynamics*, for maximum airscrew efficiency the pitch must be a little greater than the diameter. From first principles also it is easy to see that the diameter must be a certain minimum so that the loss in the slip stream shall be small. Now it is always convenient to have an airscrew as small as possible, for when it is smaller it will be lighter and less in the way.

Again, unlike the screw of a ship, the airscrew has to work at bigger thrusts when the aeroplane is going slow and climbing than when it is going at full speed on the level. As a consequence the airscrew of a modern aeroplane nearly always has its maximum efficiency when its effective pitch is at its largest, i.e., when it is going fast, and its efficiency is lowest when the pitch is small, that is, when the aeroplane is climbing.

Another disadvantage when the aeroplane is climbing is that the engine is more heavily loaded and in consequence the airscrew goes slower. With engines as they are this always means less horsepower. We need, therefore, either a change speed gear or an airscrew in which the angle of the blades can be changed. This will avoid a drop in horsepower and to a lesser extent the loss of efficiency when climbing. We also need, however, a propeller of varying diameter so that combined with a change of angle and a suitable engine speed we should get nearly a maximum efficiency under all conditions.

There is not much room for improvement in airscrew efficiency working under the best conditions, as the efficiency is as high as 85 per cent. When climbing, however, the efficiency will frequently drop to less than 65 per cent.

Attempts at variable pitch or variable angle airscrews have been made, but none seem to have reached a practicable stage. The design of such a screw is quite possible and no particular invention is required to make it a success. As the demand undoubtedly exists, variable pitch airscrews will be made successfully and will become a standard part of the aeroplane equipment in the near future in all probability.

Performances of the Future

The aeroplane flown by the Wright Bros. had a speed of 30 to 35 m.p.h., and we have in a few years made aeroplanes that fly four times as fast. What then are the prospects of the future? Before considering this we must consider the effect of height on the speed at which an aeroplane flies.

The speed drops steadily as the height is increased, i.e., as the density of air is decreased. The reasons for this drop in speed are rather too lengthy to state in this paper. Very briefly, the resistance of the aeroplane and the horsepower of the engine each fall off when the density of the air decreases, but with engines as now designed the horsepower falls off faster than the resistance.

It is now proposed to consider what speed we are likely to attain in an aeroplane of the future flying at a height of 10,000 ft. As it is a hypothetical aeroplane engine, we are entitled to assume that all the improvements outlined in the preceding paragraph are incorporated into it. The assumptions we will make are: (a) That the planes have variable camber. (b) That the motor unit weighs 2 lb. per horsepower and will maintain this horsepower at all heights up to 10,000 ft. (c) That the body is the best possible shape, completely inclosed with no external fittings. (d) That the landing gear shall be folded inside the body during flight. (e) That the airscrew efficiency shall be 85 per cent. (f) That the percentage of useful load carried shall be 15 per cent. (g) That the duration of the flight shall be two hours.

Assuming that the weight of the structure is as at present, the weight per horsepower of the complete aeroplane will be 6.4 lb. As we are considering a faster aeroplane than is at present made it may be as well to allow a little more weight for the aeroplane structure and we will assume that the weight per horsepower is 7 lb.

We will now turn the percentage weights into pounds by assuming that the useful load is to be 450 lb., which may be two people and luggage or perhaps one man and mails. The gross weight of the aeroplane will therefore be 3000 lb. and the horsepower of the motor ·430. We will imagine that the aeroplane is of a type in which there is practically no resistance due to the slip stream of the airscrew; also that the motor requires no external cooling. In order to accommodate the engine and crew we will consider that the biggest cross-section of the body is 12 sq. ft. approximately round in section. The resistance of such a body will be about 2 lb. to the square foot at 100 ft. a second forward, i.e., 24 lb. in all.

The resistance of the rest of the aeroplane by careful design can be kept down to 16 lb. at 100 ft. a second; consequently at that speed the total resistance other than the wings will be 40 lb.

The area of the wings necessary will be governed by the speed at which it is considered reasonable to land; taking 60 m.p.h. as a possible speed and assuming that the planes can be converted into a deeply cambered section for landing, the permissible loading of the aeroplane will be 15 lb. per sq. ft., making a total surface of 200 sq. ft.

We will now take a speed of 350 ft. a second, or 240 m.p.h., and find the horsepower required at a height of 10,000 ft., i.e., where the density of the air is 0.74 of the normal. The wing drag may be taken as a fifteenth of the weight as with wings of varying camber we shall be able to get a high lift-drag ratio even at a small lift coefficient. The resistance due to wing drag, therefore, will be 3000/15, which is 200 lb.

As the aeroplane is flying at 350 ft. a second, the body drag will be 3.52 times what it was at 100 ft. a second, which will be 490 lb. As, however, the air is 26 per cent. less dense, its resistance will be reduced to 364 lb.

The total drag will be the sum of the body drag and the wing drag, 564 lb. in all. Taking an airscrew efficiency of 85 per cent on the power required for flying will be very nearly 430, which is just the power available.

The example just taken may seem fantastic to many people here to-night; it must be remembered, however, that when the Wright Bros. were flying at 40 m.p.h., speeds of 150 may have seemed to them equally fantastic. On the assumptions we have made it is reasonably certain that a speed of four miles per minute can be obtained, and as motors of less weight per horsepower become available there is no reason why this speed should not be exceeded.

The rate of progress in increase in speed will depend upon the demand for speed. If war were to last it is almost certain that speeds of much more than 200 m.p.h. would be common in quite a few years from now.

Stability and Control

In the original Wright aeroplanes no attempt was made to obtain stability. The aeroplane was definitely unstable and required considerable care on the part of the pilot to keep it in equilibrium.

The early French aeroplanes were a little better in this respect, but the first aeroplane to prove that it really was stable, i.e., it could fly without control, was that designed by Lieut. Dunn. This was an aeroplane of somewhat curious

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construction and never became a success, although it certainly was stable; on a windy day it was somewhat difficult to persuade it to fly on a straight course and its control when landing seems to have been insufficient. Lieut. Dunn, however, certainly showed that a completely stable aeroplane was a possibility.

About the time at which Dunn was making his experiments certain German designers claimed that they had produced a stable aeroplane. No records seem to exist of any test that proved their aeroplanes were stable, and in any case they certainly suffered from lack of control.

The first aeroplane of normal type that was proved to be stable was produced as the result of experiments carried out by the late Edward Busk. An aeroplane known as the R.E.-1 was used for the first experiments and it was modified until it was made completely stable. Tests were carried out in order to prove that this aeroplane really was stable, and with Busk as pilot, carrying Colonel Sykes as observer, a flight was made from Farnborough to Salisbury Plain, in which the only control used was the rudder, and this for part of the time at least was worked by Colonel Sykes.

Since that day most English aeroplanes have been designed to be stable; it has been found that for purposes of fighting an aeroplane that is extremely controllable is necessary, and it has been also found that if an aeroplane is made too stable the controls are apt to become too heavy to make the aeroplane sufficiently sensitive. In modern-day aeroplanes intended for war purposes the aim of most designers is to make the machine just comfortably stable over the range of speeds used in ordinary flight, but to provide sufficiently large controls that the inherent stability of the aeroplane can be entirely overcome.

It is often asked, if we have stable aeroplanes why do we still have flying accidents? It would be quite possible to design an aeroplane in such a way that whatever the pilot did with the controls he would be unable to upset the equilibrium of the aeroplane. Such an aeroplane, however, would be valueless for fighting, and as practically all aeroplanes nowadays are made for war purposes there must continue to be an element of danger for the unskilled pilot.

Increase in speed and the increase in controllability both tend to increase the stress that will be put on the structure of an aeroplane in flight. Experiments in the increased loads that are likely to occur when doing sharply banked turns and loops have shown that the load is frequently increased to three or four times the normal.

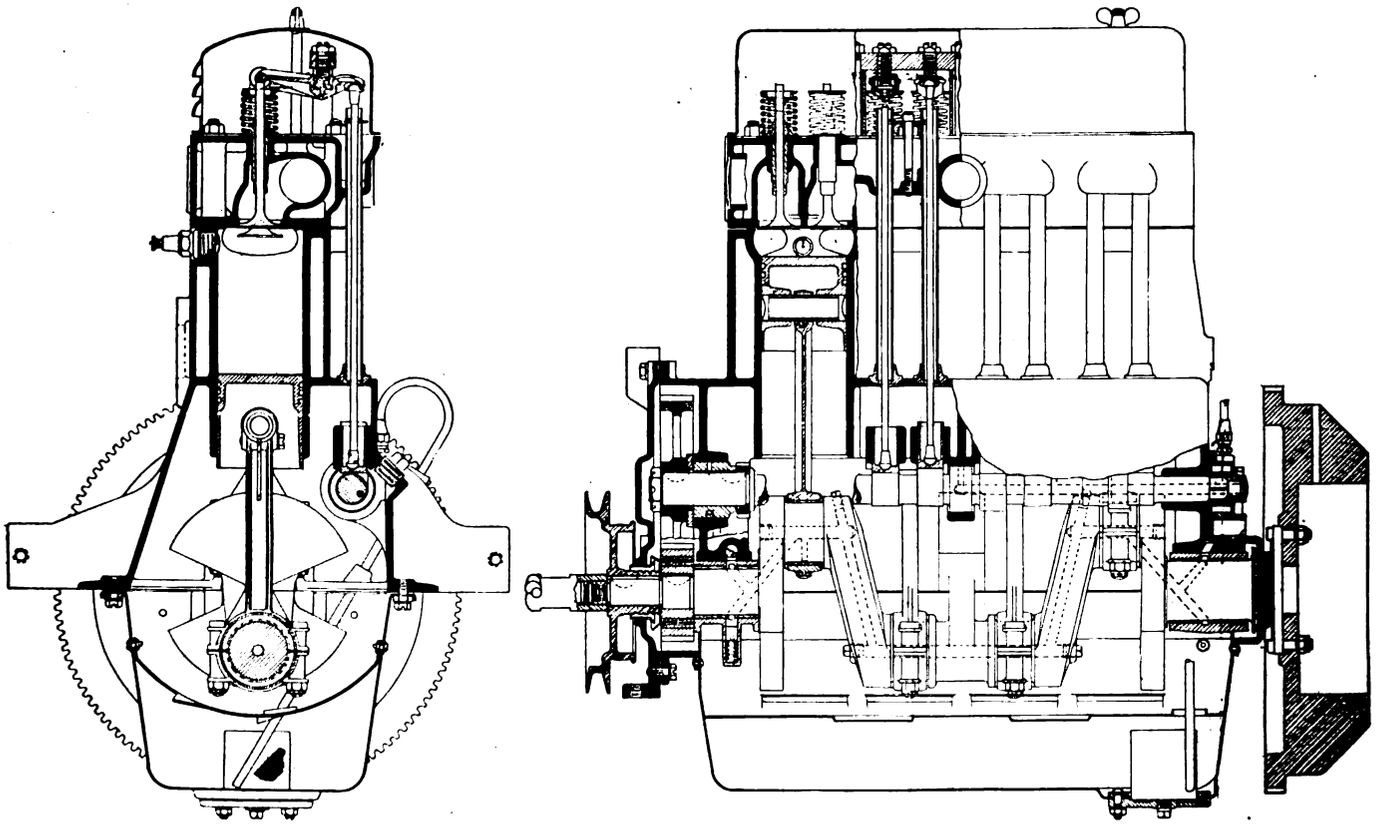
Structural Strength and Size

Present-day aeroplanes have to be very much stronger than before. Modern machines that are expected to maneuver rapidly are not considered tolerably safe unless the wings can support at least six times the weight of the aeroplane. Fortunately, large aeroplanes for peaceful purposes will not be required to maneuver very rapidly. This fact will have an important bearing on future possibilities.

In an earlier paragraph it was stated that the proportional weight of the aeroplane parts proper was more or less constant. This applied only to machines of the sizes that are used now, *i.e.*, up to about 6 tons loaded weight. As aeroplanes are made bigger, if they are designed on similar lines, the weight of the wing structure per square foot will increase, assuming they are to be designed for the same factor of safety. It is true that on the large aeroplanes now made this increase of weight is not very apparent because greater trouble is taken to economize in the design of the wings. This increase of weight, however, is likely to be important for machines of much larger size, but as we shall be able to use somewhat lower factors of safety the weight of the wing structure will not increase as rapidly as it would otherwise have done.

We have no logical right to think that our flying machines of to-day are more than the crudest caricatures of the aeroplanes of the future. We engineers are a little apt to become so engrossed in our immediate difficulties of design that we do not see further ahead than is suggested by our own ideas, and make predictions for the future that only follow along the lines of progress that we can clearly see.

The writer has often been asked if he thinks that flying will ever become an ordinary means of travel. His answer is that he does not think, but that he knows it will become so. Ten years ago to attempt to fly from place to place was considered suicide; five years ago it was an adventure; to-day to many of us it is a very ordinary affair. A few years more and we shall laugh to think of the aeroplanes of which we are now so proud, we shall shudder at the risks we ran, and we shall travel with comfort, speed and safety.



Sectional views of the Brush engine used on the new Olympian car described in AUTOMOTIVE INDUSTRIES *of Jan.* 10

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British Cabriolet Design

Gives Limousine and Touring Car—Compared with Brougham-Limousine It Provides All Comforts of Closed Car and Gives Touring Body Besides

By George J. Mercer

Body space can be conserved by the use of the European cabriolet design in place of the brougham-limousine. The cabriolet type possesses all of the seating space and all of the light area of the brougham-limousine and in addition is fully convertible, giving a true open-car design as well.

A direct comparison of these two types is given in the illustrations, Fig. 1 being the brougham-limousine and Fig. 2 the cabriolet.

The brougham-limousine is very popular as a town car in the winter months. It has the smart features of being low and compact looking with the extra tires bedded in the fender. The fenders are the long, sloping crown shape which retain their exclusiveness because they are the most expensive to make. Additional features on this body are the moderate slanting windshield, the pillar lamps and ventilator in the cowl.

European Type Collapsible

Contrast with this the cabriolet in Fig. 2, which is commonly used in Europe, particularly in Great Britain. It seems strange that this has not been used to a greater extent in this country, particularly at a time when car owners are prone to conserve. It is fully collapsible (Fig. 3) the glass lights all dropping flush so that when open it is a good looking touring car and when closed it is a comfortable closed type. In either position it defies any criticism that it has a makeshift appearance.

A direct comparison of the two types shows that the seating accommodations, width of the doors and lights are the same. The height of the roof above the seat is slightly greater in Fig. 2 than in Fig. 1, helping compensate for the lower door entrance and insuring clear vision without interference from the roof which comes further down on the sides.

All the advantages, however, are in favor of the cabriolet in Fig. 2, as regards the dissimilar parts. All the service that can be secured from the brougham-limousine type can be secured in the cabriolet and in addition there is the advantage of having both a town and touring body. It is readily changed from one to the other and the driver in the convertible type has better protection. It is lighter in weight and altogether more serviceable.

Method of Operating

The method of operating the convertible top is shown in Fig. 3, the folding parts are shown by dotted lines in their upright position and by full lines folded down, the arrows indicating their line of travel.

The building of a body of this kind is not difficult, but it is primarily essential that the workmanship be of the best, and the parts must work free and

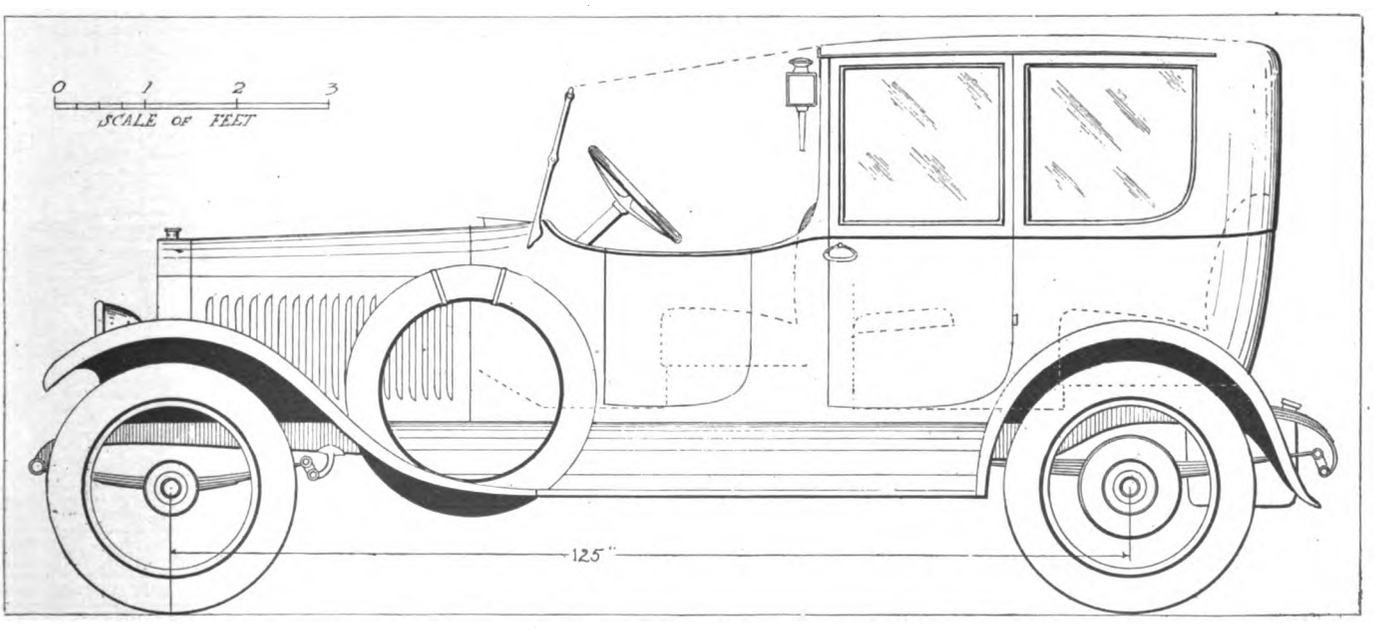


Fig. 1—Brougham-limousine which makes a popular type of closed car for winter use

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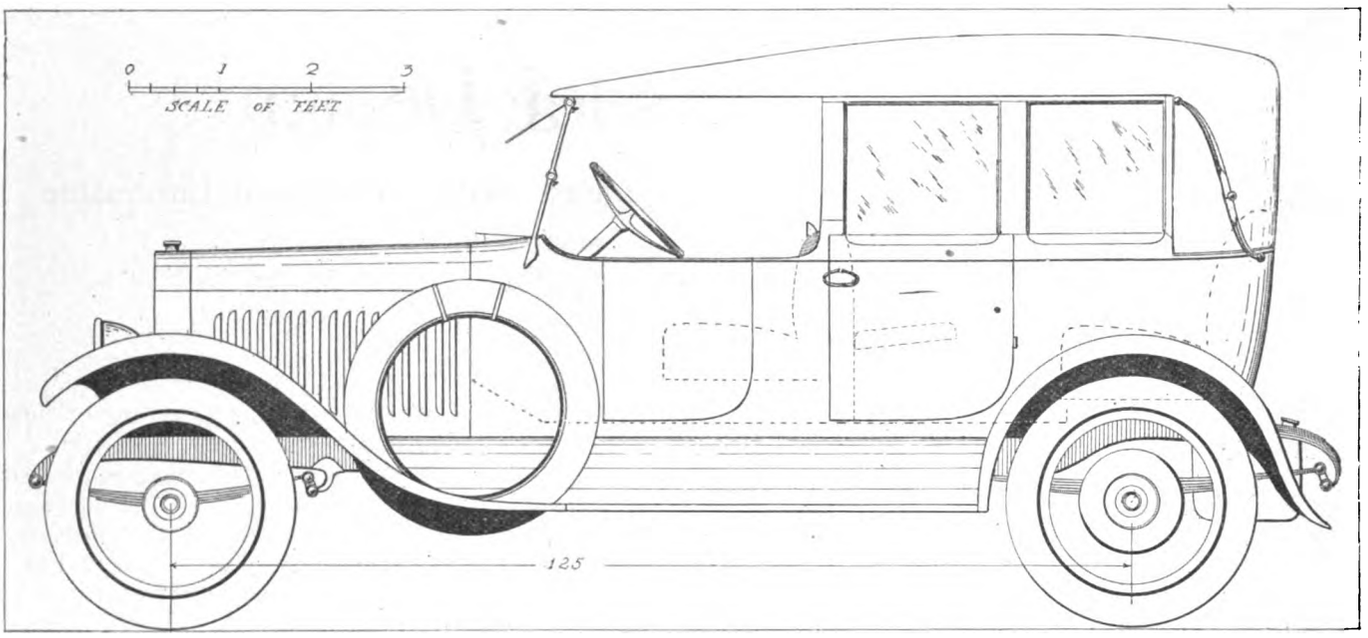


Fig. 2—Cabriolet design, popular in Great Britain, which gives all the comfort and accommodations of the brougham-limousine shown in Fig. 1, but which is convertible in addition

without strain so as to have a durable and easily operating top. If well made there will never be a complaint that this body is not so warm and comfortable as any permanent roof body. The top is entirely collapsible and the overhang or extension beyond the body at rear is short and will never cause trouble by reason of being overloaded behind. The parts themselves are not heavy individually, and as they are all tied together by hinges they serve to brace themselves and by resting one on the other the weight is well divided, thus assuring good, durable wearing qualities.

This style of top is not confined to any particular length of body. It can be either longer or shorter than the illustration. There are sufficient bows to keep the roof in proper shape.

There is almost an unlimited number of patented hinge arrangements for working this style of top; practically all will accomplish satisfactorily the result desired, but the one here used is the simplest. It is very strong as well as having the fewest number of parts and folds compactly as shown on this figure. It is of British manufacture and is in common use. To assist in carrying the weight when folding and raising there is a barrel hinge at the rear of the pillar and one outside joint on each side, the lower support of which forms the rest when the top is down. When in its lowered position the top has only a slight increase in size over the touring top, which is specially apparent when the envelope is in place.

The combination body in various forms has a great hold on the public fancy because of the general usefulness of this design. In the past a falling top body has not been in much favor on account of

(*Continued on page* 294)

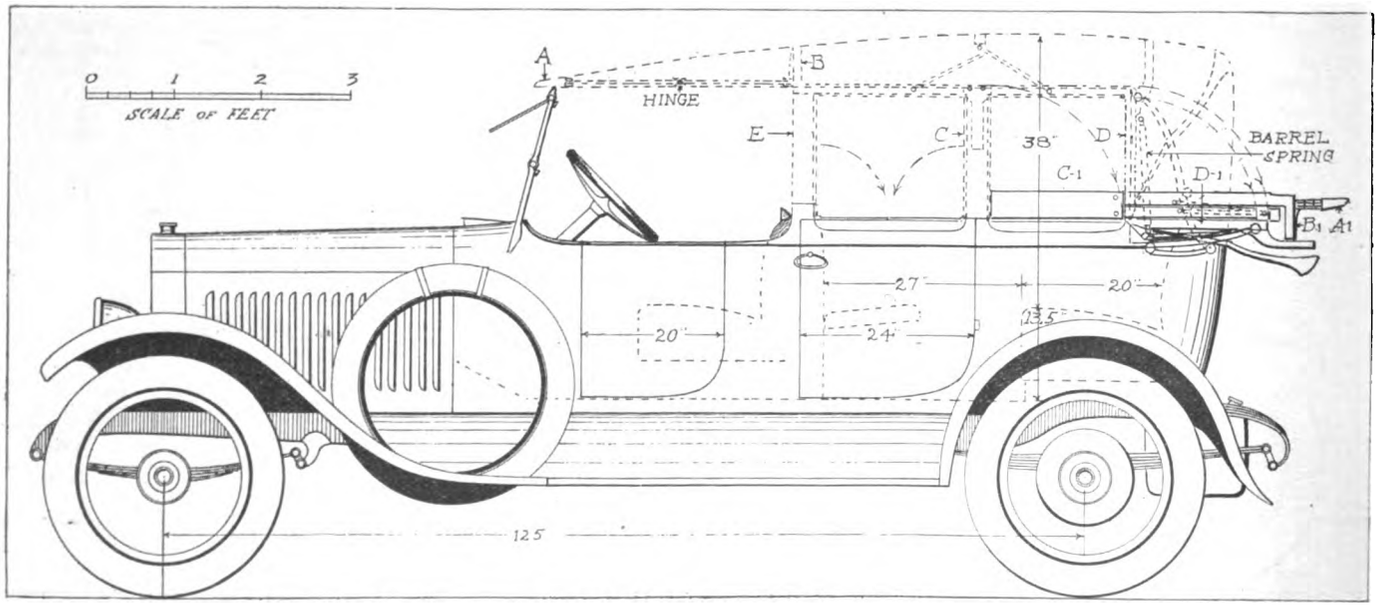


Fig. 3—Method of operation of the folding top on the cabriolet. The full lines show the top down and the dotted lines the positions of the various components with the top up

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A Systematic Parts List

Nature of the Parts List and the Need for It in Manufacturing Plants—Viewpoints to Be Considered in Making Up the List—A Proved System Described

By R. C. Barron
Formerly Chief Draftsman, The Curtiss Airplane Corp.

WHEN production is increased 1000 per cent in the manufacture of a machine which has not been systematically handled in the drawing room the effects are apt to be such that the engineer is compelled to give the matter attention.

The subject of a well-organized drafting room has received considerable attention, especially among the well-established automobile companies. Several writers have set forth well-defined systems.

Among the most important items in such systems is the bill of material or parts list, because through this medium the whole factory is enabled to produce the product to meet the demand of the sales organization through the ingenuity of the engineer.

Parts lists usually have been called Bills of Material. This name, which has now lost its original meaning, is fast becoming extinct.

The term Bill of Material originated in the early days when the inventor was the engineering department behind the machinery. It was customary for the inventor to make a toy or model machine to satisfy himself—or, if he needed the money, his friends—that he could make a labor-saving device. If he accomplished his desire (which was seldom the case) he built a real working model. The chances were if the machine was really good it was worked nearly to death before it was discovered that even machines wear out. Upon discovery of this important fact the machine was turned over to the machinist, who built another as near like it as he could, with perhaps a few improvements. By the time the machine had reached this stage the inventor or owner was confronted with the problem of producing several more.

They had already learned that certain parts of the machine would wear out more rapidly than others, and they had to plan on getting a record of how these pieces had been made without tieing up the machine while they used the old part for a sample to reproduce the part and have it fit. A drawing then became a twofold necessity. First, as a guide to make the part without a sample; second, as a record for future use in making replacements. However, many of the parts were of such a nature that it was possible to obtain the parts without a drawing, such as a ¼-in. bolt ½ in. long, a 1-in. square piece of wood 3 ft. long, ½ lb. tenpenny nails, etc. In order to save time and money, because the inventor usually made all of the necessary drawings, such material was either called for on the drawings or on a letter or list attached to the drawings as a part of the information necessary to construct the machine.

Bills being the most important part of the work, it was most natural to call such a list a Bill of Material.

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PARTS LIST

NOTE CHANGE	PART NO.	NAME OF PART	NO. REQ PER UNIT	REMARKS
	516982	CRANK-CASE-MACHINING ASSEMBLY	1	SHEET No. 21
		BEARING-CAP-ASSEMBLY FR. MAIN		No. 513062 SH. 84
	42-3-4	STUD-INLET WATER TUBE	8	
	42-3-9	STUD-WATER PUMP	2	
	42-3-6	STUD-TRANSMISSION HOUSING	10	
	516910	BEARING-FRONT MAIN UPPER	1	
	520031	BEARING-FRONT MAIN LOWER	1	
	49690	BEARING-CENTER MAIN UPPER	1	
	516911	BEARING-CENTER MAIN LOWER	1	
	520080	BEARING-REAR MAIN UPPER	1	
	519631	BEARING-REAR MAIN LOWER	1	
XX	374194	BUSHING-GOVERNOR SHAFT BEARING	1	NOT USED ON ENGINES FROM No. 9654 TO No. 10672

NOTE CHANGE	PART NO.	NAME OF PART	NO. REQ PER UNIT	REMARKS
ISSUE	7-6-17 A.			
DATE	9-10-17 A.			
	1-6-18 A.			

NAME: CRANK-CASE-ASSEMBLY UPPER HALF — PART NO. 517005

REPORT ALL DIFFERENCES TO THE RECORD DEPT BY PARTS LIST, SHEET & ITEM NO. — DIVISION: SUB-ASSEMBLIES — SHEET NO. 76

Fig. 1

Better Drawings Needed

As production and complicated mechanism increased, so the necessity for more and better drawings increased. Material which formerly could be called for in bulk and worked into shape on the bench had to be bought with more care, nearer to the ultimate shape, and often made in another city, or even another country.

It has been found advisable to have a drawing for every part of the machine, even if it is only descriptive, so that each part will have a number and name by which it is known throughout the organization. When this is done it becomes also advisable and necessary to compile a list of parts to make one unit.

In the well-organized factory which manufactures complicated units the pieces will first be made individually and then assembled in small units, known as bench assemblies or subassemblies, and finally in a department for that purpose, known as the Final Assembly, all the subassemblies and parts which could not be subassembled are brought together and assembled in a certain systematic way.

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When the engineering department does its work well it will have a drawing for every part of each subassembly and of the final assembly.

As long as a concern is making a product of which each succeeding design or improved design is similar in construction it will be found very convenient to make a parts list which will conform with the drawings, and which is so arranged that additions may be made to take care of future models or types without disturbing the past models, which may be in the course of construction,

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PARTS LIST

NOTE CHANGE	FIG. NO.	PART NO.	NAME OF PART	NO. REQ'D PER UNIT	REMARKS
	1	317005	CRANKCASE-ASSEMBLY UPPER HALF	1	SHEET 76
	2		CRANKCASE-MACH. ASSEMBLY		No. 316982 SH. 21
	3		BEARING-CAP-ASSEM. FR. MAIN		No. 319042 SH. 54
	4				
	5	307061	GASKET-CYL. SLEEVE	1	
	6				
	7	307043	PACKING-CYL. SLEEVE	4	
	8				
	9	317095	CYLINDER-HEAD-ASSEM.	1	SHEET 71
	10		CYLINDER-HEAD-MACH. ASSEM.		No. 317026 SH. 70
	11				
	12	28-5-12	LOCK-WASHER-CYL. HD. ATTACH. STUD NUT	18	
	13	2-5-4	NUT-CYL. HD. ATTACHING STUD	18	
	14				
	15	316932	SHAFT-CAM SHAFT DRIVE	1	
	16	316978	BRACKET-CAM SHAFT DRIVE SHAFT LO.	1	
	17	316932	SCREW-CAM SH. DR. SH. LO. BRG. LOCK	1	
	18	28-5-8	LOCK-WASHER-CAM SH. DR. SH. LO. BR. SC.	1	
	19	317016	HOUSING-CAM SH. DRIVE SHAFT	1	
	20				
X	21	316924	GASKET-CYLINDER HEAD	1	
	22				
	23	309961	COVER-ASSEM. CYL. HEAD	1	SHEET 67
	24				
	25	28-5-9	LOCK-WASHER-CYL. HD. COVER	3	
	26	1-5-1	NUT-CYL. HEAD COVER	3	
	27				
	28				
	29				
	30				
	31				
	32				
	33				
	34				
	35				
	36				
	37		CONTINUED ON SH. E1-B		
	38				
	39				
	40				

NOTE CHANGE	FIG. NO.	PART NO.	NAME OF PART	NO. REQ'D PER UNIT	REMARKS
ISSUE DATE		7-10-17 A.	7-26-17 A. 8-13-17 A. 10-317 A.		
		7-13-17 A.	7-30-17 A. 8-20-17 A.		
		7-21-17 A.	8-6-17 A. 9-10-17 A.		

NAME: ENGINE - ASSEM. MOD. E TYPE 1 — PART NO. 510000

REPORT ALL DIFFERENCES TO THE RECORD DEPT. BY PARTS LIST, SHEET & ITEM NO. — DIVISION: FINAL ASSEM. — SHEET NO. E1-A

Fig. 2

or which may have to be maintained for replacements or other reference.

Take the case of a concern which manufactures such products as automobiles, engines, typewriters or bicycles. Almost all of these concerns are continually redesigning and bringing out new models. Many of the parts, and often whole subassemblies of the old machines, would not be changed.

Nearly every assembled unit of any size requires, or has for commercial purposes, a few attachments to accomplish various results. These are usually known as accessories or equipments. Such equipments should be handled in the parts list as units, regardless of what model they are designed for.

The modern manufacturer also finds it necessary to furnish a small or large kit of tools, depending upon the size of the unit. There are usually several tool sets, due to changes in design, the addition of equipment, or the desires of a good customer.

Another problem which confronts every manufacturer making a unit which is subject to severe usage is that of spare parts. Very often it is arranged to make up a set of the most rapidly wearing parts and ship them with the unit. These sets of spare parts are like the tools, and vary with the design, the order, or the customer.

The parts list, then, may be divided into five distinct groups. Taken in the order of their relative importance, they are:

1. Subassemblies.
2. Final Assemblies.
3. Equipments.
4. Tool Sets.
5. Extra Parts Sets.

Each subassembly sheet will show the name of the assembly, its part number and the date of issue. All the parts necessary to construct the assembly are itemized, giving the number of the part, the name, and the number required. If another subassembly is used, it is known as a sub-subassembly, and is treated as a separate part. Its individual parts will be found on a separate sheet. For convenience, the sheet number is given in the column for remarks.

Each subassembly has a parts list sheet number assigned to it. Beginning with one (1) they are numbered consecutively. This number is always maintained, and is referred to as Subassembly Parts List, Sheet No. 1. If there should be more than one sheet required for an

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PARTS LIST

NOTE CHANGE	FIG. NO.	PART NO.	NAME OF PART	NO. REQ'D PER UNIT	REMARKS
	1	413761	MUFFLER - ASSEM. EXHAUST	1	SHEET 30
	2				
	3	413763	MANIFOLD - ASSEM. EXHAUST	1	SHEET 31
	4				
	5	413765	FLANGE - BRAZING ASSEM. EX.	4	SHEET 32
	6				
	7				
	8	416741	GASKET - EXHAUST MANIFOLD FLANGE	4	
	9	28-5-21	LOCK-WASHER - EX. MANIFOLD FL. SCREW	8	
X	10	6-5-8	SCREW - EX. MANIFOLD FLANGE	8	
	11				
	12	10-5-6	BOLT - EXHAUST MUFFLER	1	
	13	1-5-1	NUT - EXHAUST MUFFLER BOLT	1	
	14	59-5-3	COTTER-PIN - EXHAUST MUFFLER BOLT NUT	1	
	15				
	16	10-5-6	BOLT - EXHAUST MANIFOLD	2	
	17	1-5-1	NUT - EXHAUST MANIFOLD BOLT	2	
	18	59-5-3	COTTER-PIN - EXHAUST MANIFOLD NUT	2	
	19				
	20				
	21				
	22				
	23				
	24				
	25				
	26				
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	40				

NOTE CHANGE	FIG. NO.	PART NO.	NAME OF PART	NO. REQ'D PER UNIT	REMARKS
ISSUE DATE		6-10-17 A.			
		7-1-17 A.			

NAME: MUFFLER - INSTALLATION — PART NO. 410577

REPORT ALL DIFFERENCES TO THE RECORD DEPT. BY PARTS LIST, SHEET & ITEM NO. — DIVISION: EQUIPMENT — SHEET NO. EQ-17

Fig. 3

assembly, the first sheet is marked "Continued" and the next sheet has the suffix B. If B is the last sheet it will be marked "The End." Fig. 1 shows an example of a subassembly sheet.

All subassembly sheets are segregated in a section marked subassemblies, which is known as the subassembly bank.

If the unit is a large one, and consists of many small parts, there will be many subassemblies. Care should be taken not to make them unless the parts assembled will remain together permanently, *i. e.*, are united by riveting, brazing, soldering, welding and machining; in fact, only where the parts are mechanically worked when assem-

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bled, or where the construction is such that the selection of parts is necessary to secure fits.

The reason for this is that subassemblies are made up and are stocked as single parts and are drawn on for the final assembly and for replacements. The price list and catalog for the use of the customer are made from the parts list; therefore, to protect the customer, when ordering new parts, from paying for parts on a subassembly which are in perfectly good condition on his unit, the number of pieces assembled must be kept down to a minimum.

If bench assemblies are desirable to further facilitate the final assembly they should be constructed on the final assembly floor, and their compilation is a function of that department.

Final Assemblies

These are, of course, the final product of the concern, minus the equipments, or in other words the stock units, the equipments being attached in accordance with the sales order.

In conjunction with the name of the unit, the model and type are given, otherwise they are made up similar to any other assembly, having a part number and its parts itemized.

It has been found that in making up the final assembly parts list the easiest way to insure against missing some of the pieces, and also to assist in locating parts, is to arrange the parts as nearly in the same rotation as the unit will be assembled on the assembly floor.

It is unnecessary to mention the sub-subassemblies on the final assembly parts list, but it has been found advisable to do so as a reference. Care must be taken that the numbers of such assemblies are not placed in the regular column for numbers, as it would confuse the order department when placing assembly orders. The place for the part number and sheet number in this case would be in the Remarks column. The advantage of this arrangement is to enable the record department to collect quickly all of the sheets of the parts list necessary for the construction of a unit. See Fig. 2.

These final assembly sheets are numbered with a combination symbol composed of the model and type and a letter prefix; *i. e.*, if the model were A and the type 1, the first final assembly sheet would be A1-A, the second A1-B, etc. Each succeeding sheet is marked "Continued" until the last, which is marked "The End."

The final assemblies are arranged consecutively according to priority, and separated by an index sheet bearing the model and type number as illustrated in Fig. 6.

Equipments

The question of just what parts of a unit may be considered as equipment is almost a personal one.

It is generally understood that any part or assembly of parts which can be detached and be replaced by a new set of a different design, is equipment; in fact, any parts which may be optional with the customer come under this head. For example, on the automobile, the starter, tire pump and speedometer come in this division.

The parts list for equipments is made up in the same manner as the final assembly; in fact, they are final assemblies in the case where the concern is an accessory manufacturer.

There will be a tendency, when following this system, to arrange so many parts in the equipment division that there is little left for the final assembly. This should be guarded against by the engineer taking a firm stand at the point where a change in equipment affects the performance of the product. If a change in the parts is for the improvement of the performance of the product it may warrant a change in the type of the unit.

The equipment parts list is numbered consecutively, but in order to distinguish it from the subassembly parts lists a symbol is adopted, such as EQ. The first equipment would become EQ-1, the second EQ-2, etc. If there is more than one sheet to an equipment the second sheet would be numbered EQ-1A, the third EQ-1B, etc.

Fig. 3 gives an illustration of an equipment where

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PARTS LIST

NOTE CHANGE	EQ	PART NO.	NAME OF PART	PARTS PER UNIT	REMARKS
	1	406071	WRENCH – MAGNETO	1	
	2	406103	WRENCH – CARBURETER	1	
	3	406074	WRENCH – SPARK PLUG	1	
	4	407000	WRENCH – ADJUSTABLE	1	
	5	407006	WRENCH – ¼ TO ⅜ DOUBLE END	1	
	6	407007	WRENCH – ⅜ TO ½ DOUBLE END	1	
	7	407008	WRENCH – ½ TO ⅝ DOUBLE END	1	
	8				
	9	407003	SCREW-DRIVER – 2 INCH	1	
	10	407002	SCREW-DRIVER – 4 INCH	1	
	11				
	12	409001	LIFTER – ASSEMBLY VALVE	1	SHEET-12
	13				
	14	409010	JACK – ASSEMBLY FOOT LEVER	1	SHEET-29
	15		LEVER – ASSEMBLY JACK	1	No 409006 SH 27
	16				
X	17	409995	PLIERS – 6 INCH	1	
	18				
	19	410005	TOOL-BOX – ASSEM 18 INCH	1	SHEET 16
	20		TRAY – ASSEM. TOOL BOX	1	No 411001 SH 28
	21				
	22				
	23				
	24				
	25				
	26				
	27				
	28				
	29				
	30				
	31				
	32				
	33				
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	39				
	40				

NOTE CHANGE	EQ	PART NO.	NAME OF PART	PARTS PER UNIT	REMARKS
ISSUE DATE		5-16 A 6-17 A			

NAME: TOOL SET – STANDARD — PART NO. 410010

REPORT ALL DIFFERENCES TO THE RECORD DEPT. BY PARTS LIST SHEET & ITEM NO. — DIVISION: TOOL SETS — SHEET NO. TS-1

Fig. 4

there were several styles of exhaust pipes and mufflers to suit different installations of an engine.

Tool Sets

What constitutes a tool set depends upon the design, the quality and size of the product, the engineer, and (sometimes) the customer.

It may be dangerous to furnish too many tools, as the customer is liable to adjust parts which may affect the performance of the product.

In most cases, a few of the most used tools, such as wrenches, pliers and screwdrivers, cost but little, appeal strongly to the prospective customer, and are gladly furnished.

The tool-set parts list is numbered similar to equipments, having a special symbol, such as TS.

A typical tool set and the method of making up the list are shown in Fig. 4.

Extra Parts Sets

Extra parts are not always taken into consideration, but most machinery has parts of such a nature that they are easily broken or wear out much faster than the more protected or more robust parts.

A very striking example of the extra part is the needle

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PARTS LIST

NOTE CHANGE	ITEM NO.	PART NO.	NAME OF PART	NO. REQ'D PER UNIT	REMARKS
	1	251602	BOX- ASSEMBLY EXTRA PARTS	1	SHEET 90
	2				
	3	453001	PISTON PIN	2	
	4				
	5	416732	PISTON RING	6	
	6				
	7	416083	VALVE - EXHAUST	2	
	8				
	9	416084	VALVE - INLET	2	
	10				
	11	416085	SPRING - EXHAUST VALVE	2	
	12				
	13	416086	SPRING - INLET VALVE	2	
	14				
	15	419005	SPARK PLUG	4	
	16				
	17	417032	PACKING - WATER PUMP	4	
	18				
	19	1-5-1	NUT	6	
	20				
	21	59-5-3	COTTER PIN	36	
	22				
	23	10-5-6	BOLT	6	
	24				
	25	28-5-21	LOCK WASHER	6	
	26				
	27	59-5-4	COTTER PIN	12	
	28				
	29	1-5-4	NUT	6	
	30				
X	31	419064	BUSHING - VALVE GUIDE	2	
	32				
	33				
	34				
	35				
	36				
	37				
	38				
	39				
	40				

NOTE CHANGE	ITEM NO.	PART NO.	NAME OF PART	NO. REQ'D PER UNIT	REMARKS
ISSUE DATE		6-2-17 A 10-12-17 A 12-1-17 A			

NAME EXTRA-PARTS-STANDARD G — PART NO. 416035

REPORT ALL DIFFERENCES TO THE RECORD DEPT. BY PARTLIST SHEET & ITEM NO. — DIVISION EXTRA PARTS — SHEET NO. EP6

No. 5

of the sewing machine and graphophone, or the tires of the automobile.

In any case, the manufacturer of machines always makes a certain number of spare or extra parts, depending on his production, to be retained for replacements.

The example shown in Fig. 5 might be a list of the extra parts such as would be furnished with every six engines furnished to a dealer who repaired the engines in his locality.

The extra part set parts list is, like the list of equipment and tools, given a special symbol such as EP, as shown in the example.

Changes may be made in any parts list sheet by checking the item changed in the column for that purpose and adding a new issue date; all previous checks denoting changes, unless in regard to the same item, to be removed.

This may be done with or without a notice, depending on the size of the issue and the size of the concern. It is not, particularly vital, but very convenient, when the order department is efficient and considers it necessary to insure proper attention.

It is a mistake to try to make the parts list form contain enough information to satisfy every department, as many have tried to do.

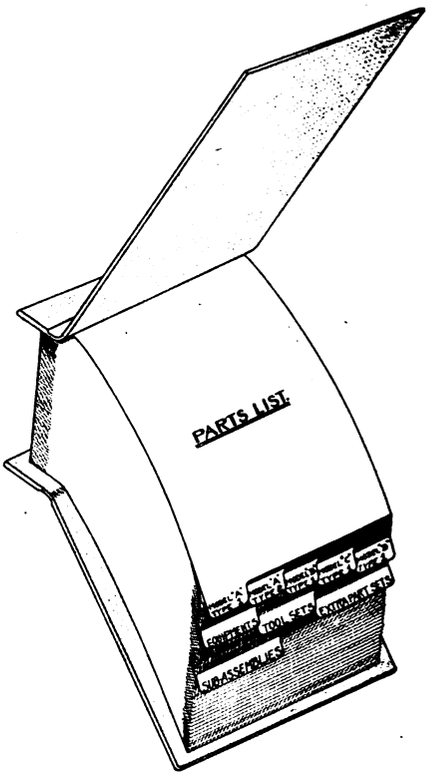


Fig. 6

Take, for example, the form shown in Fig. 7. Much time was spent in trying to produce a form which would answer many uses. The result was that it soon became a cumbersome, expensive item when filled, hard to reproduce, and harder to produce, and it was finally discarded for the more simple form.

The form shown in Fig. 1 is simple, and is doing good service where many other forms had been tried and proved failures. If other lists are desirable for temporary use it becomes a very simple matter to compile such lists.

The writer has experienced the necessity for a different parts list when called upon to furnish a complete numerically arranged list of all the parts necessary to satisfy a certain sales order calling for a model, several equipments and a set of tools, which contained over three hundred parts.

For the moment it looked as if the method of compiling

(*Continued on page* 294)

FORM 194

FILLED OUT BY DRAFTING DEPARTMENTS.
ISSUED BY ENGINEERING RECORD DEPARTMENT.
COPIES TO OTHER DEPARTMENTS AS REQUIRED.

MANUFACTURING LIST

PART LIST — ENGINEERING DEPT. — CUSTOMER — CUSTOMER'S ORDER

ITEM NO.	CHANGE LETTER	NAME OF PART	PART OR PART LIST No.	PAT. OR DIE No.	MATERIAL	No. REQ.	No. PCS. ORDERED	ORDERED FROM	REQUIREMENTS	PROMISED	ORDER NUMBER	REMARKS
1												
2												
3												
4												
5												
6												
7												
8												
54												
55												
56												
57												
58												
59												
60												
61												
62												
63												
64												
65												

NAME _____ PART LIST No. _____ COPIES TO _____

APPROVED BY _____ DATE _____ SHEETS _____ SHEET No. _____

Fig. 7

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Condition of War Zone Roads in France

General Layout of the French Road System and Its Service in War Time—Traffic Conditions Behind the Firing Line—Building of Special Roads and Maintenance Methods Employed

By W. F. Bradley
Special Correspondent of Automotive Industries

THE observations upon which these statements are based were made by the writer in six months' service within the war zone as a part of the French army transportation system, namely, as a driver in the American Ambulance Corps. They cover practically all that part of the Western Front now held by the French Army; specifically from the vicinity of Nancy near the Swiss border to the Somme River, which, up to last March, marked the junction of the French and English forces.

The actual front line work was done in the Argonne Forest sector near St. Thomas and St. Menehould, where ambulances worked within 400 yards of the German first line; and on the Somme battlefield between Peronne and Chaulnes, where the work was done in the ground taken from the Germans in the great offensive of 1915. Back-line work was also done at various points within the war zone; on the famous Ber-le-Duc Verdun road; through the battlefield of the Marne, from Vitry-Le-Francois to Meaux, and in the vicinity of Amiens.

It is not possible to generalize as to conditions and phases of the road situation within the entire war zone. There is a great variety of topography. From the Somme to the Moselle, one goes from low rolling plains to high abrupt hills and rugged country. Along the line there is great variation in activity. Comparative quiet reigns in the Argonne and Vosges sectors; traffic is regular and fairly low in volume and to all purposes about as well under control as in peace times. The lines here have not moved substantially since 1915. It was in the Somme sector that I found things moving at highest tension and the transportation system most severely taxed. Here there was an immense volume of traffic moving in the entire area twenty miles back of the line; destructive artillery fire within the 5-kilometer zone; continuous heavy fighting that demanded great movements of troops, supplies and ammunition, and the necessity for the accommodation of an advancing army over ground that has hardly a spot untouched by shells. My remarks in this paper will, therefore, deal particularly with the Somme sector, especially when referring to heavy volumes of traffic.

I—PLAN OF ROADS

The original layout of the French system of highways was fortunately most comprehensive. It has filled the requirements of the present exaggerated demands in a most admirable way, and has undoubtedly been a tremendous factor in the defense against the German invasion. New roads have, of course, been constructed under special local conditions, but these instances seem to be rare and in the main, the original highways, unchanged in location, grade, or width, carry the war traffic.

Safety Roads

New roads are constructed mainly to relieve traffic from shell fire. On the eastern end of the line, among the hills, roads are often built to the leeward of the enemy. A specific instance of this is in the Argonne forest, near Four de Paris. The main concentration of reserves, supply stations, dressing stations, etc., is in a long narrow valley a few hundred yards back of and parallel to the first line trenches, which are on the other side of a low hill range. The original road was on the far side of the valley and is in sight and easy range of the enemy. It is marked Very Dangerous on army maps. An entirely new road has been built in the shelter of the hill range, hugging it closely in all the deviations of the slope. Here traffic can move in almost full security from direct hits.

Main roads are well known to the enemy and their range established by experience. In the flatter country they often run on tangents miles in length, making easy targets. In heavy actions these roads are so vigorously shelled that supply trains cannot pass except with severe losses. As a counter measure, new roads are sometimes built nearby—crooked in alignment, but in general direction paralleling the main road. Traffic is shifted between these roads to avoid shell fire or to confuse enemy airmen as to which line is actually being depended upon for service.

Control and Economy of Movement

The French plan of troop cantonments, supply stations, base hospitals, etc., is quite evidently designed with the road facilities as a basis. It is a rare thing to find heavier traffic moving than the width of road can accommodate (except, of course, on the main trunks near the first line, where congestion is unavoidable; this case will be discussed later). Each class of road from the grand highways to the little community roads seems, in a busy sector, to have just that portion of the traffic which it can satisfactorily handle. This condition is too general to be accidental, and as the result of careful planning of concentration points and the routing of movements, it is admirable and a great credit to the French engineers.

Temporary concentration camps for large bodies of troops, as we know them here, are practically unknown in the war zone. Tents, except for hospital uses, are rarely seen. Troops are quartered in villages, the houses of which are entirely commandeered for the purpose. Each house, public building and stable car-

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ries a card showing the number of men it can shelter. Troops move out and new men come in, in the same day without confusion. This system is of special advantage from the transportation engineer's standpoint for it obviates the necessity for special camp roads, does away with the transportation of cumbersome camp equipment, and keeps men and materials concentrated on existing highways and village streets.

When a division moves to a new point different units of the division may be ordered to move on different routes. Marching troops are slow moving and tend to obstruct motor traffic on the main roads; side roads are better suited for them. Light motor ambulances can take a longer route, using secondary roads. Horse-drawn supply wagons can take rough side roads which have been allowed to get in bad condition. Heavy motor trucks, with low gasoline mileage and costly to repair, must have the best roads and the direct route. In such movements each unit is given its routing; it may or may not be designed to prevent congestion accordingly as the necessity exists. But the general scheme is there ready for use and it is made possible by the minute network of roads of all classes in the French system.

All cross roads and road junctions are plainly and permanently marked with distances and directions to neighboring points. This has proved an invaluable aid to effective movements of units in charge of officers, the great majority of whom are strangers in the particular locality. I cannot conceive of all the divergent movements of the present war being put through without the aid of these road signs, except with endless confusion and delay. On the other hand, they must be of similar aid to the enemy in the occupied territory. It would be an excellent plan in any retreat, or in time of invasion to have men especially detailed to destroy all road signs before the retirement.

II—TRAFFIC

At certain points and at certain times in the war zone the volume of traffic of course exceeds all limits of peace times. It combines all elements of destruction to the road surface which it uses. It is continuous and urgent. It cannot be halted for careful repairs or maintenance work to restore the road surface; yet the surface must be kept in a fair traveling condition. Travel must go on in the rainy season when the surface is softened and holes rapidly deepened by displacement of mud; and in dry summer, when the binder flies out in clouds and constant raveling occurs.

Traffic is made up of all varieties. Cavalry (very little); horse-drawn wagons and batteries with steel-tired wheels; troops with hob-nailed shoes; heavy motor trucks, and fast motor automobiles. It seemed that heavy motor trucks made up fully 50 per cent of the traffic on the main roads. It will be seen, from our American standards, that continuous traffic of the above nature constitutes as severe a test of a wearing surface as can be imagined.

Traffic on the Amiens Road

The road leading from Amiens to the front lines of the Peronne-Chaulnes sector, is a good example of extreme concentration of traffic on a main feeder of a busy front. From Proyart to the front—a distance of about nine miles—the bulk of the traffic must move at night, incidentally without lights, to avoid observation by the enemy. From Amiens to Proyart it moves principally in the day time. In both instances it is practically continuous—four solid lines of vehicles move in almost continuous procession. Slow-moving horse-drawn vehicles hug the shoulders of the roadway, leaving the center for motor travel. Fleets of motor trucks pound steadily by, in hundreds; spaced only about 50 ft. apart and traveling at an average rate of at least 12 miles an hour.

All convoys, or fleets of vehicles, move in a formation which provides an open space of 100 to 200 ft. or more after a group of several vehicles. Certain vehicles in the convoy carry a large red disk about a foot in diameter to indicate to the driver following that he is to leave space. This is to expedite the passage of fast-moving units, such as officers' cars, dispatch cars, or ambulances, which would otherwise be forced to proceed at the speed of the convoy. Even with four lines moving an open space several feet in width is usually maintained in the center. Independent units move in this, dropping into convoy spaces to permit the passage of other independents going in the opposite directions.

Cavalry and batteries are sometimes forced by traffic demands to move through the fields bordering on the roadway. It is quite common to see long stretches of main road where the effective width has been increased by what is practically an earth road on either side. Troops on the march are sometimes shunted to side, secondary or even temporary roads when the jam is great, and roadside signs indicating where this may be done are frequent. These expedients are necessary to the proper movement of wheeled traffic when a main trunk leading to a busy sector is reached. As a result this enormous traffic moves with a smoothness that is amazing.

Altogether, it is difficult to understand how any system of roads could handle traffic of such volume, continuity and destructive qualities. That it is being done in France indicates that there are lessons to be learned there by the highway engineering forces of all other nations. The various factors that make this feat possible are worthy of deep study and investigation which the nature of my army service made it impossible to give.

III—TYPE OF ROADS

The prevailing type of road in northern France is the waterbound macadam. Many gravel roads were also seen and a very few roads in the Marne Valley were found to be of a local chalky material. The latter were wholly minor roads. Except for the cobble and block streets of some of the villages, no bituminous macadam concrete, brick or any of our American so-called permanent types of construction were encountered.

The waterbound macadam type lends itself extremely well to the demands of war conditions. Material can often be found at roadside or locally, thus relieving the transportation system; maintenance and repairs can be conducted in the rough manner necessary to keeping roadways open and with unskilled labor and without special equipment. The severe test of this type would of course come in the summer, when the wear due to loss of binder in the wind and to raveling must be very great. Unfortunately, I was not in the war zone during that period and so cannot judge. I saw these roads in the early fall, however, and they seemed to be in what I could afterwards estimate as average good condition.

One is inclined to wonder just what would happen to our bituminous highway surfaces, to our 6-in. concrete, or to our brick construction if these were subjected to the continuous pounding of traffic such as occurs on the Amiens road, for instance. They would develop severe weaknesses, of course—no standard surface could withstand such wear. I believe that the difficulties in repairing them in kind would be enormous.

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owing to the absolute lack of time for necessary refinements. Modern war traffic over our standard country highways would undoubtedly bring serious problems of maintenance and repair.

IV—GENERAL MAINTENANCE AND REPAIR

The system of maintenance and repairs to road surfaces in the war zone might be summed up in the phrase, "do the best you can while you can." Work of this nature, in its true sense, cannot be performed with traffic demanding all of the roadway continuously. Makeshifts and rough work must be resorted to—such repairs as are possible must be made. When, and as soon as, the shifting of the point of big actions permits, complete repair and restoration of the road must be undertaken. It seems to be the French policy to keep all the important roads in best possible shape against the time when they must be used unsparingly, unmercifully and without repairs. No effort to accomplish this is neglected. In no other way can the excellent service given be explained.

To illustrate: On the eastern end of the line there was comparative quiet last winter. The big actions in the Argonne and around Verdun were over. They had unquestionably brought enormous destruction to the roads in these sectors. The Bar-le-Duc Verdun road, about 50 miles in length, had carried, during the months of the attack on Verdun, a continuous chain of about 5000 motor trucks night and day. The total wear and depreciation of the surface must have been terrific. But I found this road and the other main roads of these sectors in excellent condition; with smooth surfaces, full cross-section, clean waterways and with plentiful rock supply stored on the sides—in short, to all purposes, as good as new. Quite evidently these roads had been repaired and thoroughly renewed without loss of time immediately after traffic congestion ceased. They are now as ready as they can be made to withstand the strain of another great traffic concentration should it come—and it may come any time. This is true preparedness—the result, no doubt, of the old French thoroughness in road construction and maintenance, combined with the lesson of experience in the importance of serviceable roads to effective army operations. Its results are remarkable, especially when one considers the demands for labor and materials for purely offensive and defensive operations.

Worst Roads Near Firing Line

The worst roads are encountered very near the front, in an active sector. The artillery fire of the enemy within say, 5 kilometers of the front line, is very destructive to the roads and in a great measure prevents effective repair work. This is particularly true in the Somme sector, where the country is flat and practically treeless, and so without protection to the roads or the traffic moving on them. Most of the time the enemy fire is directed on the roads and batteries in the zone from 2 kilometers to 4 kilometers back of the line.

Here, too, the entire area was swept with creeping barrage fire during the Allied offensive and advance. Roads were destroyed and there has been no opportunity to rebuild them in good shape. It is a fact, therefore, that even the main road is in very rough condition after one advances beyond the position of the French first line trenches before the offensive—that is, in recaptured territory. Ambulances, for instance, are obliged to run largely in low gear from this point to and from the advanced dressing stations. The roads are passable but extremely rough. In this sector, too, upkeep of roads within about 2 kilometers of the front line is not attempted. Their position is too exposed and the shelling too severe. No vehicles approach the front beyond this limit, except the small "soup kitchen" and light supply wagons, and these only at night.

V—MAINTENANCE AND REPAIR

My study of the details of maintenance and repair was of necessity confined to what I could see by chance in passing along the highways on service runs. It was never possible to stop for discussion with the officials in charge or to examine the work closely. Often, however, I passed a single piece of work so frequently that I became fairly familiar with it. I was able to pick up some information from officers in cantonments, which, coupled with actual observation, gave me such knowledge of the system as I here present. It is obvious, however, that this discussion cannot go deeply into this very interesting subject. But with these reservations the statements are, I think, true to fact.

Nature of Work

The work very naturally divides itself into the more or less continuous addition of new material without interruption or real displacement of traffic—which can be called maintenance; and the renewal of the wearing surface completely, or repair.

Maintenance

The pre-war continuous patrol of road surfaces by individual cantonniers is not in evidence in the war zone. It is, of course, unnecessary to keep surfaces in the degree of excellence obtained in peace times. The little roadside houses of the cantonnier are now abandoned or used for storing tools. Maintenance, in the war sense, is practiced principally on the more important roads carrying heavy traffic. Two methods are in use:

1—Loose stone is placed by hand shovels in the surface depressions and compacted by traffic. The work is done at periods when the traffic is lightest. Usually the stone has to be placed hastily and in a rough manner. Sometimes it must be cast entirely from the sides. Compaction takes place very quickly under passing fleets of heavy motor trucks with solid double 4-in. rear tires. In the continuous wet weather that was the rule last winter the results were surprisingly good.

2—The surface is first roughly cleaned of excess mud. Working in short periods whenever traffic permits, layers of material about one stone thick are placed in narrow, longitudinal strips and rolled into the surface with steam rollers. The resulting surface in this, as in the first method, is irregular and rather rough, but the main object, which is to restore sufficient material to maintain full thickness, is accomplished.

Repair

Repairs to main trucks in busy sectors are not attempted except for the filling of shell holes. Material must be supplied by the methods above described and repairs postponed until such time as traffic will permit.

Surfaces are renewed by the half-section plan of operation. The old surface is scarified by hand and stone added to the desired thickness. Earth and clay seem to be freely used to expedite quick binding. The new surface is compacted with steam rollers.

Rock supply is often brought in by rail. Usually, though, there seemed to be a local source within wagon haul. The rock is broken by hand, either at the quarry or at roadside. Supply piles are kept stacked at roadside for maintenance and repair.

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Building stone from villages demolished by shell fire is another interesting source of road material. Stone is so generally used in the construction of French villages that in many cases a large amount of material convenient to the location of the work can be obtained in this manner. In the Somme sector one of our advanced posts was a dugout at the crossroads, which had once been the center of the village of Etrees. Originally it was 2 kilometers long and had a population of about 1500. I was amazed at the completeness with which it had been destroyed—there was hardly a sign of the building that must have stood there, not a wall or a portion of a wall standing. I soon learned that the underlying reason was that building stone had been carried away for road purposes.

Brick is also obtained from ruined buildings for road purposes. I saw an original and interesting type of surface reconstruction in the vicinity of the big base hospital at Marcelcave. A 3-in. course of brick bats, salvaged in this way, mixed with a small percentage of crushed stone, compacted with a steam roller, was used. The finished surface was quite smooth and looked like a red clay road of our South. Wet weather continued during the time this surface was under my observation. Under this favorable condition it was an excellent road. It was probably recognized as a temporary expedient and will be in some manner strengthened to withstand dry summer weather.

Labor Used

Fighting men are not used for road work. All road work is done by men over the military age, by prisoners of war and by Anamites. Prisoners of war may not be and are not, worked within the fire zone—that is, in ordinary range of their own guns. Manual labor on the roads is also optional with them and they are paid therefor. Great numbers of them may be seen at maintenance and repair work, however.

The Anamites are soldiers of Chinese appearance from the French province of Anam in Asia. They do not, I understand, believe in warfare and are used for guard duty well back of the lines and are apparently the main source of road labor. In winter they are largely employed in clearing roadways of snow and scraping from the surfaces mud, which collects in enormous quantities.

VI—GENERAL CONDITIONS

As stated in the beginning of this paper, my work by good fortune carried me over many hundred miles of roads of all classes in the war zone. The average condition of these roads was far better than, under the circumstances, I expected. The first and second-class highways are kept in relatively excellent condition. The community roads have, in very many cases, gotten into rather bad shape. They are often extremely rough with big holes, but they are hard surfaced and carry their traffic with safety from miring, if without comfort. This neglect of minor roads at certain points is evidently deliberate. It is true economy that decides it. These roads are used almost entirely by horse-drawn vehicles, which are not seriously handicapped or damaged by them; in their ordinary use speed is not essential; the distance traveled over them in reaching a second or first-class road from the particular village is always short. The labor and materials necessary to their upkeep can be expended with greater effectiveness on the main roads. It comes back to our own policy and basis in the design of American road system; 80 per cent of the traffic on 20 per cent of the road, and I think that the ratio in favor of the concentration of effort on main trunks is even more marked under the peculiar requirements of war traffic.

VII—CONCLUSION

It is evident that the French road system has made good. I cannot conceive of any road system in the world designed without knowledge of the present demands meeting the situation as well; indeed, it almost seems that the French system *must* have been planned for just the present conditions. Its basic theory was certainly sound. The following features of its design have proven of special advantage at this time of crisis when so much depended on its carrying the war traffic efficiently, without delay or confusion, and with economy of effort:

1—**Grade**—The prevailing grades are very easy, permitting heavy loads for horse-drawn vehicles and faster speeds for motor convoys. Location lines are found to follow contours in almost all cases. This has made for easier maintenance and easier rebuilding after destruction.

2—**Drainage.**—The drainage systems, surface, side and subdrainage seemed to be practically perfect. Outside of villages I do not recall a single instance of poor drainage on a first or second-class road. This has been a considerable factor in giving durability under the war traffic.

3—**Foundation.**—Without adequate foundations, the main roads would have long ago completely failed. Maintenance, care or addition of surface rock could not have saved them. But these roads, even the worst community roads, stay solid and traffic does not mire or stick in soft stretches of broken sub-base soils. This is one of the great lessons driven home; good foundation and adequate thickness of pavement.

4—**Width.**—Width of traveling surface has been most important to army transport. Some of the grand highways, main feeds to the front, have a width of about 33 ft. between shoulders. Even this is crowded to capacity most of the time. How great a factor these widths have been to the success of the French army cannot be estimated nor can we guess the difference in offensive and defensive results, if they had been, say, the 18-ft. American standard.

5—**High Ratio of Road Mileage.**—The landscape of France is a veritable network of roads. The number of miles of road per square mile of territory must be at least double—probably more—than in the United States. Inasmuch as these are all improved roads this has been of great service to army movements. Between two given points several routes may be selected, none of which will greatly exceed the most direct route in distance. To aid in the understanding of the continual large movements in the war zone, I should have, perhaps, explained earlier that divisions are constantly shifting location from one sector of the front to another; from the rear of the war zone to the actual front; in the very active sectors, a particular division may be in the trenches only a few days—two weeks is said to be the average. It is this feature—sometimes overlooked—combined with demands for munitions and supplies, which accounts for the great burden of traffic these roads must bear. The dispersion of travel over different routes made possible by the high mileage ratio is, therefore, another great advantage of the French plan.

6—**Road Signs.**—The military advantages of this feature have been discussed—they have depended on the fact that the work was done comprehensively, accurately and for permanence. The uniformity of signs throughout the country enhances their value.

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An Agricultural Power Unit

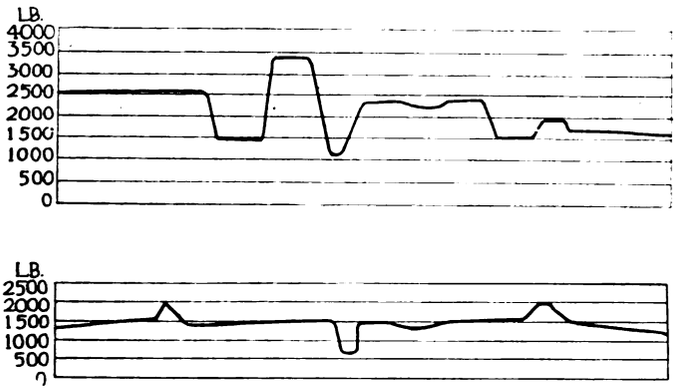
Some Factors Governing the Design of a Small Tractor—Problems New to the Mechanical Engineer Involved—A Variety of Possible Types Considered

Part II

By Alan E. L. Charlton

From the tests at 2 m.p.h. (see Fig. 7) when the drawbar-pull is 500 lb. per share, the curves in Fig. 8 have been got out in which the important effect of gradient is indicated. For four shares and a gradient of 1 in 10 it will be noted that the load at the engine is 23 b.hp., and it is desirable that this should be obtainable if not inconsistent with the other governing factors of the design, for with four shares instead of three, 25 per cent extra ploughing will be effected for the same cost of labor.

Weight of tractor, 3¼ tons.
Weight on driving wheels, 5000 lb.
B.hp. of engine = 18·75.
Driving wheels, 4 ft. 6 in. dia., 15 in. wide.
Plough, Ransome, 3-share, cutting 6 in. deep, 9 in. wide.



Upper Graph—Test No. 1

Ploughing at 1·57 m.p.h. in stubble. Stiff clay land.
Mean drawbar pull, 2300 lb.
Mean drawbar hp. = 9·65 = 3·21 hp. per share.

Lower Graph—Test No. 2

Ploughing at 2 m.p.h. in stubble. Medium soil.
Mean drawbar pull, 1500 lb.
Mean drawbar hp. = 8 = 2·66 hp. per share.
Rolling resistance of tractor with spuds on = 277 lb. per ton.
Power used in ploughing = 8·0 hp. = 42.5 per cent of total hp.
Power used in rolling res. = 4·8 hp. = 25·5 per cent of total hp.
Power used in transmission = 5·95 hp. = 32 per cent of total hp.

Fig. 7—Tests of Two-Cylinder Paraffin Tractor

From the tests made in dragging the tractor, the 900 lb. drawbar-pull for a 3¼-ton tractor is equivalent to a rolling resistance of 277 lb. per ton on land. As the tests show the loss in the gearing of the tractor is 32 per cent of the total power; had the gear of this tractor been constructed on the lines of motor car practice a considerably higher efficiency would have been obtained.

From the other test at 1.57 m.p.h. the drawbar-pull is 2300 lb., or 766 lb. per share, the drop in speed allowing the engine to deal with the stronger land. The peakiness of this curve shows the value of large flywheel effort on the engine.

The highest power which a tractor when acting as a stationary power unit is called upon to provide, is generally accepted as that for threshing.

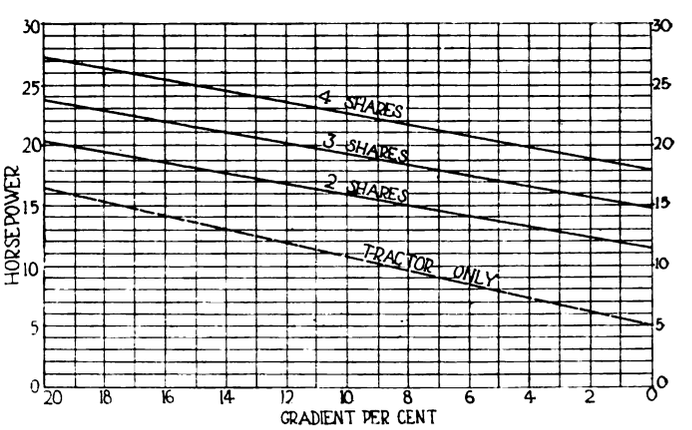
Table Fig. 9 gives an approximate power curve for different sizes of threshing machines. From this it will be seen that 20 hp. is not exceeded, though it is usual to allow 25 hp. for large machines. For grinding the powers are less.

Summing up now, and allowing a margin of safety on the results so far arrived at, the fundamental values for the multi-purpose tractor may be taken as—

	Power Reqd.	Driving Axle Loading.
Road Work	18 to 20 hp.	4400 lb.
Land Work	23 to 25 hp.	"
Farmstead	20 to 25 hp.	Stationary

Though the following observations are not fundamental they form very important considerations in the design of a tractor.

The Engine.—Any consideration of the engine must begin with the conditions under which it has to run on a farm, the inexpert attention likely to be given to it being an important factor. Generally, while this necessitates robust construction, it also calls for a low power rating or a considerable reserve of power, and probably the factors of low speed, large cylinder capacity for power required, strength and simplicity of parts are the main ones. That the engine must



Weight in working order with 3-share plough, 3 tons.
Ploughing speed, 2 m.p.h.
Rolling resistance of Tractor with spuds on, 280 lb. per ton.
Furrows, 6 in. deep, 9 in. wide. Gearing efficiency, 80 per cent.
Pull required per share, on stubble land, 500 lb.

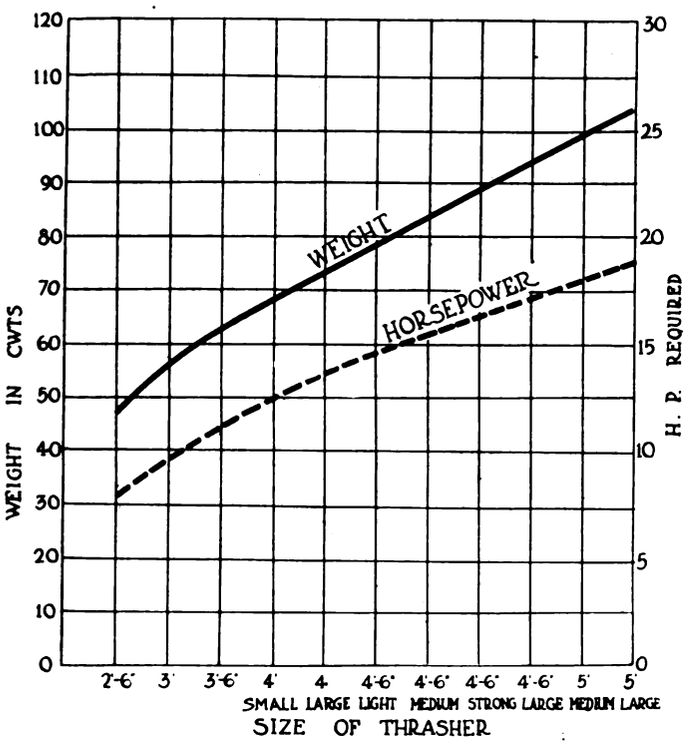
Fig. 8—Power Required on Gradients Ploughing Medium Soil.

operate on kerosene is a *sine qua non*, and further, it is preferable that it should develop its power without water injection.

The gain to be obtained by the use of crude oil in a high compression engine would justify the greater refinement of the engine, though there is greater difficulty in obtaining the fuel, kerosene being probably the most universally and readily obtainable of all oil fuels. On the other hand, such an engine

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running on kerosene would probably use up to 30 per cent less, a very material and important saving and one which should induce the engineer to persevere with this type; the fact that the automatic-ignition of this type removes the risks of all electrical gear must be borne in mind. It should be quite possible, however, to secure better economies with the ordinary engine than are at present customary. It may be taken that the consumption per acre in practice is 3 gal., often more, sometimes less. A 20 hp. tractor has probably an average load of not more than five-eighths of the maximum, or say 12½ b.hp. (see dynamometer readings—3 shares, plus allowance for stoppages and headlands). Taking 2 hr. per acre, this gives, say, 12 pints per hour or 0.96 pint per brake horsepower. This result is not at all a bad one, and is probably much better than what is actually taking place in day to day work when the tractor is run by an ordinary farm hand. It should be possible to cut it down to 0.85 pint per brake horsepower, or with a high compression engine to 0.6 pint or even less.



The type of engine used, whether vertical or horizontal, would in practice largely depend upon the plant of the manufacturer, four-cylinder vertical engines being naturally adopted by the motor car engineer, whose factory is suited to that type; where factory considerations do not step in it might very reasonably be claimed that the horizontal type is to be preferred. It has frequently been found in practice with vertical engines not possessing vaporizing devices in the engine cylinder, that some of the kerosene fuel passes the pistons and mixes with the lubricating oil in the crank chamber, with a consequent thinning of the lubricant, which causes excessive wear on the main and crankpin bearings. It is not suggested that there are not many effective kerosene carbureters on the market, but rather that, despite these, with the class of labor available on the farm for operating the tractor, such action will frequently take place in starting up and on light load.

The horizontal engine gets over this difficulty inasmuch as excess kerosene will drain off through the exhaust valve before reaching the piston. A form of inlet valve which has been very successful is shown in Fig. 10. It will be noted that the hollow head, which is kept hot by the cylinder temperature, is arranged so that the entering gases in passing at a high speed through the venturi will impinge upon the hot walls; this forms an effective and compact vaporizer, and at the same time being in an inverted form, is self-draining. It must not be forgotten that the hot bulb engine can work with tube ignition, thus cutting out the electric installation, which is of all parts of the tractor probably the least understood by the farm hand; incidently, the running cost is reduced, as gasoline is not required for starting up. Thus such an engine could be arranged to operate by tube with but trivial alteration, in case of failure of the electric ignition.

The water injection, so often found in the high-speed engine of the vertical type, cannot be said to be conducive to long life; it was tried years ago in gas engine practice and eventually dropped.

The vertical quick running type can be and is manufactured at a less total weight, and this has been an additional reason for its use on light-weight tractors. It is, however, quite reasonable to ask whether, despite our being used to comparatively high speed engines on motor cars and wagons where the average load is low, and the quality of fuel and the attention good, a speed of 500 r.p.m. can be exceeded under the conditions of farm service, quality of labor, heavy ploughing loads and kerosene fuel, without a more than proportionate risk in wear and tear. Fig. 5 shows diagrammatically the two types of tractor, of which there are, of course, many variations.

Further, it is considered desirable that full power should be obtained with a mean pressure of only about 50 lb. per square inch, and that as in the horizontal type of engine the vaporizer should be in the cylinder head and allow of easy drainage for the use of low grade fuels. A suitable arrangement has already been described in Fig. 10.

It is quite true that the high speed engine reduces the weight of the tractor, but in view of the necessity of giving a reasonably long life under the conditions of farm usage, it is debatable if this is a wise policy. A comparison with a light-weight tractor on a basis of cylinder capacity indicates that these tractors obtain their light weight per horsepower largely by high engine speed and rating.

Flywheel Effect.—It is very desirable to arrange for ample storage of power in the flywheel of the engine to provide for the momentary excess required when meeting hard places, whereby the engine is subject to less strain, and the fuel consumption should also benefit. In the horizontal type suggested the flywheel effect is sufficient to provide 50 per cent

Type of Tractor	Weight, Lb.	B.H.P.	Bore, In.	Stroke, In.	Revs. per Minute	♀p Lb. per Sq. In.	♀p Wt. Tons	Vol. Swept per Min. Cu. Ft.	Vol. Swept per B.H.P. Cu. Ft.	Vol. Swept Wt. Tons
Four-cyl. vertical light type tractor.	3000	25	4¼	5¾	900	67	50	340	13.6	254
Two-cyl. horizontal multi-purpose tractor.....	5600	28	7½	11	475	48	10	534	19	214

power increase for about 30 sec. In the light tractor with a quick running engine there is usually considerably less power storage in the flywheel and the engine must bear directly the extra demands and shocks.

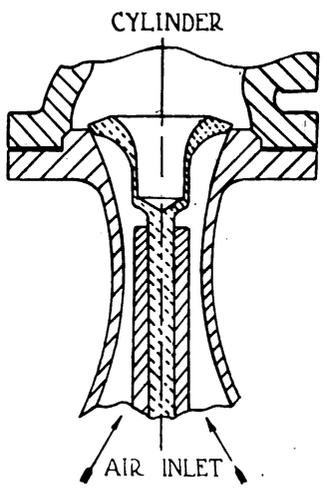


Fig. 10—Paraffin vaporizer

Cooling.—Two methods are in vogue for cooling the engine—in the one the motor car system, a radiator, fan and circulating pump are used, and in general the whole conforms very much to the standard practice in this respect. In the other system tank storage is adopted, the cooling of the motor being obtained through the loss of heat, due to evaporation from the open tank (the released latent heat of course effecting this).

The tank system is simple and is more fool-proof in its working. It allows of almost any sort of water being used, such as is found in

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streams and drains about the fields, but on the other hand, it needs considerably more make-up water than does the radiator system. The advantage of the radiator system is the much smaller quantity of water needed, so that if water is scarce the saving in cartage may be considerable. Its disadvantage is that the radiator itself may silt up or in some way develop leaks.

Both systems are used and probably local conditions will govern the choice.

Frame.—The older type medium weight machines employed as a rule a special frame built up of rolled sections, while later designs, in order to save weight, have incorporated the frame in the general design of the machine with advantage. This feature should undoubtedly be adopted in the design of a multi-purpose machine.

Gearing.—The typical forms of gearing for the two types of tractors are shown in Fig. 5. In one we have the design based on the motor car arrangement, using either bevel or worm gears, and with a high reduction on account of the high speed engines, and in the other the design is based on that of the steam traction engine, in which neither the bevel nor worm is necessary; due to the cross-setting of the engine this type has not usually been totally inclosed. This feature, *i.e.*, the total inclosing of the gearing and the running of the gears in oil baths, which originated in motor car practice, should undoubtedly be incorporated in the other. As the test detailed in Fig. 7 indicated, the loss in the gearing is high, due probably to the exposed gears, want of alignment under load and insufficient lubrication. When the horizontal engine type is built with all gearing totally inclosed, the efficiency should be equal to motor car practice. As the reduction is less, and as no bevel or worm is employed, it is not unreasonable to expect from the horizontal engine a higher overall efficiency than from the high-speed engine design. The advantages of ball or roller bearings in the reduction of frictional losses are questionable. Published tests indicate but small bearing losses, so that any gain would be trivial.

Steering.—There are two types of steering, the single and double pivot. The one is practically the standard in present agricultural machines, as steam tractors, etc., and the other is the standard in motor car practice.

The first is simple, cheap and strong in principle, and outside agricultural work, it is chiefly used in steam wagon practice. Yet despite this, there is a general tendency to adopt the double pivot system for small tractor work, and this system, when centrally mounted so as to give three-point suspension, is to be preferred for the class of tractor under consideration, Fig. 11.

Wheel Arrangements.—Fig. 12 shows some of the arrangements of the wheels of tractors on the market, for each of which the makers claim special advantages.

It is not proposed to enter into an examination of the claims of any particular arrangement as they refer solely to land work and not to the road, their use on which is somewhat in the nature of a by-product. The need for a tractor to be an efficient machine for road work, materially narrows the field of selection, and as long practice has proved that, for the power contemplated, the two-track four-wheel machine is the most suitable, this seems undoubtedly the one to be selected as such a wheel arrangement is equally effective on the land.

The size of wheels may be 3 ft. by 5 in. for front wheels, and 4 ft. by 12 in. for back driving wheels.

It is noticeable that there seems to be a tendency in tractors now coming into use to adopt rather smaller diameter wheels (4 ft.), probably with a view to reduce weight.

The caterpillar arrangement, while entirely suitable for special conditions on the land, cannot be considered as an advisable type for regular road work.

In order to stand up to the road work the wheels of the tractor must be specially strong, though this naturally tends to increase of weight. It is true that, to save in the total weight of the tractor, light wheels might be adopted for work on the land, so designed as to be readily replaced by specially strong and heavy ones when the tractor is required to run on the road. In actual practice, however, it is prob-

(*Continued on page* 294)

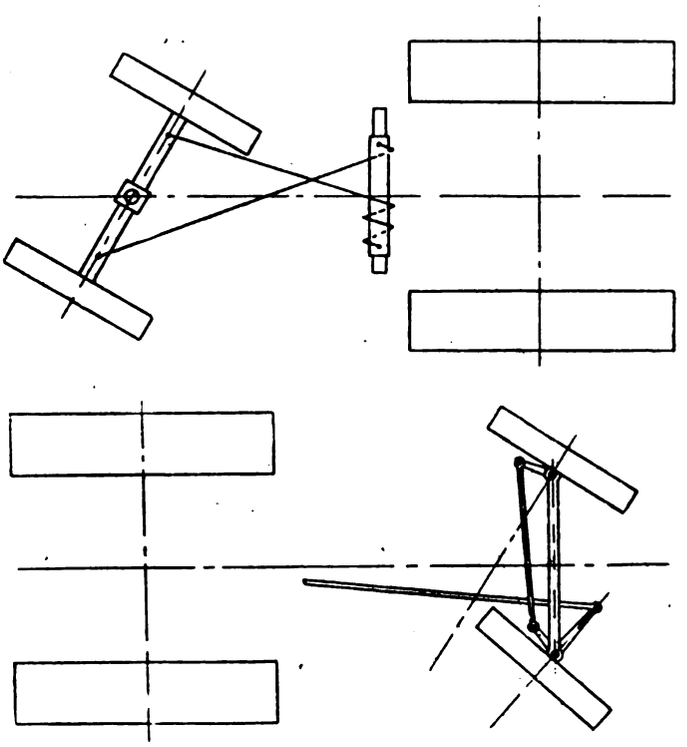


Fig. 11—*Two forms of steering*

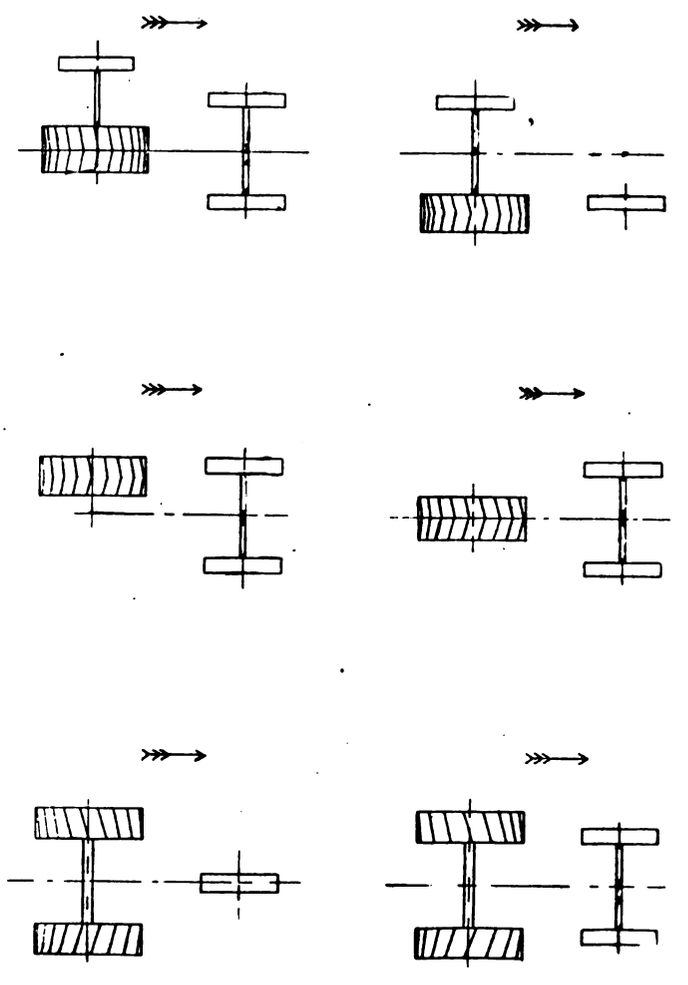


Fig. 12—*Different wheel arrangements*

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Systematically Handling Income Tax Returns For Employees

Twenty-Four Men Required To Help Ford Force of 12,000 Fill Out Forms Properly

INCOME TAX

Come to the Factory Legal Department, Y-4-4, fourth floor Y building, to-morrow, after work, to make out your income-tax statement.

This statement will cover your total income for 1917.

Bring your tax receipts, land contracts, bank books, and all other papers regarding money you have received or owe during last year.

Ford Motor Company.

Fig. 1—*Summons blank which is attached to timecard bidding employee to come to office for assistance in filling out blank*

INDUSTRIAL concerns employing large numbers of men should assist their employees, and incidentally the government, by aiding in the filling out of the individual income-tax return blank.

Handling this matter on a systematic basis will not only make the matter less of a burden to employees but will also reduce the loss of unnecessary time which would otherwise be spent in endeavoring to make a correct return. This is not only true of concerns which employ a large number of foreign or unskilled workmen, but also those who have any great number of employees who are receiving more than $800 per annum.

It is not difficult to handle the matter rapidly, and the following method, which is employed by the Ford Motor Co., Detroit, can be used for any manufacturing concern, and will enable the employees to make correct returns in a minimum time and with the least amount of trouble to the government, the employer, and the individual.

For 12,000 taxable employees it requires twenty-four men to handle the job expeditiously. To put this another way, twenty-four men can take care of 500 a day. For a total working force of 2000 men it would not be necessary to have more than four, so that the proportion of men necessary to handle the work runs about two men per 1000 taxable employees.

To handle the work it requires a record book, a summons blank, a posted notice, and a supply of income-tax blanks.

In the record book is kept a list of the employees by number. The headings on the columns at the tops of each of the pages in the record book are:
Number. Name. Address. Amount paid 1917 Married.

Reference to the employee is by number, corresponding to the number on his time-clock card. The amount paid in 1917 is arrived at by taking 294 days as full time and multiplying this by the daily rate. Under the column Married is written the word Yes or No. The days absent are deducted from the 294 in the record under the column Amount Paid 1917.

How Records Are Kept

The head of the department—which may be called for the moment the Income Tax Advisory Department—keeps the record in his possession. The head of the department also plans the day before how many men he desires to take care of on the following day. He issues summons blanks in accordance with this number. These summons blanks are shown in Fig. 1. They are attached to the time-clock card of the men it is desired to call in, and, as will be noted by the wording on the card, they give the men a day's notice in advance. If there is too much congestion at the office owing to too large a number of the summons cards having been issued, it is only necessary to take the number of men desired and to ask the rest to report on the following day. The summons cards for that day are reduced accordingly.

The blank filled out is entitled "Form 1040 A—United States Internal Revenue." This is for net incomes of not more than $3,000. There are nineteen questions on this blank and an affidavit at the bottom. This is all that need be filled out unless there are other sources of income, in which case a few additional questions must be answered. The government will assign you an expert to aid you in giving advice to your employees, and he

NOTICE

U. S. FEDERAL INCOME TAX WILL SOON BE DUE

Know amount of your taxes

Know amount of your income for 1917

Our Income Tax Advisory Department will assist you in filling out your blank.

Fig. 2—*Notice posted in each department to be ready as Federal Income Tax will soon be due*

EMPLOYEES RECORD BOOK

No.	Name	Address	Amount Paid 1917	Married

Fig. 3—*Employees record book*

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will coach the men that you assign to this work as deputy. In this way it is quite simple for you to get an efficient force to handle the matter, and you will be able to expeditiously take care of the blank.

When the blank is filled out the man passes on to a notary, where he swears to his statements, and he then passes on to the cashier, where he pays his tax in to the latter, who issues him a receipt and takes his blank to forward to the government. It is highly important that the blank be taken at the same time that the money is taken, so that it can be forwarded to the government together with the check covering the income tax for any part or all of the employees. The blanks which go to make up the amount on the check are forwarded with the check.

Should the employee not have the money to pay his tax he leaves his blank in the income-tax advisory department, which forwards it to the government, and the latter sends an income-tax invoice to the individual who pays it directly.

There are several points to observe in working this system, one being to make any corrections in the record book at the time the employee is examined, should any errors be found.

The blank, which comes in two pages, containing the tax returns on one sheet and the instructions on the other, is torn in half at the time the employee fills out his blank; the half with the tax data upon it goes to the government, and the half with the instructions are retained by the employee for reference, either for himself or friends.

A very important part of the system is that no one should be assisted in filling out his blank unless he brings with him his summons blank. In this way the committee in charge can entirely control the number of men taken care of each day. They can also handle the men by their numerical order in the record book, and in this way avoid any necessity of having to jump from one part of the record book to another in tracing the men who come up to the committee for assistance.

Before putting the system in operation arrangements should be made with your local government authorities: first, for a man to instruct your deputies, who are in turn to assist the employees in filling out their blanks; and second, for accepting checks from your concern for the employees you are taking care of. Some concerns, such as the Burroughs Adding Machine, have found it better to open a separate account to handle this matter, the account being opened at $1,000 advanced from the treasury of the company, and then, after the money has been taken in from the employees and paid to the government, the account is closed out and the $1,000 returned to the treasury.

To sum up the steps in the operation of the system above, the course of the employee in filling out his blank may be traced:

1. Employee sees notice posted in his department to be ready, as his Federal Income Tax will soon be due.

2. Employee receives summons card attached to his clock card, bidding him come to office for assistance in filling out blank to-morrow.

3. Employee enters Income Tax Advisory Department in his proper turn, is seated at table with member of advisory committee, who assists him fill out blank, referring to record book should employee have doubt regarding his yearly income.

4. Record book used to check up statements regarding annual income or married state of employee, should such appear necessary.

5. Employee goes to notary in income-tax advisory department and swears to or affirms his answers.

6. Employee takes blank sheet which has his income-tax data upon it to cashier and deposits it with him, together with check, money order or cash covering the same. He retains other half of income-tax blank containing instructions for reference for himself or friends; or,

7. If he has not the money to pay his income tax he leaves blank with income-tax advisory department, which forwards it to government, which in turn sends invoice to individual.

8. Cashier sends income-tax blanks, together with check covering same, to government.

Laminum Shims for Engine Bearings

IT is now the general custom, in order to facilitate the taking up of engine bearings, to provide shims between the bearing proper and its cap. These shims may be either solid or they may be made up of a considerable number of very thin leaves of which one or more can be removed when the bearing has to be adjusted. The advantage of the solid shim is that it always gives the same degree of adjustment when the cap is drawn up tight. Its disadvantage is that the work of filing down the shim to reduce the bearing diameter is very tedious, and, besides, very few workmen are sufficiently expert with the file to be able to file down the shim absolutely parallel. The so-called loose leaf shim has the advantage that it permits of easy adjustment of the bearing, because all that is necessary after the cap has been removed is to take out one or two of the leaves and replace the cap. Unfortunately, there are also difficulties with the loose-leaf shims. The leaves are only about 3/1000 in. in thickness, and it is obvious that they cannot stand any hard usage. When removing a bearing cap it is a frequent experience that all of the leaves will drop from the bearing bolts and one or more are lost. Furthermore, the leaves are likely to be covered by oil and the thickness of the oil film will be different according to the temperature and the grade of oil.

A special form of shim which is claimed to combine the advantages of the solid brass shim with those of the loose-leaf shim is being manufactured by the Laminated Shim Co., New York. This shim, known as Laminum, is made of a number of sheets of brass, 0.002 in. or 0.003 in. thick, the sheets being firmly held together by a metallic binder. As far as can be seen by the naked eye the shim appears as made of solid brass. However, the nature of the binder is such that any sheet can easily be peeled off and thus the thickness of the whole shim be reduced by 2/1000 or 3/1000 of an inch. There is no possibility of loosing sheets by dropping them or of getting them covered with dirt, and the shims always remain absolutely parallel. The individual layers can be readily peeled off by means of a penknife. The advantages of such shims to the repair man are obvious.

Electrically Heated Foot Warmer

To minimize the discomfort of long standing outdoors in severe weather, an electrically heated foot-warmer has just been placed upon the market by the Westinghouse Electric & Manufacturing Co. of East Pittsburgh, Pa. While designed primarily for lookouts stationed in the bow and crow's nest of vessels, the device is applicable to the use of watchmen, sentries, doormen, traffic policemen and others whose work requires them to be out of doors continuously with little chance for exercise. It has been found that if the rest of the body is adequately clothed, a foot-warmer will insure comfort at any temperature.

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Trucks Move French to Italy

By W. F. Bradley

PARIS, Jan. 1—The transfer, in the minimum of time, of big French and British forces from the French to the Italian front, when this latter was threatened by the great Germano-Austrian thrust, was one of the triumphs of the automobile. Under war conditions, which obviously exclude Switzerland, there are two railroad routes between France and Italy. The more northern one passes the frontier near Modane, by the Mont Cenis pass, 6500 ft. above sea level, and the other follows the shores of the Mediterranean. To get the armies into Italy in time to save the situation, these two lines had to be turned over exclusively to one-way military traffic, most of the trains returning empty in order not to lose time in loading. This railroad traffic included all kinds of war material, not neglecting automobiles.

Over Alpine Passes

But the railroad was not alone in taking relief to the Italian forces. There are two main passes over the Alps, one at Mont Cenis, following practically the same route as the railroad, and another cutting across very near the coast line; between these two there are a few minor passes, all of them less than 6000 ft., but often presenting difficulties by reason of the roads. All these available roads were made use of by automobile convoys, which at times passed in a continuous stream. As there has not been since the war any great amount of road traffic between Italy and France, these various routes naturally formed one-way roads, which was a fortunate condition, for even on perfectly engineered European roads the passage of incessant convoys in a mountainous district is not an easy operation. The difficult nature of the operation will be understood when it is mentioned that on some of these Alpine routes there is a continuous climb for 12 miles and an unbroken descent for 14½ miles. Many of these mountain roads are merely a ledge cut out of the face of the cliff; many of the village streets were only just wide enough for two touring cars abreast and did not give sufficient room for two trucks to pass. There were sharp hairpins which if not taken with the correct lock on the first attempt would necessitate backing and the possible holding up of the entire convoy.

More than 100 years ago Napoleon passed over these same Alpine roads with horse and mule convoys, and the task is still pointed out as a marvel of organization. The traffic of the French and British armies which went into Italy by road in October and November, 1917, is greater than that required by Napoleon, and was much more difficult to organize, for the time element was most important; yet the whole was handled in a marvellous manner and has been passed over by the general public as almost commonplace.

Danger Signs Posted

To reduce the possibility of accidents, road signs were erected on a liberal scale. In this district direction was the least important indication. As the men did not know the roads, warning notices gave indications of all the obstacles ahead and told where the men had to change into low gear in order to get the advantage of the motor as a brake on the dangerous descents. On the long climbs it was necessary also to warn the men so that they would space out and have their sprags down in case the truck should begin to run backward.

Trucks were grouped in convoys of 20, each group being in charge of an officer, and no group allowed to overtake another. Every truck was provided with its own two-wheel trailer, one of these being a workshop and another a kitchen, for each convoy. The truck with the workshop trailer was provided with ropes, pick, shovel, planks and long levers in order to give assistance to any vehicle which met with a road accident. Aboard the kitchen trailer meals were prepared for the entire personnel of the convoy, between 80 and 90 men, while the column was in motion. The supplies of food carried made the men independent of the country through which they were passing, but stages were so planned that several columns would reach the same town at night, when the men would be housed in the local barracks, in some public building, or, if necessary, billetted with the inhabitants.

Every truck carried its own gasoline and oil for the entire journey, and in addition a certain provision of gasoline to allow them to operate on reaching the Italian front. The distance which had to be provided for varied from a few hundred miles to over 1000, some of the troops starting from near the frontier, while others had to move from northern France into the heart of Italy. This huge movement of automobiles was responsible in a very large measure for the shortage of gasoline experienced by the public in many districts of France. The army had to take the whole of the reserve stocks found in their district, and for a time left civilians without a drop of gasoline.

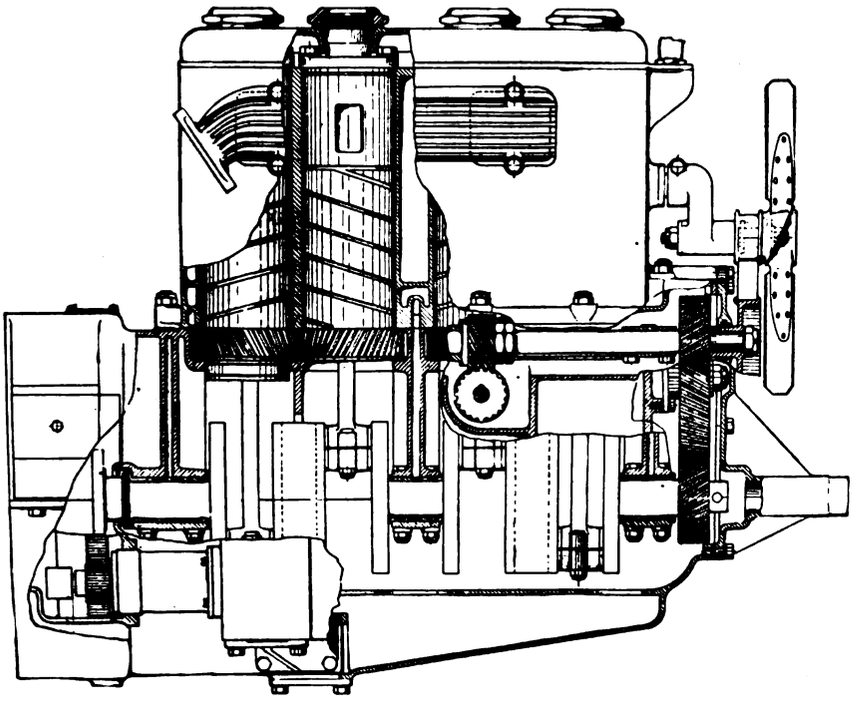
Generally the freight space aboard the automobiles was made use of for goods rather than troops. Over such a long distance it was more economical to send infantry by train and let the automobile columns handle the material required by the artillery and the engineers. Much of the motor-hauled artillery was advantageously sent through by road, while the horse-drawn material was put on the railroad.

American Sleeve Valve Engine

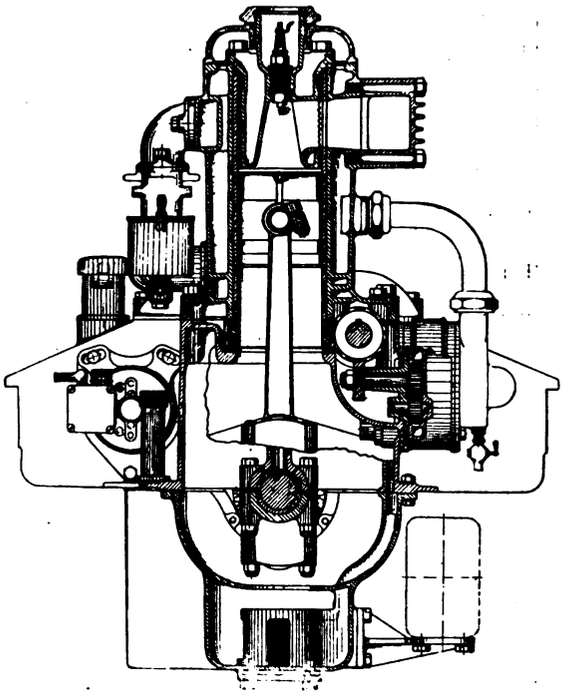
AMONG the most interesting new engines seen at the recent New York automobile show was the American sleeve valve engine manufactured by the American Sleeve Valve Motor Co., Philadelphia. The dominant feature of the engine is a revolving cylindrical sleeve between the piston and cylinder wall which replaces the valve gear of the poppet valve type of engine. This sleeve, which is lubricated by oil films between the bearing surfaces, has no vertical movement whatever and in revolving passes the intake and exhaust ports in the cylinder at the proper time. The valve gear as a whole consists of the rotating sleeve, which is driven by a worm gear from the bottom of the sleeve. In this way the number of parts are considerably reduced as compared with that of the poppet type of valve gear.

One of the features of the valve gear is that the timing is not affected by the crankshaft speed, as it may be in the case of the poppet valve type, in which the loss of power at high speeds can be traced in a great number of instances to the inertia effects of the reciprocating parts of the valve

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Side view of American sleeve valve engine showing sleeve gears and counter balanced crankshaft



Cross-sectional view of American sleeve valve engine

gear, which at high speeds will no longer follow the contour of the cams. On account of the rotating motion of the sleeve, it is worn equally by the piston, thus insuring a uniform piston clearance and also uniform compression.

The area of the intake and exhaust ports can be made large, and this fact makes possible very good scavenging action during the exhaust stroke, as the cylinder can be exhausted through an unobstructed port. The single sleeve also makes possible efficient cooling.

The engine is lubricated by a force feed system which is worked at constant pressure to guard against over-lubrication. The oil is carried to the upper part of the cylinders by means of helical grooves, which furnish the supply of oil for the oil film between the sleeve and the cylinder wall. The crankshaft is of the counterbalanced type and the pistons are light in weight. The crankcase and several other parts are made af aluminum.

The four-cylinder engine, which has a bore of 4 in. and a stroke of 5 in., develops a rather high horsepower for its displacement. The N. A. C. C. rating of the engine at a piston speed of 1000 ft. per min. is 25.6 hp., but the engine actually delivers 43.6 hp. at this piston speed. A test made on this engine by the manufacturer gave these results:

R.p.m.	B.hp.	R.p.m.	B.hp.
400.....	4.96	1600.....	50.88
600.....	10.20	2000.....	54.00
800.....	20.80	2400.....	56.88
1200.....	43.68		

From a production standpoint the engine represents practically straight machine work through the entire assembly.

Specifications for Class B Chassis Assemblies

(*Continued from page* 264)

manifold must be free from all leaks.

39. **Sprag**—All connections of cable must be secure. Raising and lowering mechanism shall operate properly.

40. All pin connections and pulleys must be well lubricated.

41. **Painting**—Chassis must be painted as per following specifications: The entire chassis must be thoroughly cleansed of all dirt, grease or oil, and covered with a coat of best quality rust-resisting metal primer.

It shall then be painted with two coats of best quality paint (olive-drab color), per sample submitted to this office for approval.

Each coat must be permitted to become thoroughly dry before applying following coat.

Purveyor to guarantee paint against checking, blistering or peeling for period of six months.

42. **Lubrication**—Before shipment each truck must be thoroughly lubricated. The engine, transmission, axle, steering gear, spring brackets and all grease cups, etc., must be filled to the proper level with approved lubricant.

43. **Preparation for Shipment**—Where rail shipment is required, all parts liable to rust must be coated with a heavy oil or dope.

44. Care must be taken that any parts liable to injury by weather or rough handling are protected in the proper manner.

45. The cooling system must be drained out to prevent damage by freezing. All gasoline must be drained out before shipment to prevent danger of fire.

46. The clutch must be blocked in the disengaged position to prevent the plates from sticking.

47. **Road Test**—Every chassis must go through a road test of at least fifty (50) miles. The last twenty (20) miles of this test must be made with a load of 7500 pounds, inclusive of the body but exclusive of passengers and equipment. At the completion of the road test all trucks shall be presented to the senior inspector or his designated representative for approval.

48. The inspector making this test must catch any deficiency in performance, cooling trouble, engine knocks, noisy gears, overheating axle and wheel bearings, defective brakes, play in universals, loose fits in splined shafts, governor action, clutch action, compression leaks at cylinder head gasket, spark plugs, valves or leaky piston rings, oil leaks in any part of engine, transmissions or rear axle, play in any part of steering arrangement, improper steering qualities, defects in control of truck, defects in spring action, defects in carburetion, unnecessary rattles in hood, floorboards, body, etc.

49. Governors to be checked for a speed of fourteen (14) miles per hour.

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The AUTOMOBILE

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Modernizing Shipbuilding

PROBABLY the greatest problem that confronts our Government at the present time is that of quickly building a sufficient transport and cargo fleet to maintain a large army abroad. To speed up shipbuilding it was at one time proposed to build wooden cargo ships, but the impossibility of producing large wooden structures on the interchangeable plan and the insufficient strength of wood to withstand the heavy stresses of steam power and ocean waves made this plan impracticable and led to its abandonment.

Few ocean steamers had been built in the United States in recent times and there was therefore little equipment at hand for producing the special section steels used in shipbuilding. To have first produced such equipment would not only have meant delay, but would have put an unnecessary tax on the steel production of the country. The plan was therefore conceived of using structural shapes instead of marine sections, and though the ships still have to prove themselves, the fact that Lloyds, the big London marine insurance underwriting concern, has given them an A-1 rating is most encouraging.

In the production of these ships at certain points on the Atlantic seaboard we have an opposite to the methods employed in the production of the Ford car. Ford makes all his parts at one central plant, ships the parts to assembling plants distributed all over the country and has the cars assembled close to where they are to be placed in service. In the case of these cargo ships the parts are being produced in plants scattered all over the country, some of them as much as 1000 miles apart, are shipped to the yard on the coast and there assembled.

No one familiar with modern manufacturing methods would have doubted the practicability of the scheme, though some conservatively minded shipbuilders are said to have cast derogatory remarks. In peace times the difficulty of finding a market for a large number of vessels of the same design would have been a great obstacle to the introduction of the plan into practice and would probably have rendered capital timid. Here the demand for the largest possible number of vessels was ready-made and there were no market uncertainties to worry about. The war will no doubt establish the entire feasibility of this method of producing ships, and once it has proven itself it will never be given up again. Henceforth ships even of the larger cargo type will be manufactured and not built.

Aid the Tax Officials!

LARGE industrial concerns can materially assist the Government by helping their employees with the Federal income tax. It is now time to make out the blanks, and all those earning more than $800 a year, unless exempted, are required to make a return.

Factories employing large numbers of unskilled men and foreigners will be well advised in marshalling these men and imparting to them the necessary information in a systematic and efficient manner. Thus it is quite possible for the factory to take care of from 200 to 500 men a day with a force of from five to ten clerks. In this way they can expeditiously care for thousands of people who would otherwise join the long lines waiting at the Government offices, thus adding to the confusion there.

It is a matter of duty to assist the Government in every way during these times, in order to make the task of carrying on the war as light as possible. The income tax affects such a large percentage of the population that it is bound to necessitate a vast amount of work to handle it properly. It is quite easy to see that a company employing thousands of workmen can do the Government a real service which would be highly appreciated.

About 30 per cent of the men connected with an average manufacturing establishment are liable under the income tax laws. A company employing 6000 men will have probably 2000 who must fill out blanks and turn in a report on their yearly earnings. It is quite easy to see that if these reports come in batches of 200 or more, accompanied by a check for the total amount from some large industrial concern, it is going to be a much simpler matter for officials to check them over than if each man came up to the desk to be questioned by inspectors who do not know the nature of their work nearly as

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well as do the employers. The slight expense necessary to take care of this will be readily undertaken by manufacturers who wish to do a real patriotic service.

Labor Prospects

SEMI-SKILLED and unskilled labor is going to be in strong demand this coming summer, according to present indications. There are generally three phases through which the labor demand passes in industrial work. First, there is the design stage, when draftsmen and engineers are in great demand. During this stage the scope of the work is outlined and the details of the product itself are settled.

The second stage might be called that of the tool maker. During this period tool makers, die sinkers, tool designers and labor of the highest class must be utilized. These men are naturally very scarce, for they have to go through long years of training and must possess an innate ability for the work.

The third stage is that of production. It is then that labor is employed most extensively and the semi-skilled men come into their own. The men who actually operate the machinery and do the work which has been previously outlined and prepared for them are by far the largest in number. The mental creators come first, and finally the machine operators. The skilled tool makers and other specialists of that nature are the middle men and are a very vital connecting link.

We are at the present time in the middle stage in a great many of our war undertakings. This applies probably most exactly to the aviation program. The plans have been made and the creative period has been passed. Just now factories all over the country are being tooled up as rapidly as possible with the limited numbers of highly skilled men available. Soon we will be out of this period and into the third, or production stage. It is then that the great demand for production labor will make itself felt, and, therefore, although the semi-skilled labor market is easy at the present time, it will be different the coming summer, so that factories may well prepare now for a shortage in this direction.

Overhead Cam Development

IN the experimental laboratories and on the drafting boards of many of the automobile factories, as well as in the offices of consulting engineers throughout the country, they are busy with new developments of the overhead camshaft engine. In view of the practically universal employment of this type of drive for the non-rotary types of aviation engine, it is very probable that some interesting developments for commercial use are under way.

It has been freely prophesied that the aviation engine as developed by the war would leave its stamp on the future passenger car and racing power plant. It is not only likely to do this, but it is also quite sure to have its effect on truck engine development, as it is quite well known that certain companies are considering overhead camshaft types for commercial car use. The advantage, of course, is in the direction of simplicity, in that a number of valve actuating components are eliminated.

For the passenger car engine the greatest advantage is perhaps not the simplicity of the valve mechanism, but the possibility of securing a nearly ideal combustion chamber shape. If the inherent difficulties can be overcome in this type of construction, an engine which develops a higher output for a given piston displacement is sure to result. This is due to the reduction of superficial wall area as compared with combustion chamber capacity. It is a well-known fact that the minimum wall area as compared with cubical contents of the combustion chamber is secured when the latter is a hemisphere. It is quite possible with the overhead development to quite closely approach the hemisphere.

Lubrication of the overhead parts has really ceased to be a problem, because if this can be taken care of under the severe conditions accompanying aviation service it surely can be coped with successfully on a truck or passenger-car engine. When the matter is sifted to the bottom, it becomes more a matter of cost than anything else, and in view of the growing simplicity of the overhead constructions, it is quite natural to assume that the costs on this type are being brought within the bounds where production methods will render them commercial.

Standardization

DURING the past couple of years there has been much discussion of the subject of standardization, in the lay as well as in the technical press. Unfortunately the term has been used in a somewhat loose manner and many people seem to be in doubt as to what is really meant by it.

In some instances large manufacturing concerns have concentrated all their resources upon the production of a single machine or model and have called it standardization. This practice would be more correctly described as intense specilization.

Some concerns assemble vehicles from parts made by well-established firms in the parts industry and call this standardization. By making use of dictionary definitions they might elaborate a rather plausible justification for their practice, but if their argument were accepted there would be by this time a great number of standardized cars.

Recently we have heard much of standard ships and standard miltiary trucks, motor cycles, aircraft, etc. In the case of ships it is the introduction of interchangeable manufacturing methods and in the case of the trucks, motor cycles, etc., the decision of the Government to have only one design of vehicle for any particular purpose, instead of several.

Finally we have the standardization of engineering details as carried on by the S. A. E., the British Engineering Standards Committee, the A. S. M. E., the I. A. S. B., etc. Here it is partly a matter of specifications for materials and partly of joints and connections which when closely specified make it possible to use accessories and fittings of any make interchangeably.

From the above it will be seen that the word standardization is rather overworked these days.

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Latest News of the

Coal Curtailment to Makers Unlikely

Ten Days Given Committee Representing 90% of Industry to Discuss Proposal of Dr. Garfield

WASHINGTON, Jan. 25—The directors of the National Automobile Chamber of Commerce and of the Motor and Accessory Manufacturers' Association met here yesterday together with the Automobile Industries Committee and Dr. Garfield and E. M. Noyes of the Fuel Administration, to discuss a certain reduction in the allowance of coal to the automobile industry.

The Fuel Administration at first demanded a 25 per cent reduction in the coal allowance. Following discussion, however, it was decided to give the industry and the Fuel officials about 10 days' time in which to think the matter over and again meet. A committee was formed composed of W. C. Durant, president General Motors Corp.; John F. Dodge, of Dodge Brothers; John F. Willys, president Willys-Overland, Inc.; C. C. Hanch, Studebaker Corp.; C. H. Pelton, Maxwell Motor Car Co., and the members of the Automobile Industries Committee, which will meet in 10 days to again take up the problem with the Fuel Administration.

Practically 90 per cent of the automobile industry is represented in the members of this committee, hence it is almost certain that whatever arrangements are made will be agreeable to the entire industry, but the arrangements which will finally be made will be first submitted to every member of the industry for final approval.

Those present included A. S. Mott, Alfred Sloan, Jr., T. J. Wetzel, C. E. Thompson, W. C. Rutherford, E. H. Broadwell and Christian Girl of the M. A. M. A., Hugh Chalmers, Roy Chapin, John F. Dodge, J. Walter Drake, C. C. Hanch, W. C. Durant, Alvan Macauley, W. E. Metzger and Carl H. Pelton of the N. A. C. C., and Alfred Reeves, M. M. Bradley, A. W. Copland and John R. Lee, the last two members of the Automobile Industries Committee.

The conference at first appeared to be unfavorable to the industry, but discussions by Mr. Durant, Mr. Rutherford, Mr. Chalmers, Mr. Copland and Mr. Dodge had a considerable effect on Dr. Garfield.

It was pointed out to him that in the first place the automobile industry is already curtailed about 30 per cent in production, which means an existing curtailment of the use of coal to that extent. Secondly, that the automobile industry is already engaged in war work amounting to more than $600,000,000 and will undoubtedly become further engaged in the work, which will require the maintenance of the present organizations to insure against future Government needs, and that this could not be done if the industry is to suffer further curtailment by coal allowance reduction.

W. C. Durant, who is chairman of the committee, has called a meeting for early next week in New York at which the matter will be further thrashed out before being again taken before a joint session of the N. A. C. C. and M. A. M. A. directors and Dr. Garfield.

—

Garfield Exempts Airplane Plants

WASHINGTON, Jan. 30—The purpose of the recent order of the United States Fuel Administrator was to help and not delay the manufacture of essential war materials. Every manufacturer of aircraft is exempt from the provisions of the order pertaining to the use of fuel. This was made plain to-day in a telgram from Dr. Garfield to James Storrow, Fuel Administrator in New England. The telegram was as follows:

"Burgess Co., Marblehead, Mass., manufacturers of airplanes, and expressly exempt from the order of Jan. 17, state they have been refused coal by your office. The obvious purpose of the recent order is to help and not retard the manufacture of essential war materials. Producers of aircraft are to receive coal next after those mentioned in Section 1 of the order of Jan. 17 before all others."

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Saxon Six Increased $60

DETROIT, Jan. 31—The Saxon Motor Car Co. will increase the factory price of its 6-cylinder touring model $60, beginning Feb. 10, making the new list price $995. The price of the 4-cylinder model has not been changed. The price of all closed cars remains the same.

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Manning Is Splitdorf Sales Manager

NEWARK, N. J., Jan. 26—F. C. Manning, for many years associated with the electrical ignition business of the country, has been appointed general sales manager of the Splitdorf Electrical Co. with headquarters at the main office. Manning will retain his presidency of the Sumter Electrical Co., a subsidiary of the Splitdorf Co. located in Chicago.

Extend Return Load Plan

Massachusetts, New York and Pennsylvania to Establish Central Trucking Bureaus

NEW YORK, Jan. 30—Proper return load facilities and an organization to carry out such work in Pennsylvania, Massachusetts and New York, as well as Connecticut, where it is now being done, are in sight. At a meeting of representatives of the State Councils of National Defense for these states yesterday it was decided to report back favorably to these respective councils that such work be taken up and pushed to conclusion as a war measure. The plan contemplates the establishment of central bureaus where truck drivers may report and be assigned return loads instead of returning to the point of departure with their trucks empty. The meeting yesterday was attended by John S. Cravens, W. S. Conning, George H. Pride and several others interested in the movement.

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To Stimulate Drive-Aways

MILWAUKEE, Jan. 30—Wisconsin proposes to permit motor cars and trucks to be run over the highways of the state without a license when in transit from the manufacturer to the dealer. This is the one important change which is scheduled to come before the state legislature which convenes Feb. 19. This bill for the repeal of the licensing law in these special cases will operate to stimulate truck and car drive-aways and in this way will help to relieve freight congestion.

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Move Aircraft Production Section to Cleveland

WASHINGTON, Jan. 30—The Production Section of the Signal Corps will remove its headquarters to Cleveland. This is being done in order the better to speed up aircraft production. The move will place those at the head of aircraft work virtually in the center of the manufacturing district.

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Standard Parts Dividend

DETROIT, Jan. 30—The standard Parts Co. has declared a dividend of 1½ per cent on common stock payable Feb. 15 to stock of record, Feb. 1. This is the first dividend declared on common stock. The company was formed in December, 1916.

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Automotive Industries

State War Money to Open Roads

Industrial Sections in Michigan To Be Put in Touch by Direct Trunk Lines

DETROIT, Jan. 26—Motor trucks and cars will be made independent of railway blockades according to the plan adopted by automobile manufacturers in conjunction with the county commissioners and the Michigan War Preparedness Board. Furthermore, the industrial centers of Michigan will not again be cut off from the rest of the country by railway tie-ups and embargoes.

Motor car manufacturers of Michigan are preparing now to meet the situation which may arise, preventing any further rail shipments of automobiles or motor trucks. Winter and summer drive-aways will be operated on a systematic basis with the co-operation of state and county authorities.

At a meeting held here yesterday and presided over by State Highway Commissioner Frank Rogers the main trunk lines to be kept open all year around were designated, and provision was made to meet the expenses of maintenance. Under present arrangements the state will pay at least half of the cost of maintaining the through roads, while the county funds will take care of the balance. Attorney General Groesbeck stated that the Michigan war preparedness board will finance the project out of its $5,000,000 fund.

Representatives of the large automobile factories throughout the state, such as the Olds Motor Works, Buick Motor Co., and other large concerns from outside of Detroit, as well as prominent companies in the city, such as Dodge Brothers and the Cadillac Motor Car Co., together with the Oakland company of Pontiac, were present and pointed out the great importance of these roads to the future of the industries in this state. The two heavy snows which have made travel impossible through this state during the last three weeks, have forced makers to abandon drive-aways and hence to stop shipments altogether. It is assured that co-operation between the manufacturers themselves, as well as on the part of the state and county authorities, will result in opening for traffic roads that would be otherwise impassable.

The highways concerned opened up the interior of Michigan to cities in communication with Detroit and Toledo, as well as to Chicago and points west. Five roads were proposed to receive immediate attention. They are as follows:

From Alma to Saginaw, Flint, Fenton, Holly, New Hudson, Detroit, Monroe and Toledo; following the Grand River west from New Hudson to Lansing, by way of Howell; one road to Chicago, by way of Charlotte, Battle Creek and Kalamazoo, another to Grand Rapids, via Ionia and Lowell, and another from Flint to Port Huron, via Lapeer, Emlay City and Capac.

Among those present at the meeting were: P. L. Emerson, sales manager Olds Motor Works, Lansing; Edmund C. Shields, Olds Motor Works, Lansing; Frank J. York, Cleveland Tractor Co., Detroit; Frank F. Rogers, State Highway Commissioner, Lansing; Edward N. Hines, Chairman Board County Road Commissioners, Wayne Co., Detroit; John J. Cox, Engineer for Eastern Washtenaw Good Roads, District of Washtenaw Co., Ann Arbor; Alex J. Groesbeck, Attorney-General, Detroit; E. C. Howard, general sales manager Cadillac Motor Car Co; W. M. Hogle, Dodge Brothers, district representative; Leonard Freeman, Flint; Flint Board of Commerce, H. S. Earle, Detroit; W. H. Masten, Oakland Motor Car Co., Pontiac; E. T. Strong, general sales manager Buick Motor Co., Flint.

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Government Control for Gasoline

WASHINGTON, Jan. 30—President Wilson will within two weeks issue a proclamation taking over to government control fuel oil and gasoline. This action, which was forecast some time ago when L. Requa was appointed oil director, is considered imperative in order that supplies may be rushed to the industries needing them for the completion of war work. This does not mean that there will be any restriction placed on the use of gasoline for cars or trucks, for the reason that there is no shortage at present. On the contrary, the country is now producing far more gasoline than it can use. L. Requa will have charge of and make necessary provision for supplying those industries greatest in need of oil products and will curtail those whose needs are not so urgent.

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Garfield Exempts Cars and Trucks

WASHINGTON, D. C., Jan. 25—The United States Fuel Administration has issued a statement to the effect that there is nothing in the order of Jan. 17 which called for the maintenance of heatless days to prevent the operation of automobiles, motor vehicles of all classes being considered as coming under the head of public utilities. In keeping with this ruling garages have been exempted also. This statement clarifies the situation and was made particularly in regard to the use of trucks operated in the movement in freight.

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Senate Hears Aircraft Plans

WASHINGTON, Jan. 30—The Senate Military Affairs Committee will hear aircraft experts on the Aircraft Production Board and in the Signal Corps in executive sessions during the rest of this week. All of the details of airplane plans will be discussed in secret.

Won't Place Industry on Losing Basis

Garfield Tells Makers' Conference He Has No Such Intention

WASHINGTON, D. C., Jan. 28—Washington is alive with events vital to the automotive industry this week. Fuel, labor, standardized use of the Liberty trucks and other important problems have arisen.

Coal Curtailment Proposed

The chief event of the week was the meeting last Thursday of the Fuel Administration with representatives of about 90 per cent of the automobile industry. Dr. Garfield came to this meeting with the firm purpose of directing an immediate curtailment of 25 per cent in the use of coal with further plans for additional curtailment to a basis to be determined by the essential character of the industry.

He learned, as he himself stated at the meeting, that the automobile industry is really one that cannot be classed with any other in the country; that it is already engaged in almost a billion dollars' worth of war work outside of manufacturing passenger cars and trucks for the Government, and that since it contemplates taking on considerable more war work it must keep its organization intact.

Must Maintain Organizations

This, he conceded, could not be done if the industry had to curtail its present activities. In view of the fact that the industry is already curtailed 30 per cent by business conditions, he suggested that the matter be given consideration for several days, and that the committee appointed last Thursday make new recommendations at the coming meeting.

It is quite likely that committee will recommend a curtailment of coal allowance for the entire industry of 5 or 10 per cent. This curtailment can be overcome by the use of substitutes and more efficient methods, and it is thought most diplomatic and wise by members of the industry in Washington that some slight curtailment such as the one suggested be recommended.

Another Labor Hysteria

Last week witnessed publication throughout the country of news items to the effect that 250,000 workmen are needed immediately for the ship yards. This created another labor-shortage hys-

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teria and is worrying many employers. The report is untrue.

It was given out by a member of the Shipping Board without qualification that this number of men would be needed in the future, which would be nearer the actual fact.

The Department of Labor stated to-day that commencing in the spring it will have to make a drive for ship-yard workers. It anticipates now that about 360,000 workers will be needed by Aug. 1, of which 220,000 will be skilled and semi-skilled. It plans to utilize the Public Service Reserve to enroll these workers voluntarily in the meantime. By this method it will know where to locate the men required and employers will know which men they are likely to lose.

The present hysteria about labor shortage is caused in the main by various shipbuilders throughout the country who anticipate that they will have to break contracts with the Government owing to the slowness in erecting plants and securing material, and who hope by their demands for workers to have an alibi later for the broken contracts.

Philadelphia ship yards, for example, are calling for 7000 men, and the Department of Labor states it could not really at this time place 20 men. The Department of Labor stated to-day that it could not even place 15,000 skilled and unskilled workers in all of the shipyards of the nation at this time, much less 250,000.

A most important decision by the Department of Labor to-day was to the effect that it does not expect to take any important number of workers from the automobile manufacturing industry, but anticipates that it will draw the kind of machinists and other skilled workers that it requires from the automobile repair and garage industry.

Figures on hand now show that about 31,000 inside machinists and 18,000 outside machinists will be required by Aug. 1 by the shipyards. Half of these, or about 24,000 men, the Department of Labor hopes to secure from the automobile repairshops and garages in the United States. It realizes that with the exception of a very few workers in the automobile manufacturing plants, such as tool makers, that there are a few all around machinists that it could use in ship-building.

The general staff of the War Department has recently made the very interesting and important decision to the effect that all departments of the War Department must use only the class B, class A and class AA standardized war trucks after July 1. This means the standardized use of standardized trucks. It eliminates the present system whereby each corps or division has its own kind of trucks together with the separate maintenance establishments, separate armies of repair men, separate stock of repair parts, etc. It is a movement toward actual co-ordination of this branch of the service.

The appointment of E. R. Stettinius as Surveyor General of supplies for the

(*Continued on page* 294)

80 Missouri Makers Discuss Safety

Plan to Reduce Accidents and Improve Traffic Laws at Council Meeting

KANSAS CITY, Jan. 22—Four hundred and twenty owners, managers, foremen and workmen of Kansas City establishments gathered around tables at the annual "get-together" meeting of the Local Safety Council the evening of Jan. 19, provided a striking indication of the way employer and employee are earnestly co-operating in these plants to maintain a high degree of efficiency in production during the war.

The owners and managers had been holding monthly meetings at noon, and the workmen had been holding monthly meetings in the evening for more than a year; and the Jan. 19 dinner was the culmination of their mutual ideals, separately worked out, for co-operation in the prevention of accidents and the maintenance of production.

The motto of the meeting—decided upon independently by the managers and by the workmen—was "All Together for Safety." The tone of the meeting was largely patriotic, the speakers emphasizing the service to country of the workmen who are faithful on their jobs in keeping industry going, and especially those who help prevent temporary slowing up by preventing accidents. The chief speakers were R. C. Richards, chairman of the central safety committee of the Chicago & Northwestern Railway; Isaiah Hale, commissioner of safety of the Santa Fe, and Dr. W. H. Coon, health director of Kansas City, Mo, for several years in charge of factory inspection for the Massachusetts State Board of Health. Officials of the Chamber of Commerce of Kansas City, Mo., and Kansas City, Kan., expressed the purpose to provide co-operation by those bodies in the objects of the Safety Council—the firms represented being located in Kansas and in Missouri. There were also short talks by foremen and workmen, who gave their views on the safety movement, and told why the foremen and workmen were interested in preventing accidents and in maintaining the highest efficiency in their own work and that of their fellow workmen.

There were 80 plants represented at the dinner. The large majority of diners were employees, though one or more owners or managers sat at each table, and the mixing of the plate-cards had effected the intermingling of the men, so that each table had men from various plants. The tickets to the dinner, $1.50 each, were paid for by the firms.

A sixth of the guests were men from plants not members of the National Safety Council.

E. G. Trimble, president of the local safety council and for several years a director of the national council, declared that this meeting was the most significant gathering on the subject of safety ever held in America, an opinion endorsed by other men present of national prominence.

The Foremen's Round Table, consisting of workmen from industrial plants, holds monthly meetings at the Chamber of Commerce rooms, where they discuss ways to make plant work safe, to educate workmen in safe practices, to improve the efficiency of the men and women for their own benefit and that of the plant.

Following are a few examples of the activities of the local Safety Council and of the round table:

(1) The Safety Council has taken up such subjects as traffic regulations; co-operative work to reduce accidents on the streets, especially as between the street railway and truck owners; education in safety of school children; interchange of information among managers on organization of safety committees in plants, and encouragement of suggestions as to hazards; discussion of ways to handle welfare work.

(2) The Foremen's Round Table gets down to bedrock on such subjects as guards for emery wheels, checking out of supplies (with special reference to inspection for safety) from stock rooms; inspection of plants for fire hazards; fire drills; handling of workmen who jeer at safety notices; education of workmen in use of safety devices; care of health as a means to improved efficiency and earning power; rules to truck and motor car drivers for the avoidance of collisions; equipment of freight elevators for safety.

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22 New Members for N. A. A. J.

NEW YORK, Jan. 25—Following is a list of new members elected to membership in the National Association of Automobile Accessory Jobbers at the New York convention:

JOBBERS

H. P. Dils & Son Co....Parkersburg, W. Va.
Downing Electrical Co. .....Des Moines
Duluth Auto Supply Co.....Duluth
Elin Auto Supply Co.....Newark
Michael Ert .....Winnipeg, Canada
Henderson Auto Supply Co. Youngstown, Ohio
T. T. Hutchisson & Co....Wheeling, W. Va.
Northern Electric Co.....Montreal
Wisconsin Auto Supply Co.....Wausau

MANUFACTURERS

Advance Auto. Accessories Corp.....Chicago
Albertson & Co.....Sioux City
Allen Auto Specialty Co.....New York
Bay State Pump Co.....Boston
Philip Brinton Co.....Kennett Square, Pa.
Hawthorne Mfg. Co.....Bridgeport
Motor Parts Co.....Philadelphia
Prescott Auto Parts Co.....Webster, Mass.
Spencer Metal Products Co....Spencer, Ohio
A. J. Stephens Rubber Co.....Kansas City
Van Sicklen Co. .....Elgin, Ill.
W. C. Wood Co.....Minneapolis
X Laboratories .....Boston

Uhler Made a Major

WASHINGTON, D. C., Jan 28—W. D. Uhler, chief engineer of highways for Pennsylvania, has been commissioned as a Major in the Transportation Division of the Quartermaster Corps and will work on truck transportation.

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New Regulations for U. S. Exports

War Trade Board Devises New Export Application Form—In Effect Feb. 1

WASHINGTON, D. C., Jan. 25—After Feb. 1 the War Trade Board will place in operation a number of new regulations regarding exports. A new export application form will be used, superseding all previous forms. It has been designed to avoid the necessity of shippers keeping various forms on file. The form, which will be known as Form X, calls for an answer to all questions, but the board, recognizing that it will not always be possible for shippers to furnish the information demanded, will be satisfied with as many answers as can be made. If the information furnished by the shipper is not sufficiently complete to enable the Bureau of Exports to act it will be returned with a request for more data.

Exporters who have at any time applied to the Bureau of Exports for export licenses are on the mailing list for the Journal of the War Trade Board, and are presumed to know of the change of forms. Neither failure on the part of the applicant, states the board, to take reasonable precaution as to the distribution of goods, nor the granting of an export license based upon the statements made in the application will relieve the consignor from any responsibility to which he may be liable for affording aid or comfort to the enemy.

An attempt to export a commodity differing in any way from that for which license has been granted subjects the exporter to the penalty of the law. If there is reasonable cause to believe that the exportation described in the Form X involves trading directly or indirectly with an enemy or ally of an enemy or with a person acting in behalf of or for the benefit of an enemy or ally of enemy as defined in the Trading With the Enemy Act, a separate application for license to so trade must be made.

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Australian Import Extension Restricted

NEW YORK, Jan. 29—The three months' extension granted American manufacturers for the shipment of automobile bodies to Australia applies only to products which were on order August 10, 1917. At first it was thought there were no restrictions to the extension, but it appears that this is not entirely correct.

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Ohio to Have War Roads Convention

COLUMBUS, OHIO, Jan. 26—Three state organizations all having to do with the highway problem in its several phases will merge their activities this year in the Ohio War Roads Convention to be held in Columbus, Jan. 30, 31 and Feb. 1. The associations are the Ohio Good Roads Federation, the Ohio Engineering Society and the County Commissioners' association. Co-operating with all is the state highway department.

The arrangements are under the direction of a committee with state highway commissioner Clinton Cowen as chairman, assisted by president D. S. Humphrey and secretary Walter A. Alsdorf of the Ohio Good Roads Federation; president A. R. Taylor and secretary John Laylin of the Ohio Engineering Society and president C. M. Hunt and secretary Richard Sinclair of the County Commissioners' association.

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Packard Prices Increased

DETROIT, Jan. 26—Beginning March 1, the Packard Motor Car Co. will increase the factory prices of all the 3-35 models $200, and the 3-25 models $250. The price change is on the chassis only, all styles of bodies advancing the same amount. The prices follow:

Model 3-25 (128-in. wheelbase)

Model	New Price	Old Price
Roadster	$3950	$3700
5-pass. touring	3950	3700
7-pass. touring	3950	3700
Sedan	5650	5400
Limousine	5500	5250
Landaulet	5550	5300

Model 3-35 (134-in. wheelbase)

7-pass. touring	$4300	$4100
Sedan	6000	5800
Limousine	5850	5650
Landaulet	5900	5700

On account of freight conditions, the company will use the driveaway plan of getting cars to their destinations, and as many as possible will be driven from the factory.

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Republic Advances Prices

ALMA, MICH., Jan. 26—The Republic Motor Truck Co. has increased the price of its models according to the following schedule, all prices being quoted in single units or in fleets, f.o.b. Alma, Mich.:

	Old Price	New Price
¾-ton (9 enroute)	$895	$995
1-ton (sold out)	1195	1295
1½-ton (6 enroute)	1550	1650
2-ton (14 enroute)	1885	1975
3½-ton (sold out)	2750	2950
5-ton (2 enroute)	4250	4500

Recently a new time schedule has been placed in effect. Both the offices and the plant closed on noon Saturday, the total time being made up by working one-half hour longer at noon. Formerly the noon period was from 11:30 until 1 o'clock. Now it lasts from 12 until 1. Otherwise the opening and closing hours remain the same.

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Reiss to Distribute Carlisle Tires

NEW YORK, Jan. 28—Charles E. Reiss, Hupmobile distributer, has become wholesale distributer for the Carlisle Cord Tire Co., and will trade as the Carlisle Cord Tire Sales Co. The new company, which is not incorporated, will function as the wholesale distributer for the Carlisle company in a large part of the Eastern territory, including New York City and parts of Pennsylvania, New Jersey and Connecticut. The acquisition of the tire business will not in any way interfere with Reiss's Hupmobile interests or business.

1917 Gasoline Price Steady

Less Than 5 Per Cent Increase —Cost of Crude Oil Advances 25 Per Cent

NEW YORK, Jan. 26—While crude oil prices have advanced 25 per cent over last year's figures on the important grades, present gasoline quotations show less than a 5 per cent increase. A year ago gasoline sold for 23 cents a gallon, tank wagon basis, in New York. The present price is 24 cents. During the same time the price in Boston has varied only from 24 to 25 cents a gallon. In addition to the higher cost of crude oil, refiners have had to contend with increased labor charges and cost of materials, and the stability in the price of gasoline is attributed to the manufacturers' desire to keep it as low as possible, and the fact that they have advanced the price of other refined oils, such as kerosene and lubricating oils, in preference to gasoline.

Prices, tank wagon basis, in important cities, follow:

City	Current Price	Last Year's Price
Baltimore	22	22
Boston	25	24
Charleston	24.5	25.5
Chicago	21	19
Cincinnati	24	23
Dallas	26	22
Denver	24	23
Houston	26	23
Kansas City	20.3	18.9
Minneapolis	22	20
New York	24	23
Norfolk	22.5	22.5
New Orleans	22.5	22.5
Oklahoma City	25	23
Philadelphia	24.3	23
Pittsburgh	26	23
Richmond	22.5	22.5
St. Louis	20.4	18.4
San Antonio	26	22
Wilmington	24.3	23

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Fuel Administrators Plan Zone Distribution

KANSAS CITY, Jan. 26—Fuel administrators of Kansas, Missouri, Oklahoma, Arkansas, Nebraska and Iowa held a conference in Kansas City Jan. 21, especially to discuss the proposal to appoint distributers by zones, and to perfect the co-operative arrangements for supplying coal to these states. They agreed that the season is too far gone for zone distributers to be of much avail in this district now. Most of the administrators are urging that operators make a reduction in price of coal at the mine starting with April, such reduction to be passed on to ultimate consumers who buy early (but to be to the advantage of the dealer who stocks and holds) in order that as much coal as possible may be placed this summer.

So far, no state administrator in this group has issued orders for the suspension of any manufacturing enterprises, or its curtailment, with two exceptions.

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In Kansas, Emerson Carey passed along the federal order for the curtailment of straw board factory work; and in Missouri, Wallace Crossley has included breweries in his general order for the closing of saloons and amusements Mondays and Tuesdays. In Missouri, there are restrictions on the use of lights. Office buildings and stores, except those selling food, must be closed at 7 p.m. All lights in the downtown section, except enough to show the way must be turned out, and banquets, theaters, etc., closed at 10 p.m.

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Trucks to Relieve Freight Congestion

MILWAUKEE, Jan. 28—The transportation division of the Milwaukee Association of Commerce is making an exhaustive investigation of the feasibility of motor truck freight service between Milwaukee, Chicago, and intermediate points, with a view to relieving congested railroad traffic. Frank Barry, traffic manager of the association, already has urged Milwaukee shippers to make wider use of trucks within the city, and between Milwaukee and nearby points, and the results are so favorable that it is believed likely that a system of motor transport over the longer distance between Milwaukee and Chicago, 90 miles, can profitably be instituted.

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Morrow to Control Coal

WASHINGTON, D. C., Jan. 25—J. D. A. Morrow, secretary of the National Coal Association, has been appointed manager of apportionment and distribution of the fuel administration, and will act as first lieutenant to Dr. Garfield in this work, with practically full control of the nation's coal supply. This means that the supply of fuel to the nation is now under the direction of a man who has been associated with the bituminous coal mining industry.

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Dale Made Sales Manager of King

DETROIT, Jan. 30—A. G. Dale has been appointed Western sales manager of the King Motor Car Co.

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Continental Earns $1,396,814

DETROIT, Jan. 30—The Continental Motors Corp. reports net earnings of $1,396,814.17 for the fiscal year ending Oct. 31, 1917, which actually covers only nine and a quarter months of the corporation's business earnings before $24,000 excess profits were deducted. Income tax, depreciation and interest amounted to $2,052,068.12. Sales during this period show an increase of 32 per cent over the preceding year and operative orders on the books as of Oct. 31 totaled $17,361,000. After deducting cancellations at the close of the fiscal year, there were outstanding 35,000 shares of preferred stock of $100 par value and 1,451,858 shares of common of $10 par value. There were 3467 stockholders whose holdings averaged twenty-four shares of preferred and 759 of common. Within the past year additions to the plant amounted to $1,148,404.75, including fitting the plant for government work.

Goodyear Stock for Dealers

$25,000,000 Second Preferred Will Be Sold Only To Agents and Users

AKRON, O., Jan. 26—The Goodyear Tire & Rubber Co. has authorized an issue of $25,000,000 second preferred stock which is to be sold, not to the general public through stock brokers, but to Goodyear users through the service station dealers and to Goodyear dealers themselves. Instead of a commission to a brokerage firm, the company will pay each dealer $2 for every share sold by him. Only $15,000,000 of the stock will be issued at present, the remainder to be held in the treasury and sold under carefully drawn restrictions. The issue is in shares of $100 par value, bearing 8 per cent interest. They are cumulative and non-assessable, and must be bought back by the company within 10 years at the rate of not less than 10 per cent a year.

The Goodyear company believes that by this unusual plan its dealers will have an opportunity, not only to make a personal investment, but to cement the relations of dealers with their customers. The present war conditions, which have caused the increase in price of raw materials, and the prospects of a still further increase, necessitated the additional financing. The company already has $25,000,000 common stock, of which $21,000,000 is outstanding, and $25,000,000 first preferred, of which $23,000,000 is outstanding.

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Slight Increase in Iron Mined

WASHINGTON, D. C., Jan. 25—Iron ore mined in the United States in 1917 amounted to 75,324,000 gross tons, compared with 75,167,672 tons in 1916, an increase of .02 per cent. Shipments from mines in 1917 were valued at $236,178,000 as compared with shipments valued at $181,902,277 in 1916. The stocks of iron ore at the mines have decreased from 10,876,352 gross tons in 1916 to 10,560,000 tons in 1917. Imports of iron ore for 11 months ending Nov. 30, 1917, amounted to 913,500 gross tons, as compared with 1,325,736 tons for the full year of 1916.

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Government Takes Ford Washington Branch

WASHINGTON, Jan. 30—The Quartermaster Corps of the United States Army has taken over the 8-story Washington branch building of the Ford Motor Co. The building was turned over to-day. The Ford company will open a new branch and service station as soon as a suitable location can be found.

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Ford to Make Own Carbureters

DETROIT, Jan. 30—The Ford Motor Co. has completed arrangements with Holley Bros. by which the Ford company acquires patents under which the Holley carbureter is produced, and also the factory in which Holley Bros. have been operating. The Holley Kerosene Carbureter Co., which was formed last December, has purchased from Holley Bros. their rights to the Holley kerosene carbureter and what remains of the gasoline carbureter business not sold to the Ford company. The Holley company will continue to manufacture carbureters.

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Lilly Made Director of Embarkation

WASHINGTON, D. C., Jan. 28—Brig. General Chauncey B. Baker of the Quartermaster Corps has been relieved of certain duties connected with embarkation by the appointment of D. M. Lilly of New York as Director of Embarkation. Gen. Baker is the Chief of Embarkation in addition to heading the truck transportation work, which latter is not in any way to be affected by the appointment of Lilly.

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Argentine Sales Outlook Is Good

BUENOS AIRES, ARGENTINA, Jan. 20—With Argentine crops expected to establish a new record for the coming summer, midsummer here being January, the sale of automobiles to the Argentine farmer should show a great increase over previous years. The farmer still continues the great center of sales in Argentina, although in the streets of Buenos Aires the number of American cars is increasing. The war has strengthened the motor car industry in Argentina owing to the shortage of farm labor and the consequent necessity for motor apparatus to make up this shortage.

During the months of October and November and during the winter months of June, July and August, the sale of automobiles was slow, and in many places entirely stagnant owing to general unrest as well as the series of railroad and other strikes.

An example of American methods of merchandising was the convention of Overland dealers held at the Plaza Hotel in this city. It was the first South American Overland convention, and demonstrated the value of such conventions in South America as well as in North America.

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Kelly-Springfield Profits $2,700,000

NEW YORK, Jan. 29—The Kelly-Springfield Tire Co. has just closed its most prosperous year with net sales aggregating $14,000,000, and profits, before deducting taxes of $2,700,000. Allowing $210,000 for the preferred dividend, almost $2,500,000 remains for $5,000,000 common stock—a return of 50 per cent, or $12.50 a share. After the war tax is deducted the profits of the company will be about the same as those for 1916, and approximately equal to the total sales of the company 5 years ago. More than 2200 pneumatic tires are being turned out daily, as compared with 1400 a year ago.

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Exempt 124 Plants in Michigan

Monday Closing Order Rescinded Where Government Work Is Being Done

DETROIT, Jan. 28—One hundred and thirty-four factories in Michigan have been granted exemption from the Monday closing rule. These exemptions are granted for the department engaged in the manufacture of materials for the government, either for the War Department, the Navy or the Ordnance Department. In addition to being exempted from the closing orders, these plants are given preferred priority for coal shipments and outrank other manufacturers in this line, although this coal must only be used for the government work.

A general order also covers all airplane manufacturing plants, all shipyards and the manufacture of explosives of all kinds. Coal to relieve the situation, and particularly to prevent delay in government work, is on its way to the interior of the state. This is coming over all lines of railroad, and indicates that it is passing the blockaded gateways.

The list of plants partially exempted includes the following from the city of Detroit:

American Auto Trimming Co.
American Brass & Iron Co.
American Car & Foundry Co.
Armour Packing Co.
Anderson Forge & Machine Co.
Barcey, Nicholdon Co.
Blodgett Engineering & Tool Co.
Briggs Mfg. Co.
E. S. Bryant Pattern Co.
Burton & Lowrey Co.
Cadillac Motor Co.
Cadillac Tool Co.
Charcoal Iron Co.
Arthur Colton & Co.
Continental Motor Corp.
Covert Gear Co.
Detroit Auto Specialties Co.
Detroit Brass & Copper Rolling Mills
Detroit Chemical Works
Detroit Gear & Machine Co.
Detroit Motor Castings Co.
Detroit Pressed Steel Co.
Detroit Screw Works
Detroit Steel Products Co.
Detroit Storage Battery Co.
Detroit Tool Co.
Dodge Brothers
Eastern Production Co.
Eclipse Counter Bore Co.
Edmunds & Jones Corp.
H. E. Edwards
Excelsior Tool & Gage Co.
Fisher Body Corp.
Ford Motor Co.
Gemmer Mfg. Co.
General Aluminum & Brass Mfg. Co.
General Electric Co.
General Motors Corp.
General Spring & Wire Co.
Goddard Tool Co.
Great Lakes Engineering Works
Hanson Tool & Die Works
Hayes Manufacturing Co.
Hinkley Motor Corp.
Hudson Motor Car Co.
International Metal Stamping Co.
King Works
Kraetke Bros.
...ncoln Motor Co.
Long Manufacturing Co.
McCord Mfg. Co.
Massnick Manufacturing Co.
Maxwell Motor Co.
Michigan Bolt & Nut Co.
Michigan Electric Welding Co.
Michigan Malleable Iron Co.
Michigan Stamping Co.
Michigan Screw Machine Co.
Michigan Tool Co.
Modern Pattern Co.
Monarch Foundry Co.
D. W. Murray Co.
National Can Co.
National Machine Products Co.
National Twist Drill & Tool Co.
Oldberg Manufacturing Co.
Packard Motor Car Co.
Paige-Detroit Motor Car Co.
Peninsular Machinery Co.
Pittsburgh Shafting Co.
Buhl Malleable Co.
Schweppe & Wilt Co.
Semet Solvay Co.
Standard Brass Works
Standard Screw & Machine Co.
Standard Tool & Mfg. Co.
Steel Products Co.
Studebaker Corp.
Timken-Detroit Axle Co.
Turner & Moore Mfg. Co.
William Warren
C. R. Wilson Body Co.
J. C. Wilson Co.
Zenith Carbureter Co.

Many Show Week Meetings in Chicago

CHICAGO, Jan. 26—The Chicago show is more prolific in dealers' meetings and dinners than the New York show was. The following have been scheduled to date. There probably will be others arranged before the week is over.

Chicago Automobile Trade Assn. Luncheon, addressed by E. LeRoy Pelletier, Lexington Hotel, Jan. 26.
Cole Motors Co., Luncheon, Congress Hotel, Jan. 30.
Franklin Auto Co., Luncheon at Congress Hotel, Jan. 30.
Elgin Motor Car (Dealers), Luncheon at Hotel Sherman, Jan. 30.
Elgin Motor Car (Parts Mfrs.) Luncheon at Hotel Sherman, Jan. 30.
Illinois Oldsmobile Co., Luncheon at Congress Hotel, Jan. 30.
Velie Motors Co., Luncheon, Hotel Sherman, Jan. 30.
Dodge Bros., Luncheon, Blackstone Hotel, Jan. 30.
American Truck & Airplane Co., Banquet at Hotel Morrison, Jan. 30.
Nash Distributors, Banquet at Hotel Sherman, Jan. 30.
Reo Motors Co., Luncheon, Congress Hotel, Jan. 31.
Paige-Detroit Motor Car Co., Luncheon, Congress Hotel, Jan. 31.
Harry Newman-Stratton Co., Luncheon at Congress Hotel, Jan. 31.
Hupp Motor Car Co., Luncheon, Blackstone Hotel, Jan. 31.
S. A. E. War Dinner, Morrison Hotel, Feb. 1.

Curtiss Adopts Premium Plan

BUFFALO, Jan. 26—The Curtiss Aeroplane & Motors Corp. has adopted a premium system to increase production. Workmen will receive regular hourly rates, but bonuses will be paid to those who finish tasks in less than the appointed time. The amount of the bonus will be equal to one-half the regular value of the time saved. As an example of how this will work out, suppose a workman, whose hourly rate is 40 cents, finishes a 16-hour job in 10 hours. His regular wage for this time is $4, and the premium is $1.20, or one-half the difference between 16 and 10, or 3 hours. The total payment would amount to $5.20, which represents an hourly rate of 52 cents.

Standard Lifeboat Is Planned

National Association of Boat and Engine Makers Will Endeavor to Design Such Craft

NEW YORK, Jan. 26—The National Assn. of Engine & Boat Manufacturers will urge the adoption of a standardized motor lifeboat by the government as part of the equipment of the emergency fleet, and will endeavor to design a boat that will meet all requirements. This was decided at the annual meeting of the association held Thursday at the Engineering Societies Building. An office will be opened at Washington to enable the association to keep in closer touch with the government.

New members, forming the class of 1920 of the executive committee, were elected unanimously: Henry H. Brautigam, Bridgeport Motor Co., Inc.; Charles A. Criqui, Sterling Engine Co.; Percy C. Jones, S. M. Jones Co.; A. E. Robinson, Regal Gasoline Engine Co., and Henry R. Sutphen, Elco Co.

To Take Census of Lumber Production

WASHINGTON, Jan. 28.—A census of the lumber production of the country during 1917 is to be made by the Forest Service in co-operation with the National Lumber Manufacturers' Assn. Questionnaires have been mailed to 30,000 sawmills throughout the country asking that the amount of each kind of lumber cut be reported promptly.

469,135 Fords in 6 Months

DETROIT, Jan. 29—The output of the Ford Motor Co. for the past 6 months was 469,135 cars or at the rate of 938,270 per year. During the month of October there were 79,675 cars manufactured. The estimated production for this year was placed at 900,000, or about 3,000 per day, but unless war conditions prevent there is little doubt that there will be more than 1,000,000 cars manufactured.

Detroit Men Qualify for Air Service

DETROIT, Jan. 28—A high percentage of applicants from this city for the air service is qualifying. Captain W. R. Wren, president of the United States Aviation Board at Washington, D. C., has just completed several days of investigation here. It was found that while in other cities one out of every ten qualifies for this service, the high-skilled mechanics from this vicinity are qualifying at the rate of nine out of every ten. There are 450 men being recruited from Detroit and vicinity to act as engineers in the non-flying section of the Aviation Corps, and to speed up the program. These men must be either gasoline engine experts or have a collegiate training in the mechanical, electrical or mining courses. Those selected will be given 7 weeks of intensive work at the Massachusetts Institution of Technology.

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British Cabriolet Design

(*Continued from page* 270)

A top material for this design is preferably Burbank or similar cloth finish exterior. A shiny or varnish-finish exterior material can be used for a touring top, because this is often only put up when it rains and the creases are not noticed, but on the design illustrated only a flexible cloth finish is permissible. This is better than leather, which while the latter looks rich and adds class to the body, still has the drawback of not wearing well when folded often.

A brief description only is necessary of the folding operation: *A*, the front bow, Fig. 3, is fastened like a touring top front bow to the windshield post and when released folds close to bow *B*. By breaking the joint in the side arms that connect the two together, the pillars *C* and *D* carry the top rail down, the whole being indicated by A-1, B-1, C-1 and D-1. The front pillar *E* is folded in toward the center of the body and the door flappers fold as indicated by arrows.

A folding top when worked out on a drawing generally shows ideally compact when folded, but the results on the actual body should be just as good as this illustration. The bows are far enough back so that the top goods will lay free and not impede the meeting of the framing.

The best material for trimming the interior of this body is a waterproof motor cloth, and the same material is used for the head lining, seat cushions and back. The carpet rug will match the goods. No curtains are used for the doors or quarter windows. The rear window is square cornered and landaulet size.

The appointments are silver finish and are very simple. They consist of one light located in the center of the back bow, concealed toilet cases, one each side forward of the rear seat and of small size, one watch in the front division, telephone for use when the body is closed, regulators on doors and division windows, foot rest and step lights. The extra seats are concealed when not in use.

The trimming design should be as plain as possible. The body will be open a large part of the time, and it is advantageous to have as few places to hold the dust as possible.

The front seat is trimmed in black leather and has pockets on the doors.

A suitable color for this car is green of a pronounced shade for all except the guards and moldings above the belt line and windshield, which should be black with black door handles.

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Systematic Parts List

(*Continued from page* 274)

a parts list was all wrong, but with a parts list made up as described, which had been so satisfactory in every other respect, it was only a matter of a couple of hours to fill this order.

The form must be printed on a good quality of bond paper, that will stand erasure, and may be furnished in pad form. The size of the form is 8½ by 11, corresponding with the standard letter size. The spacing is such that the form may be placed in a typewriter for entering the information, and when backed with carbon will furnish unlimited copies by being run through the blue-printing machine.

The completed book, which is of the loose-leaf type, may be placed in departments where it is necessary. Changes and additional sheets are forwarded to them through the regular office mail service.

Fig. 6 shows that a parts list arranged in accordance with this system is certainly a systematic arrangement.

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Won't Place Industry on Losing Basis

(*Continued from page* 289)

army will not for the present at least have any effect on the motor transport section headed by Christian Girl. Mr. Stettinius will work to supervise and co-ordinate the procurement of material, the acquisition by purchase or otherwise of all supplies and munitions required by the army. It will be the duty of the heads of the different bureaus, including, for example, General Chauncey D. Baker, head of the transportation department, which includes the motor transport section, to keep Mr. Stettinius informed of the condition of purchases in the process of manufacture.

The Signal Corps will shortly make a drive for a number of recruits for the non-flying service. The recruiting division, which has been under Major Steever, is now under Major Litchfield. Major Steever's complete organization was transferred with him.

The Ordnance Corps, following considerable criticism, is developing a publicity department, and plans to issue frequent publicity and maintain a departmental organ to show just what it is accomplishing.

The Federal Reserve Board has taken steps toward the limitation of so-called non-essential enterprises by appointing a committee of three bankers, who will pass on capital issues applications which will have to be made by all private companies for the duration of the war. Temporarily this committee will not pass on individual securities issued aggregating less than $500,000 in the case of industrial or public utility corporation.

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Confer to Keep Roads Open

LANSING, Jan. 28—Highway commissioners of Genesee, Lapeer, St. Clair, Oakland, Washtenaw, Lenawee, Monroe, Millsdale, Wayne and Branch counties held a conference to-day in Detroit for the purpose of discussing methods of cooperating to keep open roads in these counties. Frank F. Rogers, state highway commissioner, representatives of the automobile industry of the state, and a representative of the Michigan war preparedness board, also met with them.

Agricultural Power Unit

(*Continued from page* 281)

able that the inconvenience and time taken in changing such wheels, together with their considerable extra first cost, would very much limit, if not ultimately eliminate, any advantage there might be in this proposition, though it has been frequently suggested.

All axles for road locomotion must be mounted on springs, and this can be readily done in the type of tractor adumbrated.

A road engine, besides having all its weight sprung and the wheels of extra strong design, must in itself be so designed as to properly take care of the vibration set up by such duties.

Land Grips—As has been indicated, the projections attached to the rim of the driving wheels to obtain sufficient hold when plowing, are an important feature, and their design to obtain efficient working is one of no inconsiderable difficulty; the paths traced by three different forms are shown in Fig. 6. The spuds must be of such size and form as to obtain effective hold on the land, and yet not set up too great an increase in rolling resistance by their shape; they should be self-cleaning, and so formed and fitted that, should the differential come into operation and only one wheel revolve, no such side force is set up as may cause the tractor to slip sideways at right angles to its path.

Generally the older forms of tractors, although they gave good service, do not appear to have received sufficient care in their design regarding the points discussed, and they frequently lack the finished appearance of a complete design due to the apparently haphazard arrangement of the constituent parts, *i.e.*, engine, gears, etc., on a rolled section frame.

Progress in this direction has undoubtedly taken place, as is shown by the light type of tractor now coming on the market, in which a separate frame is obviated, and it is obvious that the design was completed at one time by an engineer trained with an eye to the appearance of the whole.

Similar ideas might be incorporated in the horizontal type of engine, with undoubted advantage.

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Michigan Crown Fender Elects Officers

YPSILANTI, MICH., Jan. 29—The Michigan Crown Fender Co., at a meeting of the board of directors, elected the following officers: Charles H. Bennett, president; A. E. Lewis, vice-president; F. H. Nissly, treasurer; and Fred F. Bennett, secretary and general manager. At the annual meeting the board of directors was increased from 7 to 9 members. The directors electer are Charles H. Bennett, Fred F. Bennett and John H. Patterson, Plymouth; Robert Gaus and A. S. Lyndon, Ann Arbor; H. R. Scovill, A. E. Lewis and John R. Walsh, Ypsilanti. The Michigan Crown Fender Co. was incorporated last March.

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Industrial Review of the Week

A Summary of Major Developments in Other Fields

Year's Worst Blizzards Demoralize Iron Trade

Iron and steel works of Pennsylvania and all the Middle West are floundering in a snow blockade worse than any in the past two months of such visitations. The whole industry has been so demoralized by these repeated blows that there is to-day little trace of a normal aspect in markets or in plant operation.

Chicago is making painfully slow recovery from a nearly complete shutdown, with little hope of decided improvement apart from milder weather and an early spring. In western Pennsylvania heavy snows on Monday paralyzed traffic and it took more than 24 hours to dig out trains climbing over the Allegheny mountains.

Pennsylvania and Central Western blast furnaces and steel works are operating at from 50 to 75 per cent of capacity and there is little prospect of real relief while winter lasts. Blast furnaces get little coke and what is delivered is so poor that more off iron than standard grades is made. At Connellsville coke ovens 35 per cent car supply is about the average.

Fresh storms and cold have largely defeated the plans for breaking freight blockades, and at steel works piled-up stocks of finished product will impede operations for days and in some cases weeks. The scarcity of cars to move product from the mills is thus fully as serious a factor as scarcity of coal and coke.

The chief gain from the shutdown order thus far has been in the coaling of vessels at Atlantic ports. A very promising start has been made in releasing thousands of tons of steel and munitions awaiting shipment to American and Allied armies.

War shipments make up 75 per cent of the current movement in the heavier finished steel lines. It has been surprising, in fact, on how small a part of the output the country has maintained its ordinary consumption in the past two months.

Pig iron markets have naturally slowed down as the business of delivering has absorbed every energy. That the low phosphorus pig iron supply is short of the demand for the turning out of gun forgings and other war material calling for acid steel is one of the serious features of the situation. Low phosphorus ores from Chile, Spain and Sweden are cut off and the Lake Superior Supply is very limited.

In ferromanganese there has been added to falling domestic production and much smaller imports a recent order stopping for 60 days the shipment of manganese ore to seaport over the Central Railway of Brazil, due to lack of fuel. However, after three years of alarms ferromanganese users are not easily thrown into a panic.

How large has been the volume of Government fabricated steel work, particularly for the fabricated ship program, is indicated by the 205,000 tons of bookings by bridge and structural shops in December, 14 per cent above rated capacity. Over one-third of last year's business was done in the last quarter. Two years ago a spurt due to plant extensions gave a total in December, 1915, of 208,500 tons, but general building was not heavily checked then as now.

About 45,000 tons of relatively light steel work is needed for 1500 buildings for the Signal Corps. For the Quartermaster's Department for buildings in the United States 3500 tons has been closed.

Upward of 500 tons of large machine bolts have sold at $15 per ton below the allowed level. Where demand upon certain manufacturing departments slackens, the old law of competition in price seems still to be working.

There is keen interest in the making up of a new Iron and Steel Institute committee on prices and practices in the old material trade. More drastic control is predicted, with the elimination of some of the rulings the trade has been disposed to make for itself in certain districts.—*Iron Age.*

A New Service

¶Herewith AUTOMOTIVE INDUSTRIES *supplies for the benefit of its readers a general summary of important developments in other fields of business. This is rendered possible by the editorial co-operation of leading industrial publications which are recognized authorities.*

By compressing the general industrial situation into this form we hope to give our readers a clear and comprehensive idea of up-to-the-minute developments which they could otherwise secure only with considerable expenditure of time and effort.

Coal Short in Detroit

DETROIT, Jan. 30—The coal situation continues to be serious and is now compelling big industrial plants in this vicinity to close. The C. R. Wilson Body Co. has been shut down for 2 days and only by borrowing odd amounts from other plants has it been able to reopen this morning. It is probable that the Morgan & Wright plant, employing 4200 will have to close to-morrow morning.

Detroit has been receiving an average of less than 350 cars a day whereas the average consumption is 700 cars a day. The result of the heatless Monday is not noticeable from an industrial standpoint although private consumers are directly benefitted by the saving.

Storms Counteract Effect of Fuel-Saving Holidays

The coal-conserving holidays and the following heatless Monday have had less effect in relieving the scarcity of coal than was probably anticipated when they were ordered. While the railroad situation shows considerable improvement in some localities, the "Weather Man" has apparently shown great sympathy for the Kaiser. Storm after storm has swept the country until in many regions the snow is now 2 ft. or more deep on the level, with huge drifts in many places. Thus far the winter is generally conceded to be the worst in many years. Of course, the heavy snowfall has its redeeming features, as in many localities, particularly in the West and Southwest, it is an indication of abundant crops the following year. But crops do not keep people warm in the winter. From all over the country come reports of the small and inadequate supplies of fuel on hand being doled out in half tons and ton lots to consumers who never quibble over price or quality, their only concern being to secure the coal. In many instances, all over the East in particular, long lines of people are besieging coal offices and yards, carrying away 100-lb. sacks of coal in all types and descriptions of vehicles from a barrel-stave toboggan to a high-powered automobile. Strange as it may seem, this clamor for coal is probably as insistent in Philadelphia, within 150 miles of the coal fields, as it is in any other city. The fact that coal cannot be supplied has furnished ammunition for all manner of criticism and complaints against everyone in any way whatsoever connected with the coal industry, from the meanest trapper-boy in the mines to the President of the United States. In more than one instance, and in more than one city, the police have been called upon to preserve peace and order in the offices of coal retailers. Lately there has come forward a demand from comparatively well-to-do citizens who had laid in their ordinary winter requirements of coal, but owing to the severe weather have consumed this supply months earlier than is normally the case. It now seems difficult for this class of people to understand that they cannot secure all of any commodity that they have the inclination to buy and the money to pay for.

One bright spot in the situation that has developed in the recent past is that bunkering of steamships at tidewater is now approximately normal. There are not at present, thanks to the partial cleaning up of congestion in tidewater rail yards, the long delays in bunkering of ocean-going freight and passenger vessels that prevailed two weeks ago.—*Coal Age.*

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Mexico Rated Second in Oil

61,000,000 Barrels of Crude Oil Produced in 1917—35% Gain Over Previous Year

MEXICO CITY, Jan. 24—About 61,000,000 bbl. of crude oil were produced in Mexico last year, an increase of 21,000,000 gal. over 1916. Mexico can now be rated as the second largest oil producing country in the world, replacing Russia, whose production has decreased because of the unsettled conditions during the past year.

Records of oil production in Mexico are available from 1904, since which time there has been a total output of 226,660,979 barrels. The greatest increase was in 1911, when 14,051,643 barrels were produced as compared with 3,332,807 in 1910. This was due largely to the bringing in of the Mexican Petroleum Co.'s famous No. 7 well, which has been flowing since September, 1910 at the rate of 20,000 bbl. a day without apparent diminution of quantity or change in quality.

The number of barrels of crude oil produced in Mexico since the beginning of the industry there, follows:

Mexico's Crude Production

Year	Production	Year	Production
1917	61,000,000	1909	2,488,742
1916	39,801,110	1908	3,481,610
1915	35,500,000	1907	1,717,690
1914	21,188,427	1906	1,097,264
1913	25,902,439	1905	320,379
1912	16,558,215	1904	220,653
1911	14,051,643		
1910	3,332,807	Total	226,660,979

In 1917, Mexico exported between 25,000,000 and 30,000,000 bbl. to the United States, against 20,000,000 in 1916. Shipments to other countries also increased last year, especially the republics in west South America, formerly supplied by the United States.

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Tide Water Oil Unifies Organization

NEW YORK, Jan. 26—To simplify and unify its organization, the Tide Water Oil Co. has established a Veedol department to distribute its products. The Platt & Washburn Refining Co., which previously carried on the business of selling these products, will be dissolved. This concern has been owned by the Tide Water company for 29 years, although conducted as a separate organization. There will be no change in the policy or personnel of the management, the Veedol department of the Tide Water Oil Co. simply taking over all orders, contracts and other obligations, as well as accounts, notes, etc., due the Platt & Washburn Refining Co.

A principal office has been opened at 11 Broadway, New York, with H. J. Guthrie as manager and Byron D. Benson and C. W. B. Fisher assistant managers. The metropolitan district and Atlantic division offices will be located in the same building, with F. B. Vanderhof in charge of the former and H. S. C. Bacon of the latter. The Boston office of the Atlantic division will be located at 161 Massachusetts Avenue and the Philadelphia office at Delaware Avenue and Green Street. J. M. Stockfish will be manager of the Mid-Continent division, with offices in the Insurance Exchange Building, Chicago. The Pacific division office will be in the Monadnock Building, San Francisco, with Leonard Freer as manager.

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Case Conducts Tractor School

RACINE, Jan. 26—About 20 tractor schools are being conducted in different parts of the country this winter by the J. I. Case T. M. Co., Inc., of this city. The instruction offered is entirely free and any farmer is welcome, whether he owns a Case tractor or not. Part of the time is given over to lectures and regular class room work and the rest is devoted to practical work. Students are given tractors to dismantle and study; they are allowed to reassemble and put them back in running order, and all this work is done under the guidance of experts from the factory. The students are taught to operate the tractors, to care for them under all weather conditions and to hitch up to the various implements that they will have to haul. Experts from the magneto and carbureter factories are also in attendance and explain and demonstrate these devices. The plan has met with favor among the farmers and all the schools are well attended.

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Aviation Camp at Selma, Ala.

WASHINGTON, D. C., Jan. 25—The War Department is considering the establishment of a site at Selma, Ala., for an aviation training camp.

Gas Production Cost 14.9 Cents

Figure Based on 55 Refinery Reports—Does Not Include Sales or Freight Charges

WASHINGTON, D. C., Jan. 29—Basing its investigations on figures that come from fifty-five refineries operating in all parts of the United States, the Federal Trade Commission has ascertained that the average cost of producing a gallon of gasoline is 14.9 cents. This is the bare refinery cost, including the cost of the crude oil, operating, depreciation and overhead, but does not include the cost of selling and transporting to the market, nor are any figures included for interest on the investment or profits. The figures are for gasoline produced in August, 1917, and are the result of distributing the actual total refinery costs to the various refined products on the basis of the values of the various products. The cost of the crude oil is the market price paid by the refinery, including transportation cost from the well to the refinery. The prices for which gasoline has been selling are for Sept. 1.

The states embraced in the investigation are: New Jersey and Eastern: New Jersey, Pennsylvania, Delaware, Maryland, Ohio, District of Columbia, Virginia, West Virginia, North Carolina and South Carolina. Indiana and North Mississippi Valley: Indiana, Illinois, Michigan, Wisconsin, North Dakota, South Dakota, Iowa, Missouri and Kansas. Gulf Coast: Texas, Louisiana and Arkansas.

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PHILADELPHIA, Jan. 26—A petition to have the Rush Motor Truck Co. adjudged an involuntary bankrupt has been filed in the United States District Court.

REFINING COST PER GALLON OF GASOLINE

1. New Jersey and Eastern Territory

	Low, Cents	High, Cents	Representative, Cents	New York Price, Cents
Cost of crude oil	12.0784	13.9575	12.7584	
Costs of refining	2.0271	3.9570	4.8836	
Total	14.1055	17.9145	17.6420	26

2. Indiana and North Mississippi Valley

				Chicago Price, Cents
Costs of crude oil	9.8212	12.8827	11.5120	
Cost of refining	1.3620	3.8621	2.1630	
Total	11.1840	16.7448	13.6750	21

3. Oklahoma

				Oklahoma City Price, Cents
Cost of crude oil	9.8804	15.2620	11.1860	
Cost of refining	1.5196	2.3740	3.4856	
Total	11.4000	17.6360	14.6706	24

4. Gulf Coast

				Fort Worth Price, Cents
Cost of crude oil	11.5670	14.5774	13.6608	
Cost of refining	.8520	1.7579	1.8074	
Total	12.4190	16.3353	15.4682	26

5. California

				San Francisco Price, Cents
Cost of crude oil	9.8683	12.2033	11.7400	
Cost of refining	1.8743	4.3112	1.7800	
Total	11.7426	16.5145	13.5200	20.5

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Many Sales Made at 1918 Shows

Results in Each Case Exceed Anticipation of Dealers—Record Crowds at Cleveland, Montreal and Milwaukee

MILWAUKEE, Jan. 29—Results of the Tenth Annual Show, held at the Auditorium from Jan. 16-26, were much more favorable than had been anticipated, in these abnormal times. The show was held in two sections, the first 7 days being devoted to passenger cars and accessories, and the last 3 days to commercial cars, tractors, trailers, road locomotives and commercial vehicle accessories. The total attendance for 10 days was 80,000. It is estimated that 50,000 saw the passenger car exhibits and 30,000 the truck show. Although the Milwaukee Dealers' Assn., under whose auspices the show was held, did not expect the attendance figures to come up to last year's, there was a 15 per cent increase.

Among the special features of the show was a Class B military truck, loaned to the association by the Quartermaster's department; a Nash Quad ammunition truck used for instructional purposes; a standardized Class B engine; and a Locomobile coupe equipped with a snow plow which enables the car to travel in the worst blizzard.

The truck displays included 139 vehicles made by 44 manufacturers.

—

Montreal Show a Success

MONTREAL, Jan. 26—The Fifth Montreal Automobile Show, which closed last Saturday, stands out as the most successful ever held here, both from the standpoint of the Montreal Trade Assn., under whose auspices it was held, and the dealers. The attendance was greater than that of 1917, and the sales came up to expectations. There were 62 exhibitors, showing 100 models of passenger cars and 12 trucks. In addition there were 245 accessory exhibits.

Montreal, as an automobile center, differs from most cities, because of the long winter season, but motor cars are being more generally used this winter than ever before. An idea of the increase may be gained from the fact that fiye times as many radiators and robes have been sold as during last year.

—

22 Cars Sold at Wilmington Show

WILMINGTON, DEL., Jan. 28—With an attendance of 60,000 and 22 car sales, besides a lot of good prospects, the 21 motor car dealers and eight accessory houses exhibiting at the fourth annual Wilmington Automobile Show, which closed at the Hotel Du Pont on Saturday night, believe the $1,200 which they invested in the show was well spent. Because this show is held in the spacious lobby and main dining room of the hotel, no admission is charged and the expense has to be borne by the exhibitors.

The attendants this year were more bent on business than ever before and most of the purchases were made for business reasons. While no farm tractors or trucks were permitted at the show, some tractor men were there, and they report good prospects all over the state this year.

The field in Delaware was never in better shape than it is to-day. Everybody is prosperous, while in Wilmington many unskilled laborers are making $50 a week and some skilled mechanics make more than $100. Agricultural Delaware realizes its opportunity to help take care of this year's demand for produce, and there is every reason to believe that nearly every farmer will employ any device that will save labor and help him in his business. In addition to the increased demand made on him, he finds labor very scarce, being attracted to the cities by high wages, and this is a further reason why the labor-saving motor devices are going to help him win his battle for his country and himself.

Wilmington is said to be the richest city per capita in the country, and while there are a few very rich men, the bulk of the population is well-to-do, and there are very few of the poor class. Accordingly the outlook for the motor trade in city and state this year is splendid.

—

No Change Made in Boston Show Dates

BOSTON, Jan. 26—Boston will hold its show on March 2 and the following week. The matter was thoroughly considered and it was found by the Board of Directors that a change to a later date would involve many cancellations of contracts and would be generally harmful. A number of the dealers wanted it to be held as originally planned so they could take advantage of the early Spring. The only idea of planning to change the date was due to the Monday holiday and the thought that the fuel administrator would hamper the exhibition by closing it at night. That is not thought possible now. There are 90 makers who have taken space and there will be about 500 cars and trucks in the show. This will be the only big show where trucks will have a good chance to exhibit as well as cars. Many accessory people are on the list of exhibitors also.

—

Optimism Feature at Baltimore Show

BALTIMORE, Jan. 26—The Twelfth Annual Show came to a close to-night, and left the dealers here optimistic about the coming year and certain that they will be able to sell every car they can bring into their territory. Although the attendance of the show was less than last year's, the number of sales was greater. In addition, most of these are for immediate delivery and not for spring, as is usually the case. The smaller attendance is accounted for by the fact that blizzards made the roads impassable and kept farmers and buyers from west Maryland and the eastern shore away.

There were 43 distributers, showing 183 models of passenger cars, at the show. Closed cars and convertible bodies predominated.

—

York Show Postponed

YORK, PA., Jan. 29.—Owing to the coal shortage, the annual York Show, which was to have opened Jan. 26 in the Tabernacle, South Queen Street, was called off.

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Record Crowd at Cleveland Show

CLEVELAND, Jan. 28—There was a record attendance at the Cleveland show, which closed yesterday, and dealers report the greatest number of sales ever made during show week. One result was to efface the pet theory of a few pessimists that the public is not interested in cars this year. Another was to prepare the dealers for what will probably be the greatest spring rush they have ever known.

The show was arranged as a springtime scene, and almost every exhibitor had rugs, art lamps and plants in his display to harmonize with the general effect. Every day was advertised as a special event and brought special visitors to the Coliseum. Saturday was opening day; Monday, dealers' day; Tuesday, Automobile Club day; Wednesday, aeronautic day; Thursday, tractor day; Friday, S. A. E. day; Saturday, good roads day, and Sunday, closing day.

One of the special exhibits was a dental ambulance loaned by the Government. Cars were driven overland in most cases, direct from the factories. The road from Detroit to Cleveland is used by truck trains, and the excellent condition of the route made this possible.

—

Ford Branch Managers Convene

DETROIT, Jan. 28—About forty branch managers of the Ford Motor Co. held a 4-days' convention at the Highland plant to discuss general business. Those present included J. S. Keown, Albany, N. Y.; G. B. Tyler, Buffalo; R. S. Abbott, Atlanta; H. K. Munroe, New Orleans; J. J. Harrington, Cambridge, Mass.; Gaston Plaintiff, Long Island; F. J. DeTamble, Charlotte, N. C.; G. I. Banks, Jacksonville, Fla.; Dayton Keith, Chicago; A. W. L. Gilpin, Milwaukee; G. C. Nichols, Cincinnati; F. E. McClure, Cleveland; H. M. Buckley, Columbus, O.; P. J. Garnett, Spokane, Wash.; A. J. Langford, Dallas, Tex.; N. J. Schumucker, Scranton, Pa.; Chas. Hendy, Jr., Denver; J. A. Handin, Salt Lake City, Utah; P. F. Minnock, Des Moines, Ia.; C. L. Gould, Omaha, Neb.; W. P. Winders, Fargo, N. D.; C. C. Hildebrand, Minneapolis; O. L. Arnold, Houston, Tex.; Wm. McDonald, San Antonio, Tex.; A. H. Smith, Indianapolis; H. M. Dunbar, Pittsburgh; R. P. Rice, Kansas City; W. C. Anderson, St. Louis; B. L. Graves, Los Angeles; J. B. Lund, San Francisco; C. S. Williams,

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Louisville; J. J. Right, Memphis; J. A. Deignan, Oklahoma City; W. S. McNamara, Wichita; L. C. Block, Philadelphia; R. P. Jones, Washington; A. W. Jones, Portland, Ore.; F. L. Rockelman, Seattle.

—

New United Trucks Seen at Chicago

GRAND RAPIDS, Jan. 28—The new United worm-drive motor truck models, manufactured by the United Motors Co., will be on exhibition at 1231 Wabash Avenue, Chicago, during the time of the Automobile Show. The new series includes models of 1-, 2-, 3½ and 5-ton capacities. Prices, including bumper, radiator guard, hubodometer and painting, follow:

1-ton	$1,850
2-ton	2,550
3½-ton	3,450
5-ton	4,500

—

5,000,000 Bushels of Castor Beans from Texas

AUSTIN, TEX., Jan. 29—In response to the request from the Government for an increase in the production of castor beans, which are to be made into a lubricant for the Liberty engine, more than 100,000 acres are to be devoted to this product. The average is 50 bushels to the acre, and a crop of 5,000,000 bushels in Texas alone, is practically assurred.

—

Close Missouri Garages from 7 A. M. to 7 P. M.

ST. LOUIS, Jan. 28—The first fuel order affecting local trade was issued last Thursday, when it was expressly ordered that all motor car and accessory salesrooms must be closed from 7 P. M. until 7 A. M. The order covers garages and filling stations. In case of garages with established all-night trade, permits can be obtained from Robert E. Lee, Secretary of the automobile trade associations here, who is appointed deputy fuel commissioner to enforce the order.

—

Pacific Tire Seattle Distributer

NEW YORK, Jan. 24—In an item which appeared in a recent issue it was inadvertently stated that the Pacific Tire & Rubber Co. is distributer for the Carlisle Cord Tire Co. in Los Angeles. This should have been Seattle, Wash. The Geo. W. Eno Rubber Co. is the Carlisle representative in Los Angeles.

—

Daily Truck Trains Scheduled

DETROIT, Jan. 30—Government trains of Packard trucks are now scheduled to leave the factory at the rate of one train a day or a complete convoy each week. There are thirty trucks to a train and six trains or one hundred and eighty trucks make up a convoy. It requires eighty men to handle the train and these are in charge of a lieutenant. The convoy is under the direction of a convoy officer who is located in Detroit. Many trucks going forward in these convoys are destined for the expeditionary forces.

States Cooperate on Truck Routes

Highway Departments Work During Storm to Clear Roads —Day and Night Shifts

WASHINGTON, Jan. 29—"Motor truck convoy makes trip over highway," stated a recent news item, and most readers gave it a single glance, never thinking of the importance of the statement.

In that convoy were 27 trucks and several passenger cars. It was the first army truck convoy to attempt to negotiate the highways of the United States. It successfully traveled over 900 miles of road, most of which were covered with snow and in a climate where the thermometer registered below zero.

Now comes the news that five such convoys have left Detroit, each one day apart, and are successfully coming East to the seaport. Soon, no doubt, we will learn that hundreds of convoys and thousands of trucks are on their way overland, driven by their own power, carrying vast tonnage of supplies.

The work of carrying on the winter highways, of keeping them free from snow to allow safe and speedy travel of the passenger cars and trucks was very interesting. New schemes, new methods, new appliances, all had to be arranged and secured.

W. D. Uhler, chief engineer of the Pennsylvania State Highway System, worked out the plan by which Pennsylvania so efficiently kept open its highways for the first truck company. The department was constantly alert.

It arranged with the weather bureau at Pittsburgh so that it was and is constantly informed as to weather conditions and approaching storms.

As soon as word was received of the approach of a storm the maintenance division sent immediate notices to the various district engineers through whose districts the state highway passed, and they in turn arranged to have their men and equipment ready so that no time was lost in fighting the storm.

They worked on the basis that the most efficient and economical work could be done by fighting the snow rather than waiting until after the snow had fallen. As soon as the snow reached a depth of 2 in., and indications pointed to a continuance of the storm, snow plows consisting of motor trucks fitted with wooden boards arranged on rollers to act as plows, also motive trucks pulling standard road machines and road machines pulled by horses were placed at work. In some cases road drags were used and found advantageous.

In the case of heavy drifts it was necessary to send drags drawn by horses through to break a track to enable the motor plows to work, while in extremely heavy drifts work by hand and shovel was necessary. In all cases where it was possible machinery was used, and the number of plows, road machines, drags, labor, etc., was entirely dependent upon the extent of the storms. Where necessary day and night shifts were used.

The Pennsylvania department, which undoubtedly has provided the War Department with the most efficient highway service during these extremely winter months, is now working day and night keeping open every highway for the movement of United States army trucks, and is operating nine motor trucks equipped with snow plows, fifty road machines and numerous rapid trucks. Other state highways may well observe the method and work of the Pennsylvania department and adopt some of its plans, for it has up to this time been the one state that has cooperated in every way with the Government.

Sooner or later the use of all highways, both for war and commercial purposes, is certain to come. State highway officials with vision able to peer into the future will, of course, realize the opportunity that lies in immediate development and constant maintenance of the highways under their jurisdiction.

—

Jellinek-Mercedes Dead

PARIS, Jan. 23—A news dispatch announces the death at Geneva, Switzerland, of Emile Jellinek-Mercedes, the man who is responsible for the name Mercedes in the automobile, aircraft and motor boat industries. Jellinek was a wealthy Austrian who from 1880 to the outbreak of the war resided at Nice in Southern France and acted as Austrian Consul there. About 1900 Jellinek secured financial control of the Daimler Motor Co. of Caunstatt, Germany, and he claimed credit for having inspired Mayback, chief engineer of the Daimler works, with the idea of building a light and powerful chassis. This chassis, of 40 hp. weighed less than 2200 lb., whereas the 1899 Daimler model of 28 hp. weighed about 4000 lb. The car was named the Mercedes for Jellinek's daughter.

—

Paul A. Smith Dies

ST. LOUIS, Jan. 28—Paul A. Smith, general manager of the Overland Automobile Co., died Wednesday night of uremic poisoning. Smith was born in Ingersoll, Ontario, in May, 1884, and first attracted attention as general salesmanager for the Detroit Steel Products Co. He later joined the executive staff of the Willys-Overland Co., and last July came here as manager of the local company. He became ill in December and a trip to Hot Springs and an operation failed to help him. During his stay here he was active in business organizations. The funeral was held Saturday at Windsor, Ont.

—

Welch Leaves King

DETROIT, Jan. 29—C. J. Welch has resigned as vice-president and sales manager of the King Motor Sales Co.

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Making Pennsylvania's Snowbound Roads Passable for Trucks





The Pennsylvania State Highway Department is using trucks equipped with especially designed and constructed road scrapers to keep the snowbound roads in condition for truck-train travel. Above is shown the complete truck and the method of attaching and operating the scraper



This shows the snow removal between Darlington and Beaver Falls to provide for motor truck transportation throughout the state



An excellent example of a finished snow roadway showing the width to which the snow is cleared and the smooth, hard surface



After a preliminary plow the road is widened by running the truck close to the ditches providing a smooth, hard roadway



This will give some idea of the way in which snow is piled at the sides and of the appearance and condition of the finished roadway

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Men of the Industry

Changes in Personnel and Position

C. B. Hayes President of Jackson Munitions

JACKSON, MICH., Jan. 28—Clarence B. Hayes, of the Hayes Wheel Co., has been elected president of the Jackson Munitions Co. A strong directorate has been brought together, including O. W. Mott, C. C. Bloomfield, Dean Kimball, B. M. Delameter, M. S. Potter, Edward Frensdorf, Watson R. Smith, John W. Miner and A. G. McBurney. The company is capitalized for $500,000.

—

T. P. Chase has resigned as chief engineer of the King Motor Car Co., Detroit. He leaves Feb. 1.

—

W. E. Blaine has resigned as truck engineer for the Packard Motor Car Co., Detroit. He has been appointed a captain in the Officers' Reserve Corps of the Ordnance Department and will be stationed at Washington.

—

E. B. Pierce has been appointed consulting engineer in charge of the recently completed commercial laboratory of the Republic Motor Truck Co., Alma, Mich.

—

Charles A. Ackerman, for the last three years used car manager for the New York branch of the Studebaker Corp. of America, has been appointed sales manager for the Franklin Motor Car Co. of New York, Franklin distributer. He will have supervision over both new and used car sales departments.

—

Thomas B. Davies, formerly with the Carnegie and Pittsburgh Steel companies, has been appointed district sales representative of the Syracuse, N. Y. branch of the Central Steel Co., Massillon, Ohio.

—

R. E. Benner has been made factory manager of the H. H. Franklin Co., Syracuse, N. Y. Benner was at one time with the Maxwell company as a car designer and afterward with the Buick company.

—

Ollie E. Haupt, of the Ollie E. Haupt Motor Co., St. Louis, has enlisted as an officer in the Aviation Corps, San Antonio. Paul Schoenig, of the Ford assembly plant in St. Louis, has been made manager of the company.

—

Wesley A. Stanger has resigned as president of the Mitchell Automobile Corp., St. Louis. He formerly was president of the Ben Hur Co. of Missouri.

St. Alexis Steiner, formerly an officer of the Velie Automobile Co. of St. Louis, has been promoted from first lieutenant to captain in the United States Army, and made instructor in field fortifications for the Eighty-ninth Division at Camp Funston.

—

W. F. Schmidt has been made general manager of the Packard-Missouri Motor Car Co., St. Louis.

—

Frank A. Flint, sales manager for the Hudson-Phillips Motor Car Co., St. Louis, has been made assistant sales manager of the central zone for the Chevrolet Motor Co., with headquarters at Flint, Mich. He will join B. J. MacMullen, formerly manager of the Hudson-Phillips Co.

—

W. H. Knowles, formerly chief engineer of the Saxon Motor Car Co., has been appointed superintendent of the Philadelphia plant of Hale & Kilburn.

—

J. M. Crawford, formerly assistant chief engineer of the Chalmers Motor Car Co., is now chief engineer of the Allen Motor Co., Fostoria, Ohio.

—

E. W. Martin, for several years superintendent of construction at the Ford Assembly plant, St. Louis, has become manager of the Hallman-Whitten Mfg. Co., 4440 Olive Street, St. Louis.

—

J. F. Dugan has been made production manager of the Stanley Motor Carriage Co., Newton, Mass. He was formerly works superintendent of the Buick Motor Co. and production manager of the Chevrolet Motor Co.

—

Frank Eldridge, formerly manager of the Wallace C. Hood Service Bureau, is now with the King Auto Sales Co., 998 Woodward Avenue.

—

E. E. Main, until recently with the Rajah Auto Supply Co., Bloomfield, N. J., has been appointed chief engineer of the Eclipse Mfg. Co., Indianapolis.

—

Deeds Is Promoted

WASHINGTON, D. C., Jan. 28—Col. E. A. Deeds, in charge of the equipment division of the Signal Corps, has been promoted to be assistant to the Chief Signal Officer and now has his office headquarters with the Chief Signal Officer. Col. R. L. Montgomery, formerly the assistant to Col. Deeds, has been promoted to become the head of the equipment division and is assisted by W. C. Potter, banker, of New York city, a civilian appointed as assistant to Col. Deeds.

—

Bane on Aircraft Board

WASHINGTON, D. C., Jan. 28—Lieut. Col. Thurman H. Bane, Signal Corps, is appointed a member of the Joint Army and Navy Technical Aircraft Board, vice Major Harold S. Martin, Signal Corps.

New Companies Formed

Latest additions to ranks of Automotive Industries

Minerva Co. to Build Truck and Tractor Engines

CLEVELAND, Jan. 21—In order to take advantage of the demand for heavy duty tractor and truck engines, the Minerva Engine Co. has been organized by Cleveland interests, and in the near future will start production. The engine to be manufactured by the concern was designed by C. F. Goby and R. K. Johnson. It is on conventional lines, but built for operating continuously under a nearly full load. The company has ample shop facilities for immediate needs, but is considering various factory locations. At present only one 4-cylinder model will be produced of 4 by 5½ in. cylinder dimensions, the cylinders being of the L-head type. All parts are thoroughly protected from dust and dirt, yet efforts have been made to secure the greatest possible accessibility.

—

ANN ARBOR, MICH., Jan. 22.—The Forge Products Corp. has incorporated with a capitalization of $350,000 to manufacture high speed steel forgings for tool work and automobile parts. The directors so far selected are C. F. Simmons and C. W. Goodside, of New York City, and J. C. Cummings and Henry Winenan of Detroit, who have elected L. J. Hoover president.

Work on the first building, which will be 50 x 100 ft., will be started at once. All the necessary machinery has been purchased, and will be ready for installation upon completion of the first building. The company expects to start production in about 90 days.

—

EAU CLAIRE, WIS., Jan. 26—The United States Gear Shift Co. has been formed here with $1,500,000 capital to manufacture a hydraulic gear shift which is the invention of L. A. Laursen. It is proposed to erect a factory here and to commence production within six weeks. The device is intended for application to existing cars without extensive alterations.

—

CHICAGO, Jan. 23—To assist the railroads in short-haul business and speed up freight deliveries originating in Chicago and towns immediately north and south, the Chicago, Waukegan & Hammond Transportation Co. has been incorporated. William L. O'Connell, former chairman of the Illinois State Public Utilities Commission, has been elected president. Application was made to this commission for a certificate of convenience and necessity, which probably will be granted this week.

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Mason Motor Becomes Chevrolet Component

FLINT, MICH., Jan. 28—The Mason Motor Co. has ceased to exist. It is now the motor and axle department of the Chevrolet Motor Co. The stock of the Mason company has been held in the treasury of the Chevrolet company for 2 years. Starting with Jan. 1, 1918, the title Mason Motor Co. officially ceased to exist, the company now being a direct component of the Chevrolet concern.

—

More Space for Townsend

JANESVILLE, WIS., Jan. 28—The Townsend Mfg. Co., Janesville, Wis., maker of gas engines, tractors and power machinery, has awarded contracts for the erection of two shop additions made necessary by several large orders received from its distributers in the United States, Canada and Europe.

—

Wolverine Tractor Moving to Saginaw

DETROIT, Jan. 23—The Wolverine Tractor Co. will move to Saginaw, where it will occupy the Piano Action plant. Saginaw will raise $250,000 for stock in the company.

—

Cassidy Co. to Sell Twombly Pump

NEW YORK, Jan. 28—The Edward A. Cassidy Co. will be the sales representative for the Auto Pedal Pump Co., New York, and sell the Twombly Tire-Foot-Pump.

—

Enterprise Brass Foundation Finished

MUSKEGON, MICH., Jan. 29—The foundation of the Enterprise Brass Works building is complete, and a 2-story building 40 x 60 will be erected on it immediately.

—

Larger Quarters for Niehoff & Co.

CHICAGO, Jan. 28—Paul G. Niehoff & Co., Inc., has moved to larger quarters at 232 East Ohio Street and has increased the facilities of its metallurgical laboratories.

—

Start Wire Wheel Patent Suits

NEW YORK, Jan. 26—The Wire Wheel Corp. of America has started suit charging infringements of five of its wire wheel patents, Nos. 1,047,742-Pugh, 760,684-Cowles, 1,030,428-Cowles, 1,076,558-Duffy and 1,125,498-Duffy. The suit has been entered against C. T. Silver, Metropolitan distributer of Kissel and Apperson cars, on the grounds that cars exhibited by Silver are equipped with Frayer type wheels made by the Phelps Mfg. Co., Columbus, Ohio.

—

Changes in Capital

CLEVELAND, Jan. 29—The Ohio Rubber Co. has increased its capital stock from $400,000 to $500,000.

WICHITA, Jan. 28—The Jones Motor Car Co. has increased its capital from $500,000 to $1,500,000.

PITTSBURGH, Jan. 28—The Denas Armor-Cased Tire Saving Co. has increased its capital from $200,000 to $1,000,000.

—

PEORIA, Jan. 28—Due to increased business and many war contracts, the Peoria Tractor Co. has increased its capital stock from $60,000 to $1,500,000. The company is composed of F. R. Dennis of Chicago, president; George McFarland of Peoria, secretary, and E. M. Smith of Peoria, director and manager. It is planned to retain the main plant at East Peoria, but branch plants will be opened from time to time at points in other states which offer the most satisfactory inducements.

—

NEW HOLSTEIN, WIS., Jan. 26—The John Lauson Mfg. Co., New Holstein, Wis., which recently increased its capital stock from $500,000 to $1,000,000, is marketing $250,000 of the new issue, which consists of preferred shares. The purpose of the increase in capital is to enable the company to double its production of tractors and still maintain its regular output of about 4000 stationary and portable gas and kerosene engines annually. The company is filling a Government contract for tractors, requiring from 150 to 200 machines, and an order for 50 tractors from the Northwell Co., Omaha.

—

DETROIT, Jan. 29—The Acme Motor Truck Co. has increased its common stock to a total of $750,000 and its preferred to $250,000. There is $280,000 outstanding common stock at present, including the $80,000 added to the stock total through a dividend declaration made by the board of directors. This represents a 40 per cent dividend.

—

KALAMAZOO, MICH., Jan. 29—The Lane Motor Truck Co. will increase its capital stock from $25,000 to $225,000. The increase will be used for speeding up production to 10 trucks a week. In the spring, an addition, 60 x 100, will be erected as a painting department. Of the proposed stock issue, $50,000 will be set aside and $150,000 will be sold.

—

LA CROSSE, WIS., Jan. 29—The La Crosse Tractor Co. has increased its capital stock to $2,500,000 to provide for the rapid growth of the company.

—

SIOUX CITY, IOWA, Jan. 25—Sioux City Tire Mfg. Co. has increased its capital stock from $200,000 to $1,000,000 and is planning an addition to its plant.

Current News of Factories

Notes of New Plants—Old Ones Enlarged

Muskegon Engine Co. Starts Truck Production

MUSKEGON, Jan. 29—The Muskegon Engine Co. has started production on its 2-ton truck. One truck has been completed and as soon as machinery is installed the plant will be speeded to full capacity. This truck is driven by a Continental type C-4 engine, has a multiple disk clutch, Torbensen internal gear axle, M & S differential, Pierce governor, Stewart carbureter, Lavine steering gear, and Bower bearings. At present about 20 employes are at work.

—

Standard Fenders for Chicago Trucks

CHICAGO, Jan. 25—Beginning Feb. 1, all trucks here must be equipped with fenders of a specified standard. The ordnance requiring this was passed recently by the City Council. The Motor Truck Owners' Assn. is contending that the law is unconstitutional, and a test case is scheduled for the Master of Chanceries Court.

—

No Chain Truck to Start Production

ST. LOUIS, Jan. 28—The No-Chain Truck Unit Co., 3302 Lawton Avenue, will begin the manufacture of the Truxton truck on a large scale at once. The company has been manufacturing the No-Chain truck unit only.

—

Hayes-Ionia to Build

GRAND RAPIDS, Jan. 28—An addition of 230 x 110 ft., three stories in height, will be added to the plant of the Hayes-Ionia Body Co.

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New Loyal Truck Models

LANCASTER, OHIO, Jan. 28—The Loyal Motor Truck Co. is preparing to manufacture a ½-ton truck and a 1500-lb. "Loyal Special," featuring oversize and greater carrying capacity.

—

Detroit Shell Buys Springfield Body Plant

DETROIT, Jan. 28—The Detroit Shell Co. has purchased the plant of the Springfield Body Co. from B. F. Everett, the company's trustee. Buildings, machinery and land brought $500,000. The Detroit Shell Co. contemplates important additions to the plant.

—

20 Per Cent Increase in Paige Orders

DETROIT, Jan. 28—The Paige-Detroit Motor Car Co. has 20 per cent more cars booked on order at present than it had last year. In spite of the shipping conditions the company is only 49 cars behind in delivery.

—

Wisconsin Motor Adds to Capital and Plant

MILWAUKEE, Jan. 30—The Wisconsin Motor Mfg. Co. has increased its capital stock to $1,000,000. An addition, quadrupling the capacity of the plant, has been completed and will be used mainly for assembling motors. It will have a floor space of 43,500 sq. ft. The old assembling plant has been converted into a machine shop.

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Price of Airplane Spruce Cut

WASHINGTON, Jan. 25—The market price of aircraft spruce has been cut from $200 per thousand feet to $105 through the work of the Aircraft Production Board. Figured on the basis of last year's output of 30,000,000 feet, which is far less than the amount which will be consumed in 1918, this represents a saving to the government of $2,850,000. The board has also arranged for a free exchange of airplane patents, and the United States will be able to use foreign designs without paying royalty. On each preliminary training machine a saving of from $750 to $900 has been effected through this action.

Louisville Advantageous for Industry

LOUISVILLE, KY., Jan. 28—The Louisville Industrial Foundation has sent out announcements to manufacturers of war materials pointing out the industrial advantages of the city. The Louisville central station, according to the announcement, has more than 10,000 kilowatts surplus electric power for industrial purposes, and a plentiful supply of coal which is assured the power station, due to the fact that the coal mine from which it draws its supply is less than a day's run, promises the continuity of electric power. The movement of residents to suburban districts has made available in Louisville several thousand buildings suited to the living requirements of labor.

Truck Lines Classed as Common Carriers

LANSING, MICH., Jan. 28—Cassius I. Glasgow, chairman of the railroad commission here, has given out the statement that truck lines advertising transportation from city to city are to be classed as common carriers. Therefore, they must give bills of lading to shippers, supply reports to the railroad commission and be responsible to the shipper. The Attorney-General has held this opinion as correct. The commission has also decided that if truck companies wish to incorporate, or file articles of association, they must go through the same process as a railroad and be controlled by the State Railroad Commission.

To Teach Foreign Trade Routine

NEW YORK, Jan. 28—A valuable document, to assist shippers and manufacturers in their foreign trade work has been published by the National Assn. of Manufacturers, through their foreign trade department. The work is a 50-page booklet, entitled, "An Export Order and Allied Topics." As the title suggests, this book aims to visualize through a series of letters, all of the documents, forms, and successive steps involved in the handling of a typical export transaction from the time the inquiry is received from a prospective customer to the payment of the goods obtained. With the aid of this book an intelligent clerk would soon be able to master the complete routine of foreign shipments. The book contains all of the forms used for export shipments, as well as tables containing matters of information to shippers, such as language spoken in different countries, consular fees, and general information. Those desiring copies should communicate with the National Association of Manufacturers, New York City.

Calendar

ASSOCIATIONS

Feb. 4-7 — St. Louis, American Road Builders' Assn. Convention.

April 18-20 — Cincinnati, Fifth National Foreign Trade Convention.

SHOWS

Jan. 26-Feb. 2 — Chicago National Show, Coliseum and Armory, National Automobile Chamber of Commerce.

Jan. 26-Feb. 2—Chicago, Salon, Elizabethan Room of Congress Hotel.

Jan. 26-Feb. 2—Bridgeton, N. J., Bridgeton Auto Dealers' Assn. O. P. Riley, Sec.

Jan. 26-Feb. 2—Harrisburg, Pa., Harrisburg Motor Dealers' Assn., Emerson-Brantingham Bldg. J. Clyde Myton, Mgr.

Jan. 26-Feb. 2—York, Pa., York County Auto. Dealers' Assn., Tabernacle. T. F. Pfeiffer, Sec.

Jan. 28-Feb. 2—Manchester, N. H., Academy. Couture Bros.

Feb. 5-9—Greensburg, Pa., Westmoreland Automobile Dealers' Association.

Feb. 5-9 — Twin City Auto., Truck, Tractor and Industrial Exposition, Overland Bldg. Minneapolis Auto. Trade Assn. Walter B. Wilmot, Mgr.

Feb. 5-9 — Kalamazoo, Mich., Kalamazoo Automobile Dealers' Assn., Armory.

Feb. 5-9—Binghamton, N. Y., Binghamton Automobile Dealers' Assn., Kalurah Temple. William M. McNulty, Mgr.

February — Peoria, Ill., Peoria Auto and Accessories Dealers' Assn. W. O. Ireland, Mgr.

Feb. 6-9—Lancaster, Pa., Automobile Track Assn., Fidelity Bldg. R. W. Shreiner, Mgr.

Feb. 7-13—Portland, Ore., Ninth Annual Dealers' Motor Car Assn., Auditorium. M. O. Wilkins, Mgr.

Feb. 9-16 — Bronx, N. Y., 2d Battery Armory, Bronx Automobile Dealers' Assn. D. J. Barrett, Mgr.

Feb. 11-17 — Toledo, Terminal Auditorium. Toledo Auto Show Co.

Feb. 11-16 — Kansas City, Mo., Kansas City Motor Car Dealers' Assn., Convention Hall. E. E. Peake, Mgr.

Feb. 11-16—Kansas City, Mo., Third Annual National Tractor Show.

Feb. 13-16 — Ft. Wayne, Ind., Automobile Trade Assn., Concordia Gymnasium.

Feb. 16-22—St. Louis, Mo., St. Louis Auto Mfrs. & Dealers' Assn. Robert E. Lee, Mgr.

Feb. 16-23—Albany, N. Y., Albany Auto Dealers' Assn., State Armory.

Feb. 16-24—San Francisco, Cal., San Francisco Dealers' Assn., Exposition Auditorium. G. A. Wahlgreen, Mgr.

Feb. 18-23—Syracuse, N. Y., Syracuse, Automobile Dealers' Assn., State Armory. Harry T. Gardner, Mgr.

Feb. 18-23 — Nashville, Tenn., Nashville Auto Trade Assn., Hippodrome. Henry B. Marks, Mgr.

Feb. 18-23—Grand Rapids, Mich., Automobile Business Assn., Klingman Building. Ernest T. Conlon, Mgr.

Feb. 18-22—Newark, N. J., N. J. Auto Exhibition, Co. G. First Regiment Armory. Claude E. Holgate, Mgr.

Feb. 18-23 — Springfield, Ohio, Springfield Auto Trades Assn., Memorial Hall. C. S. Burke, Mgr.

Feb. 18-23 — Waterbury, Conn., United Shows Co.

Feb. 18-23—Duluth, Minn., Duluth Automobile Trade Association. John J. Lane, Mgr.

Feb. 18-23 — Pittsfield, Mass. State Guard, State Armory. James J. Callaghan, Mgr.

Feb. 18-27—So. Bethlehem, Pa., Fourth Annual (cars 18-23; trucks 25-27). Coliseum. J. L. Elliott, Mgr.

Feb. 20-23—Quincy, Ill., First Annual, Armory. L. B. Bartlett, Mgr.

Feb. 23-Mar. 2—Brooklyn, N. Y., Brooklyn Motor Vehicle Dealers' Assn., 23d Regiment Armory. I. C. Kirkham, Mgr. Passenger cars Feb. 23-Mar. 2; Trucks Mar. 5-9.

Feb. 23-Mar. 2—Omaha, Neb., Omaha Auto. Trade Assn. Auditorium. Clarke G. Powell, Mgr.

Feb. 25 - Mar. 2—Indianapolis, Indianapolis Automobile Trade Assn., Diamond Chain Work Bldg. John B. Orman, Mgr.

Feb. 25-Mar. 2—Muskegon, Mich. Second Annual, Merrill Auditorium. John C. Fowler, Mgr.

Feb. 25-Mar. 2 — Bridgeport, Conn., Fourth Regiment Conn. Home Guard, State Armory and Casino. B. B. Steiber, Mgr.

Feb. 27-Mar. 2—Columbus, O., Auto Exhibitors Co. W. W. Freeman, Mgr.

Feb. 27-Mar. 6—Boston, Mass., Salon, Boston Automobile Dealers' Assn., Copley Plaza Hotel. Chester I. Campbell, Mgr.

Mar. 1-15—Lyons, France, Third Sample Fair.

Mar. 2-9—Boston, Mass., Boston Auto. Dealers' Assn., Mechanics' Bldg. Chester I. Campbell, Mgr.

Mar. 2-9—Pittsburgh, Pa., Automobile Dealers' Assn. of Pittsburgh, Motor Square Garden. John J. Bell, Mgr.

Mar. 4-9—Utica, N. Y., Utica Motor Dealers' Association, Inc., State Armory.

Mar. 6-9—Clinton, Ia., Clinton Automobile Dealers' Assn., Coliseum.

Mar. 6-9—Watertown, N. Y., Automobile Dealers, Inc., State Armory. Arthur E. Sherwood, Mgr.

Mar. 6-9—St. Joseph, Mo., St. Joseph Automobile Dealers' Assn., Auditorium. John Albus, Mgr.

Mar. 6-9—Sioux Falls, S. D., S. D. Automobile Dealers' Assn.

Mar. 8-11 — Green Bay, Wis., Brown County Automobile Trade Assn.

Mar. 12-15—Fargo, N. D., Gate City Auto. Show Co., Auditorium. J. W. Murphy, Mgr.

Mar. 15-20—Great Falls, Mont., Montana Automobile Distributors' Association, Lexington Garage. A. J. Breitenstein, Mgr.

Mar. 19-24—San Francisco, Cal., Motor Truck Dealers of San Francisco, Auditorium. Ivan R. Gates, Mgr.

Mar. 11-16—Cedar Rapids, Ia., Cedar Rapids Auto Trade Assn., Auditorium.

Mar. 20-22—Houlton, Me., Second Annual, Houlton, Motor Car Dealers' Assn., Bangor St. Exhibition Hall. J. D. Luth, Mgr.

Mar. 20-23 — Holdredge, Neb., Second Annual of Southwest Nebraska.

Mar. 20-23 — Trenton, N. J., Trenton Auto Trade Assn. Second Regiment Armory. John L. Brock, Mgr.

Mar. 30-Apr. 6—Hartford, Conn., Eleventh Annual, Hartford Automobile Dealers' Assn., Inc. State Armory. B. F. Smith, Mgr.

Mar. 30-Apr. 6—Atlantic City, N. J. Second Annual, Garden Pier. S. W. Megill, Mgr.

Apr. 6-13—Red Bank, N. J., Monmouth County Auto. Dealers' Assn., Armory. E. C. Von Kattengell, Mgr.

Apr. 9-13—Stockton, Cal., Third Annual San Joaquin Auto Trade Assn. Samuel S. Cohn, Mgr.

Apr. 17-20—Calumet, Mich., Upper Peninsular Show, Copper County Automobile Dealers & Garage Owners' Assn., Coliseum.

Sept. 23-28 — Chicago, National Accessory Show for Fords. Coliseum.

S. A. E.

Feb. 1 — Chicago, War Dinner during Winter Meeting.

ENGINEERING

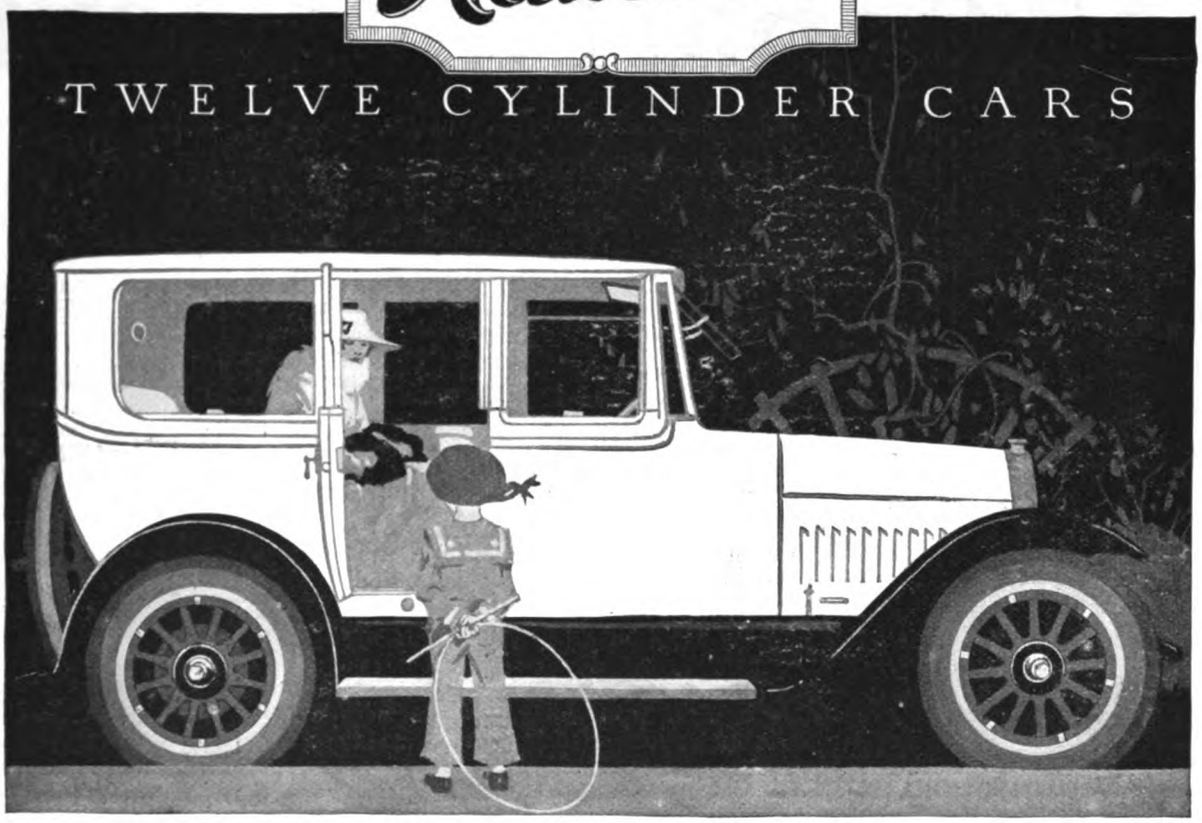
American Society of Heating and Ventilating Engineers.

Mining and Metallurgical Society of America.

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National

TWELVE CYLINDER CARS



STAMINA THAT IS ECONOMY

THE immediate success met by this new twelve-cylinder National Touring Sedan constitutes a splendid recognition of the fact that true war-time economy is a matter of efficiency.

No more would we think of limiting the strength, the ability, or the convenience of this practical traveler than we would of suggesting that the equipment of our troops overseas be curtailed.

These times test the soundness of every man's economy-doctrine, and they emphasize the wisdom of the dealer who sells and of the customer who buys this car in which stamina is the source of important savings.

With either the six- or twelve-cylinder airplane-type engine, it is a trustworthy car for all purposes; staunchly built to meet the exactions of shrewd judges and of long, varied service.

Its fuel, tire, and maintenance costs are surprisingly low.

The versatility of the carriage of this National, easily closed for winter or opened for summer, is enjoyed without sacrifice of touring range.

It affords the advantages of a cold weather equipage and of a warm weather tourist at the cost of one car.

The new National spreads its inherent utility and economy over the entire year and thus, from its initial cost, it yields the utmost in service value.

Behind these economy-facts the prosperity of National dealers is firmly entrenched.

NATIONAL MOTOR CAR & VEHICLE CORPORATION - INDIANAPOLIS

Eighteenth Successful Year

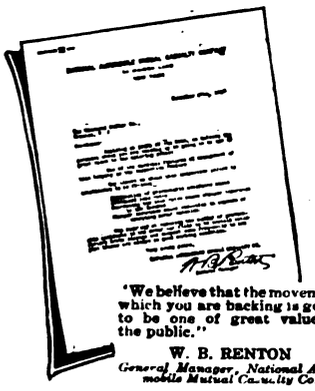
National Dealers Now Offer Complete Range of Body Styles in Both

Six and Twelve Cylinder Models

7-Passenger Touring Car, 4-Passenger Sport Phaeton
4-Passenger Roadster, 7-Passenger Convertible Sedan

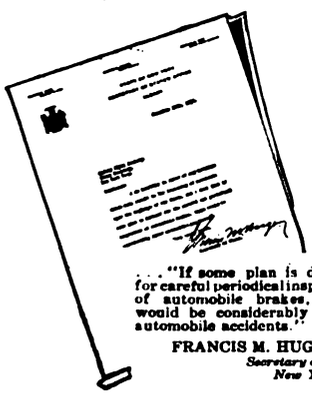
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Get behind this big National Movement



"We believe that the movement which you are backing is going to be one of great value to the public."

W. B. RENTON
General Manager, National Automobile Mutual Casualty Co.



"If some plan is devised for careful periodical inspection of automobile brakes, there would be considerably fewer automobile accidents."

FRANCIS M. HUGO
Secretary of State New York

An open letter to the trade:

The new Brake Inspection Movement is of such importance to motorists in general, and to the trade in particular, that we wish to add to it our endorsement and to ask your assistance in furthering it.

Object of the movement

The object of the movement is to decrease the number of preventable accidents due to imperfectly adjusted or defective brakes.

An official of the Motor Truck Club of America says that 60% of the accidents caused by brake troubles could be avoided.

One reason for these accidents is that the brake bands are located out of sight and any deficiencies are consequently liable to pass unnoticed until they have developed into serious troubles.

The plan of the "Brake Inspection Movement" is to prevail on every motorist to have his dealer inspect his brakes before the touring season opens. It is called to his attention that the brake-rods can usually be turned up two or three times before new brake lining is needed. A simple adjustment of the equalizers will frequently make the brakes safe instead of dangerous.

Less important evils have been corrected

Glaring headlights have been forbidden by legislation in many states. It needs no argument to prove that defective brakes are even more of a danger. It will probably be but a short time when motorists will be compelled by law to have their brakes inspected at regular, stated intervals.

Aside from the broad civic interest which you will have in this movement it will also command your support for business reasons.

Where motorists are being urged so strongly to have their brakes inspected it is evident that this must result in increased brake lining business.

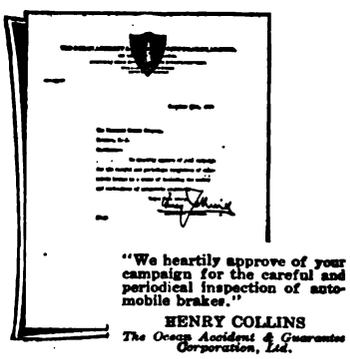
In closing, allow me to urge most strongly that you give this movement your active assistance, as well as your endorsement.

Sincerely yours,

H. F. Blanchard

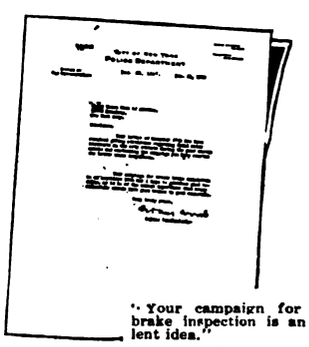
(General Sales Manager)

THERMOID RUBBER COMPANY
Trenton, N. J.



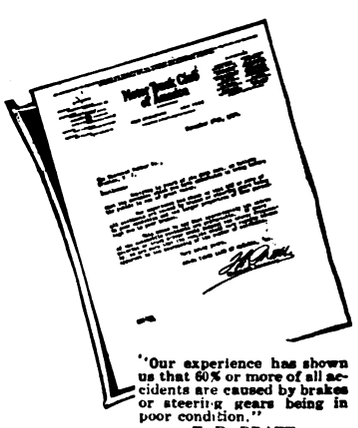
"We heartily approve of your campaign for the careful and periodical inspection of automobile brakes."

HENRY COLLINS
The Ocean Accident & Guarantee Corporation, Ltd.



"Your campaign for better brake inspection is an excellent idea."

ARTHUR WOODS
Former Police Commissioner New York City



"Our experience has shown us that 60% or more of all accidents are caused by brakes or steering gears being in poor condition."

T. D. PRATT
Motor Truck Club of America

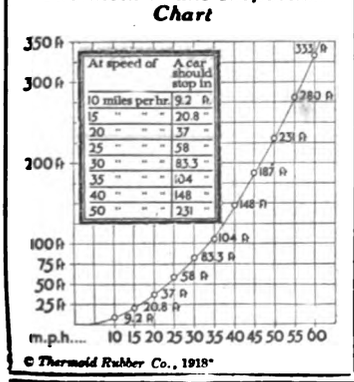
V^2 / 10.8 Will your car do this?

Automobile engineers have proven that when brake mechanism is right and road conditions average, any car should stop at distances and speeds given by the chart.

V^2 means the square of the velocity or speed of your car. 10.8 is the proven factor of retardation under average road conditions. This factor decreases on smooth slippery roads to 6.7 and increases as high as 17.4 on rough worn roads. The chart represents the average condition and other conditions can readily be figured by changing the factor within the given limits.

Remember that your brake mechanism is not "right" unless its brake lining has the ideal co-efficient of friction. The better the brake lining the quicker your stop.

Thermoid Brake Inspection Chart



© Thermoid Rubber Co., 1918



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At the Chicago Show

You can see the various models of Waltham Clocks that have become standard equipment for the following makes of cars:

Anderson 6-40
Apperson
Brewster
Cadillac
Chalmers
Cole
Crane
Cunningham
Detroit-Electric
Doble
Fergus
Franklin
Haynes
Hal
Hudson Super-Six
Jordan
Kissel
Locomobile
Marmon
Mercer
Murray
Owen-Magnetic
Packard
Pierce-Arrow
Rauch & Lang
Rolls-Royce
Simplex
Stearns
Studebaker
Willys-Overland
Winton

Over 250,000 Now in Use as Standard Equipment



The Waltham Automobile Clock

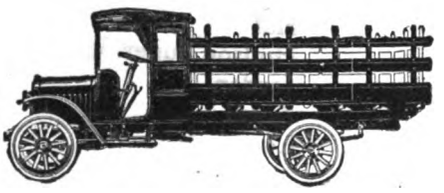
has two mainsprings and is stoutly and scientifically built to resist the shocks of road travel and the extremes of temperature. It is the **only** clock so built and so adjusted. It tells the right time. It is splendidly durable. In appearance it conforms with the luxurious cars that use it. A red signal on the dial shows when the clock needs winding. The presence of a Waltham in a car has become an index that points to the car's class.

WALTHAM WATCH COMPANY, WALTHAM, MASS.

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Axle and bearings of a two-ton truck

Prices (F. O. B. Detroit) Chassis $985. With cab and windshield, $1025; Combination box stake gate body, $1075; Stake gate, $1080; Express canopy, $1095.



Certainty—that is what you want—a truck you can sell confidently to near neighbors. Millions of dollars' worth of truck business will be done in the next few months; you know it. But you are afraid of the "*ought*-to-be-good" unproved trucks that suddenly are being offered on every hand. You can't take chances. You have a local reputation to build up and maintain.

HERE is certainty for you—a truck that has PROVED its merits, its capacity, its durability, its economy. It is the Maxwell; a truck design throughout, not an adapted passenger chassis. It has ten feet length of loading space; trouble-proof, mud-proof transmission; and the famous time-tried Maxwell engine, the most efficient engine of its type in the world. It has proved itself, in the severest use, "the best truck for the worst roads" . . . Every one of them you sell will enhance your local reputation. . . . Enormous production is fast being overtaken now by enormous orders. . . . Wire us today for our offer to dealers.

Most miles per gallon Most miles on tires

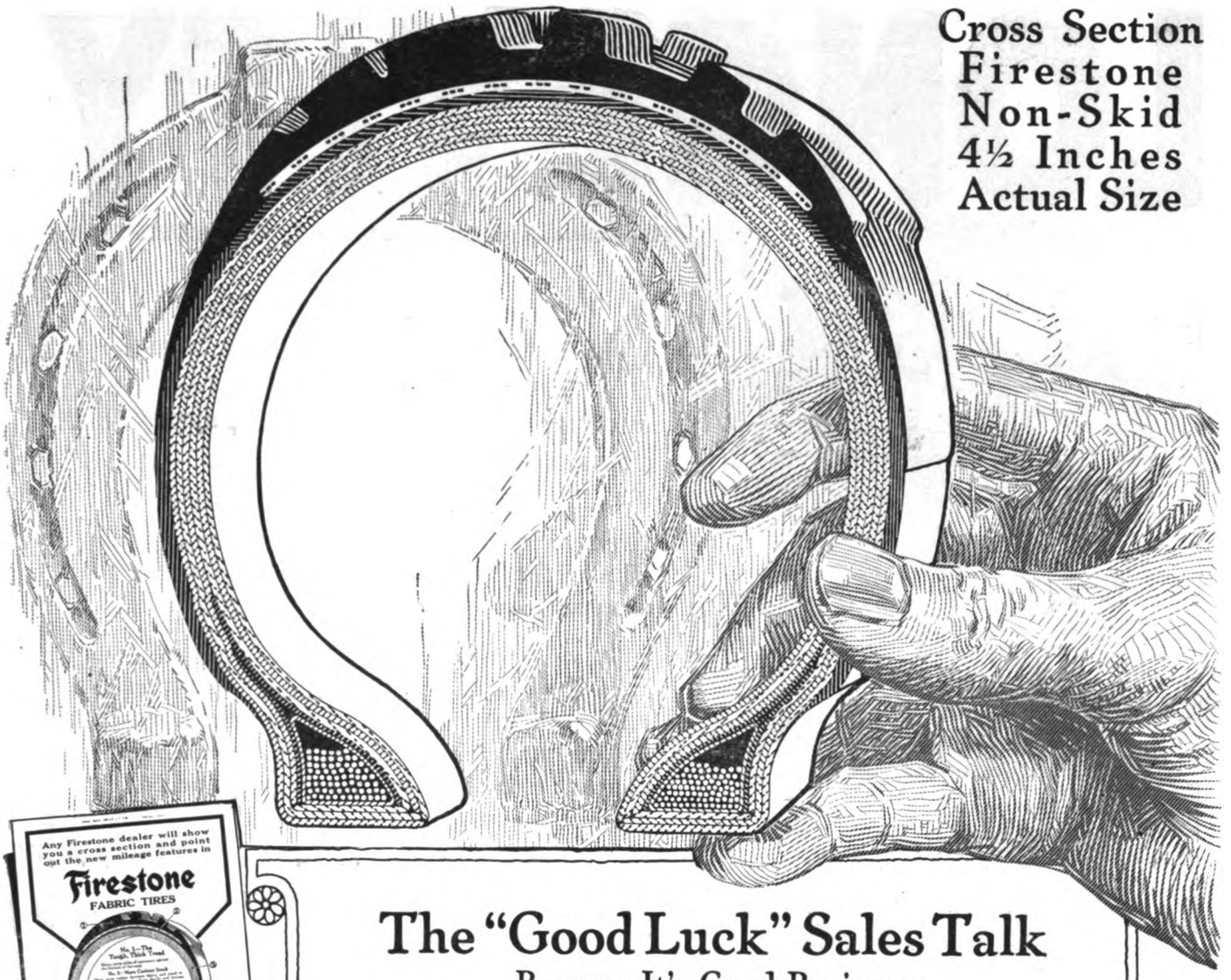
MAXWELL

ONE-TON WORM-DRIVE

TRUCK

Maxwell Motor Sales Corporation Detroit, Michigan

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The "Good Luck" Sales Talk

Because It's Good Business

SHOW your customers a Firestone section. Tell them the Firestone facts. Explain the advantages of:

Extra Tough Tread — More Rubber Between Layers
Thick Cushion Stock — Reinforcement in Sidewall

You'll find that sales come quick and often. Your sales efforts are "lucky" because they are founded on actual constructive advantages. Build big business, sure business, repeat business, by putting Firestone superiorities before the motorists of your community.

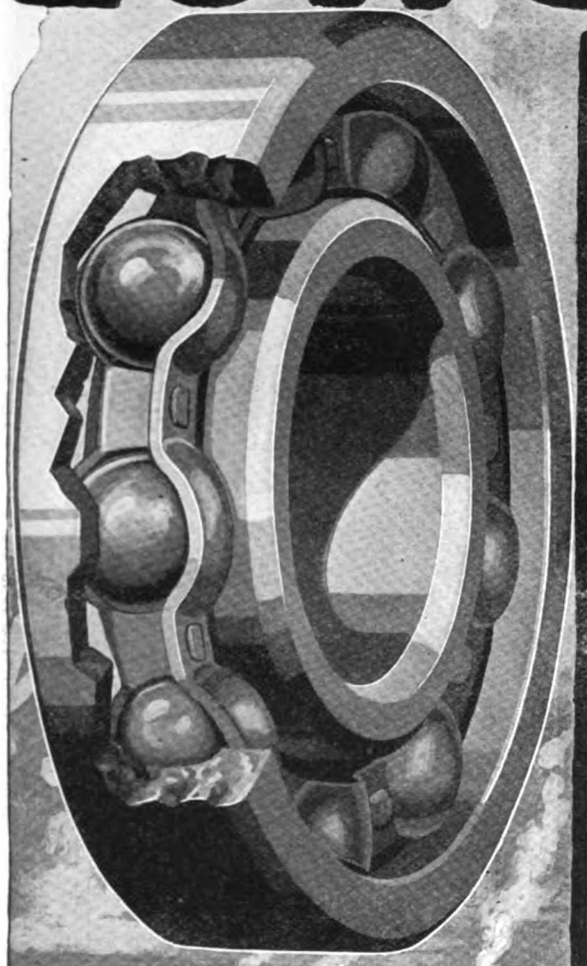
Tell them why both Firestone Fabric and Cord Tires produce MOST MILES PER DOLLAR and you'll find a ready response in interest and sales. Try it. Write for Firestone facts, sales aids and advertising helps.

FIRESTONE TIRE AND RUBBER COMPANY
Akron, Ohio — Branches and Dealers Everywhere

Firestone

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LONGEVITY



NO small credit is due New Departure Magneto type ball bearings for the exceptional service and endurance of many important electrical devices.

A wealth of engineering talent, the very newest and most improved machinery, skilled operators and an exceptional inspection system absolutely fix New Departure superiority.

As one engineer said to us, *"If you did not make the best bearing on earth, with that equipment, you certainly would have reason to be ashamed of yourselves!"* A back-handed compliment, to be sure, but we are as proud of our product as we are of our plants.

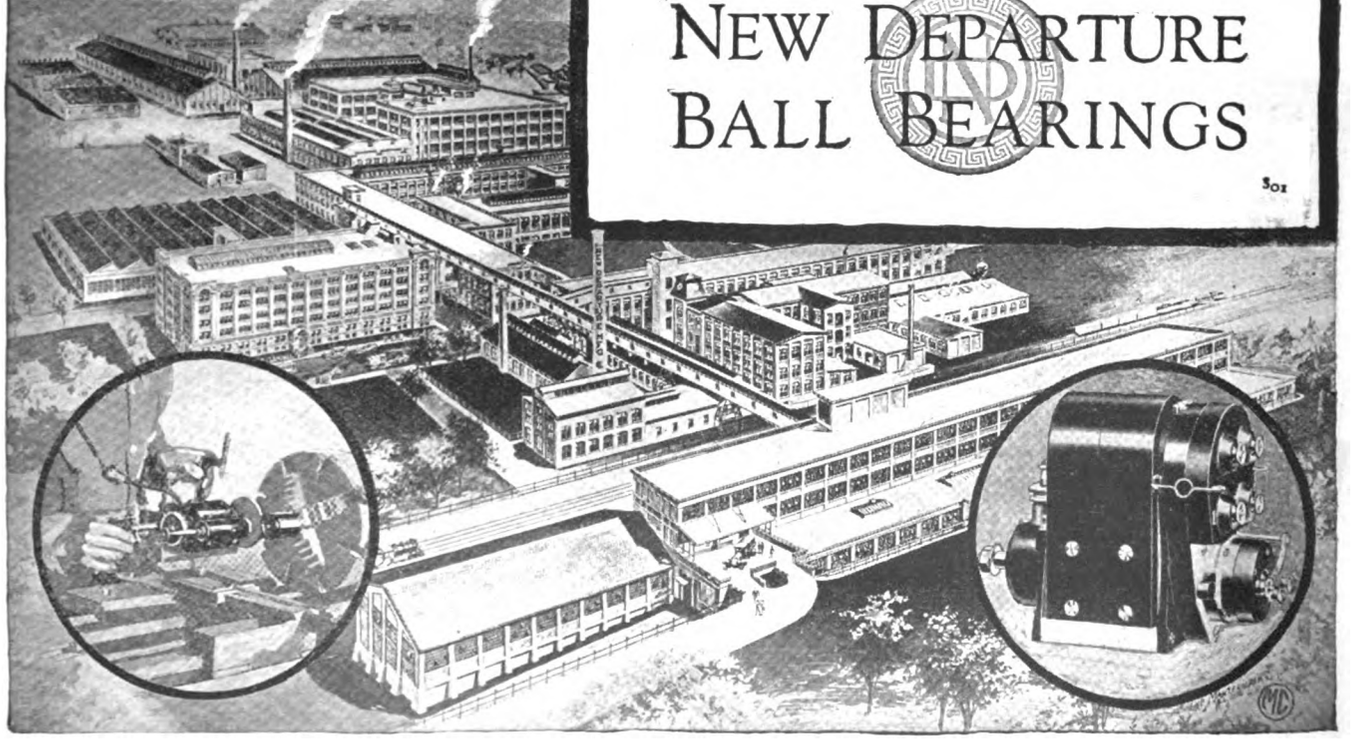
Our experience in solving bearing problems is freely at your command.

THE NEW DEPARTURE MANUFACTURING COMPANY,
Bristol, Conn. Detroit, Mich.

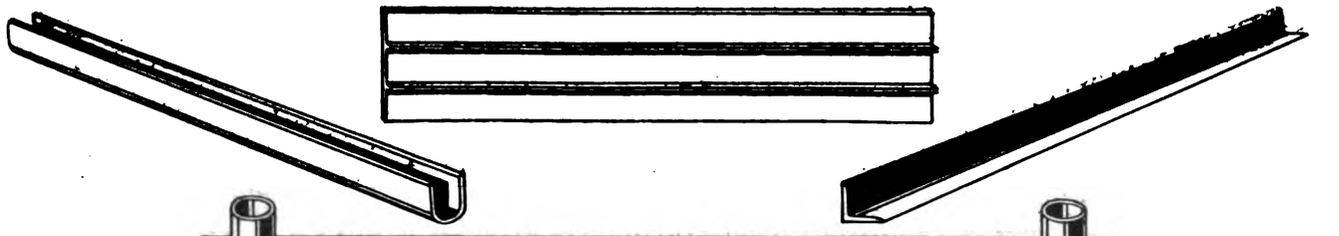
Conrad Patent Licensee

NEW DEPARTURE BALL BEARINGS

301



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Prompt Deliveries

From crude materials to finished merchandise ELISCO products are made in our own steel plants, assuring us an ample and independent supply, and the ability to make prompt and regular deliveries on all orders for

ELISCO

STEEL PRODUCTS

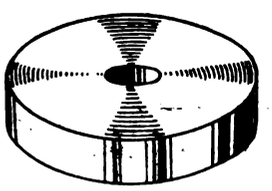
We specialize on light gauge cold drawn steel tubing from 1/4 inch to 3 inch O.D. — made by the "Elisco" process—the only process using automatic machines combining *all six* operations in *one* and ensuring the utmost in mechanical accuracy and finish.

Let us figure on your requirements also in high carbon butted and brazed Steel Tubing; Strip Steel; Bars, Angles, Channels, and Special Shapes.

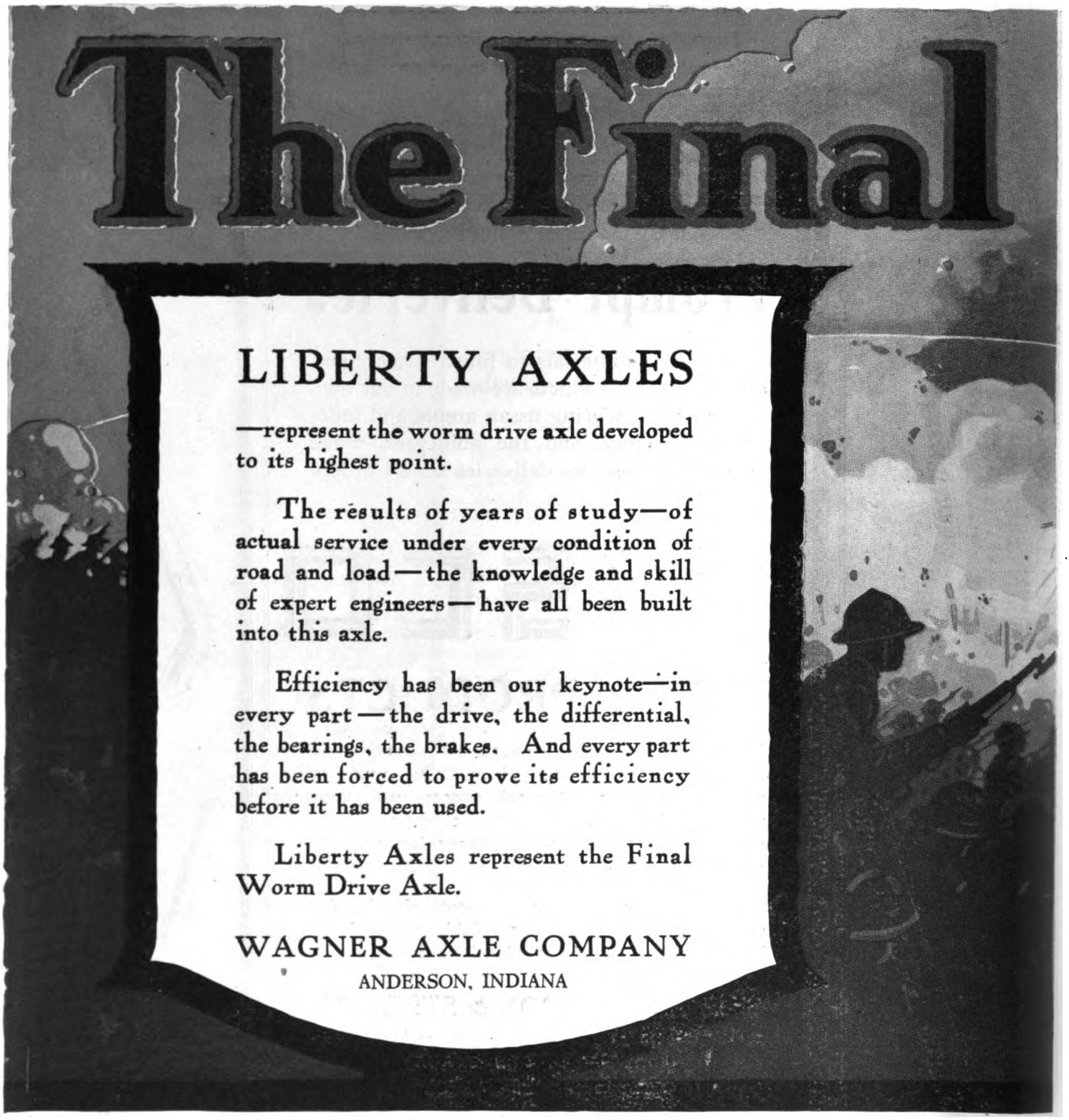
THE ELYRIA IRON & STEEL CO.

East 131st Street **Cleveland, Ohio**

Chicago Office: 1243 Peoples Gas Building
Detroit Office: 1934 Dime Bank Building
Atlanta, Ga., Office: Candler Building
New Haven, Conn.: 504 Colonial Building

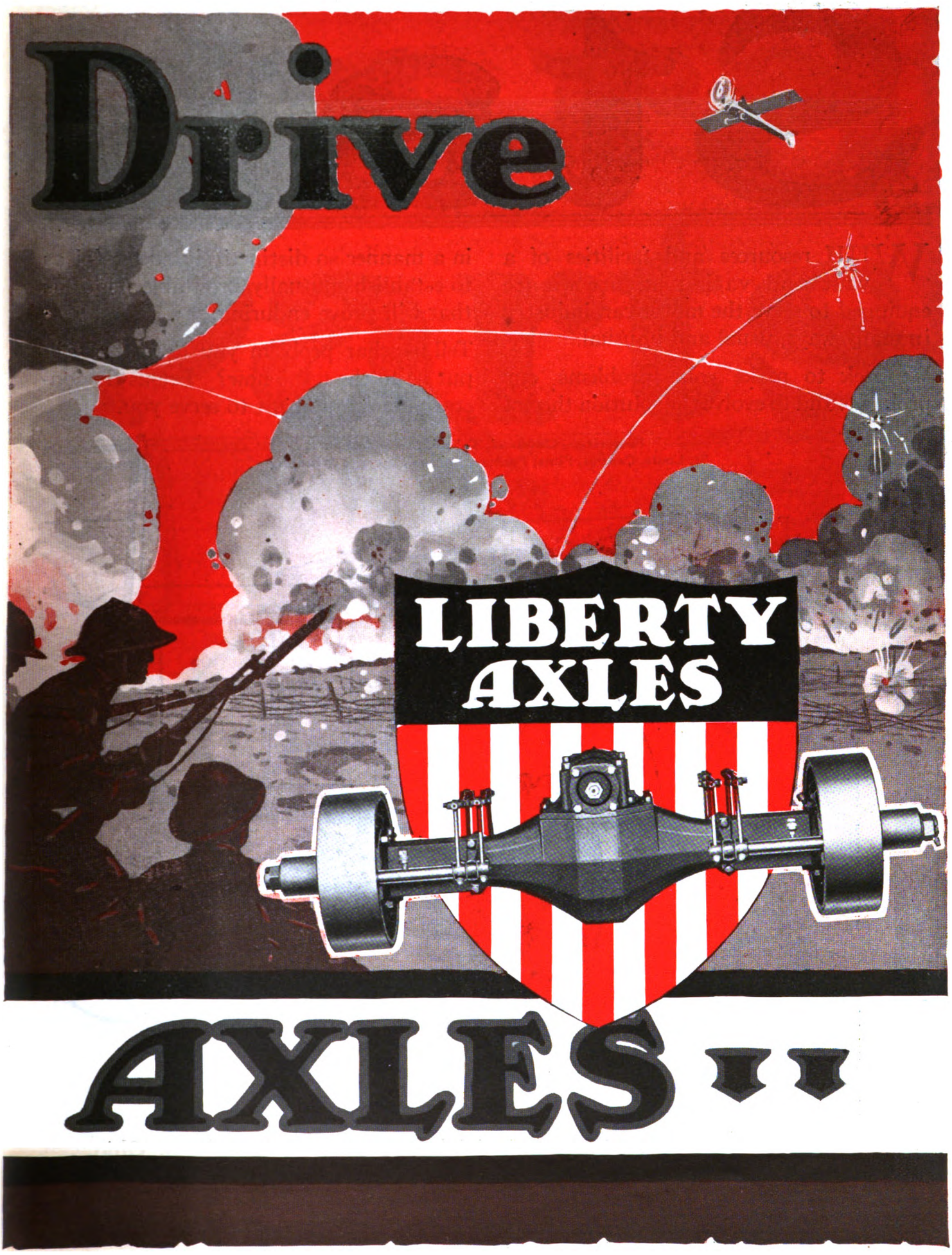


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Please mention Automotive Industries when writing to Advertisers

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Stan

WITH resources and facilities of a vast and varied nature we are equipped to serve the motor car industry in many ways, usual and unusual.

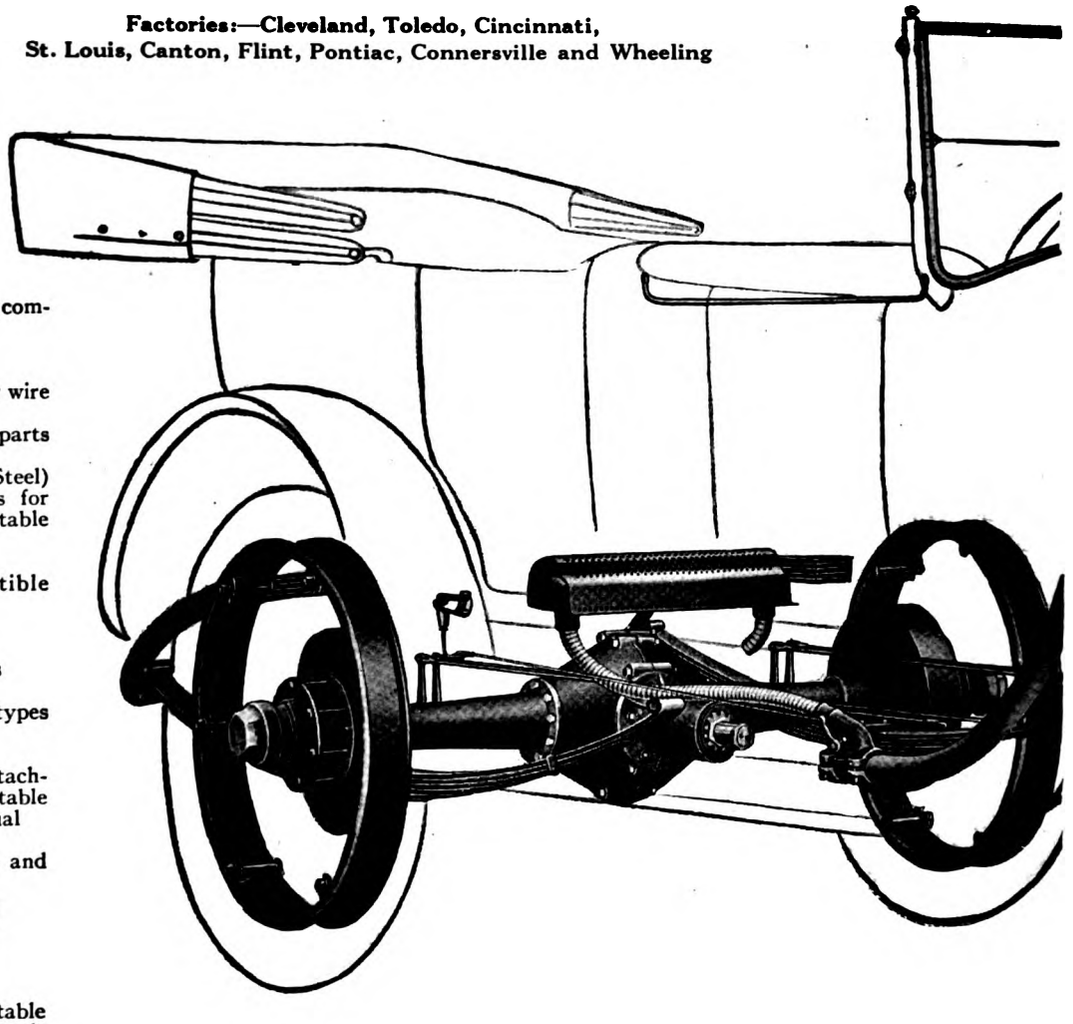
We seek to make your problems our problems and to evolve the solution thereof in a manner so distinctively successful as to establish mutually profitable relations that will prove enduring.

Tell us what problem you have that will put us to the test—now? Let us demonstrate our equipment to serve you.

Factories:—Cleveland, Toledo, Cincinnati, St. Louis, Canton, Flint, Pontiac, Connersville and Wheeling

For Motor Vehicles

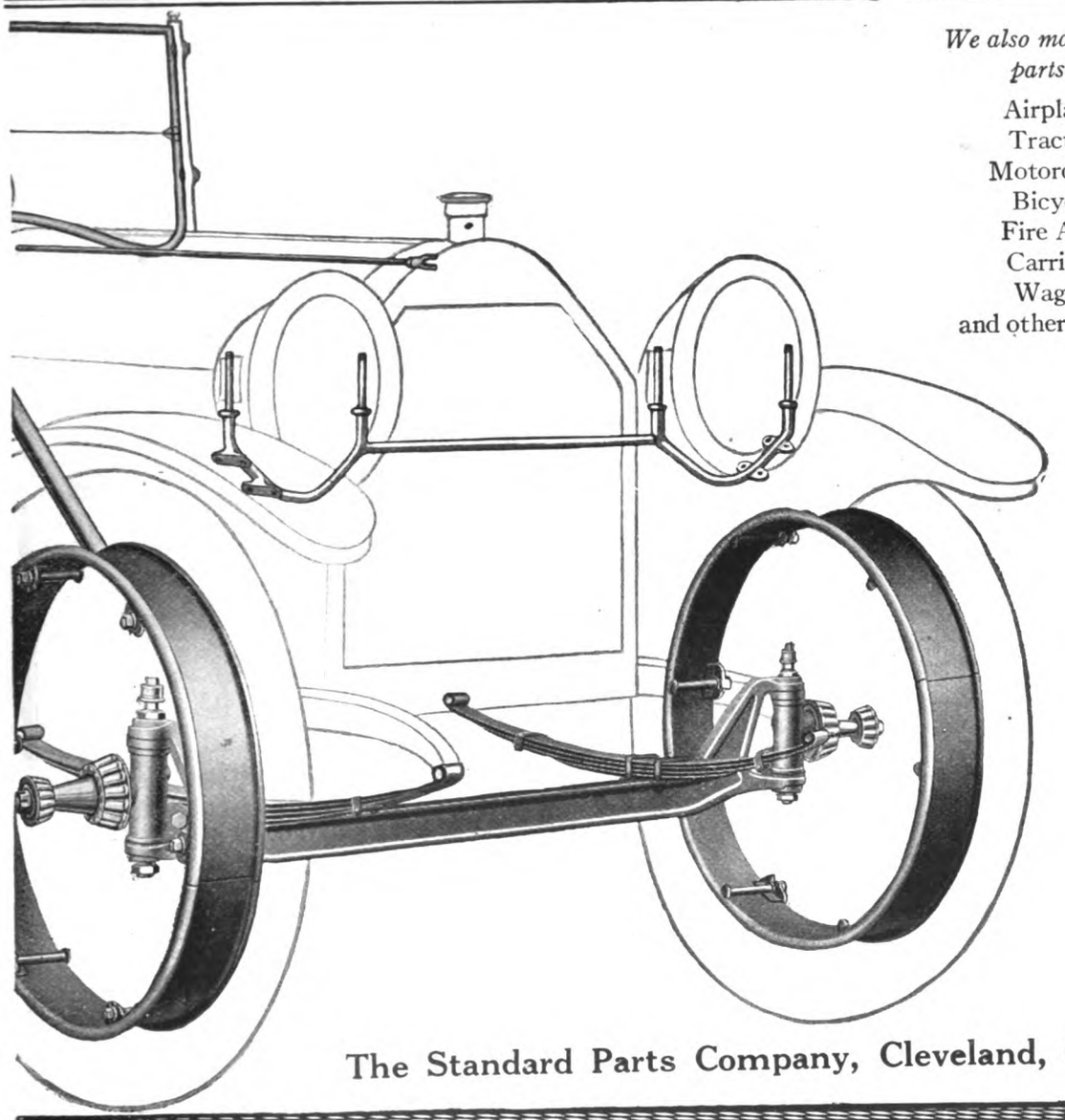
Axles
Axles (dead rear)
Bearings
Brake rod assemblies complete
Clincher rims
Cranks (starting)
Detachable rims for wire wheels, special
Electric welding of parts
Exhaust tubes
Felloe bands (S. A. E. Steel)
Flanges and fittings for attaching demountable rims
Formed Tubing
Forgings for convertible trucks
Heaters
Hubs
Ignition wiring tubes
Mast sleeves
Millimeter rims, all types
Oil tubes
Radiator rods
Rims—clincher, detachable and demountable for single and dual equipment
Starting gear rings and boxes
Straight steel tubing
Steering gear tubing
Springs (regular)
Springs (thin leaf)
Tail pipes
Tire bases in demountable and pressed on channels
Torsion tubes
Truss rods
Tubing (straight and formed)



The Standard Parts Company, Cleveland, Ohio

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dard parts



We also manufacture parts for

Airplanes
Tractors
Motorcycles
Bicycles
Fire Arms
Carriages
Wagons
and other vehicles

The Standard Parts Company, Cleveland, Ohio

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A DRIDEK Leather Top Will Not Scratch or Chafe Will Hold Its Color and Appearance and Is Guaranteed Absolutely Waterproof

TRADE DRIDEK MARK REG.

The Most Remarkable Top Material Yet Produced

"Over the Top"

When you put a DRIDEK leather top on your car, you cover it with a character and distinction that produces an increased value and puts your car in the class where it belongs.

DRIDEK tops are being put on many of the *best* cars. If you don't know all about DRIDEK get samples and price list at once.

L. J. Mutty Company, Boston, Mass.

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Engineering Experience Proves

DOHNER

HIGH COMPRESSION COUPLINGS

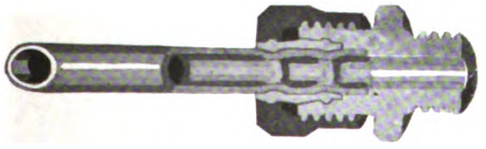
the only effective couplings



The ring is one of the main features of the Dohner Coupling. The rings on either side of the thimble are pressed into the tubing to be connected by simply tightening up the nut.



The several parts of the Dohner coupling consist of the main body of the coupling, the tapered nut and the tapered thimble. In adjusting, the end of the tubing is slipped through the nut and thimble into the body of the coupling up to the shoulder, and by simple tightening up the nut the operation of fastening the tube in place is automatically performed.



Tightening the nut automatically compresses, or transfers, the rings from the outside to the inside of the thimble. Thus the rings are "bit" into the tubing, producing a practically welded joint—absolutely air tight. Troublesome and unreliable soldering and tedious thread cutting are avoided, and all possibility of dangerous leaks absolutely eliminated.

The Dohner Coupling is a really effective coupling. This coupling is absolutely **Leak Proof**, and is the **only** coupling unaffected by vibration. Practical experience and scientific tests **prove** these facts.

"Reconnectability" of the Dohner Coupling is important. It can be disconnected by loosening the nut in the ordinary manner. Connection can be made again by tightening the nut, and coupling becomes as effective as before.

The Dohner Coupling is the most economical as well as the most effective coupling. Its slightly higher first cost is more than made up by the labor saving which its ease and simplicity of installation make possible.

This coupling is made for use with any metal, the hardness not interfering with the effectiveness of the coupling, which is made of steel or brass, as conditions require.

Dohner High Compression Couplings are coming into general use on oil and gasoline lines in automobiles, airplanes and motorcycles, and on steam lines in steam cars and locomotives.

Dohner Couplings are in use on several motor cars. Such well engineered motors as the Buick and the Maxwell use Dohner Couplings exclusively. This year the Buick Motor Car Company will use 3,000,000 Dohner Couplings.

Three years ago the Baldwin Locomotive Works, after an exhaustive study of couplings for use as a steam gauge connection for the passage of live steam, adopted the Dohner High Compression Coupling.

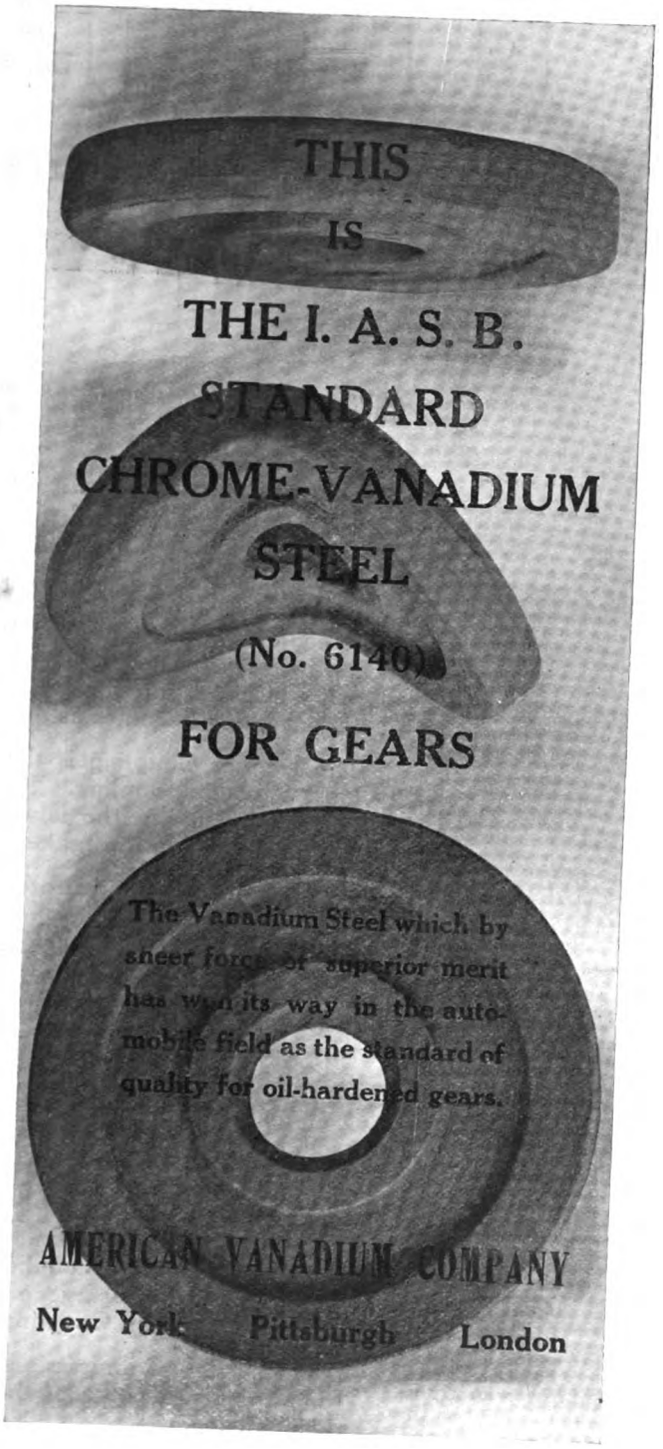
Dohner High Compression Couplings are especially adapted for airplanes because of their light weight, their stability and their efficiency.

THE DOHNER LINE IS COMPLETE, INCLUDING UNIONS, ELLS, TEES, ETC. PAT'D JUNE 13, 1916

The Ohio Metal Products Company

Sales Office: 616 Free Press Bldg. DETROIT, MICH. Factory: Dayton, Ohio

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CENTRAL STEEL CO.'S
VANADIUM STEEL

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OAKES
Cooling Fans

—in the making

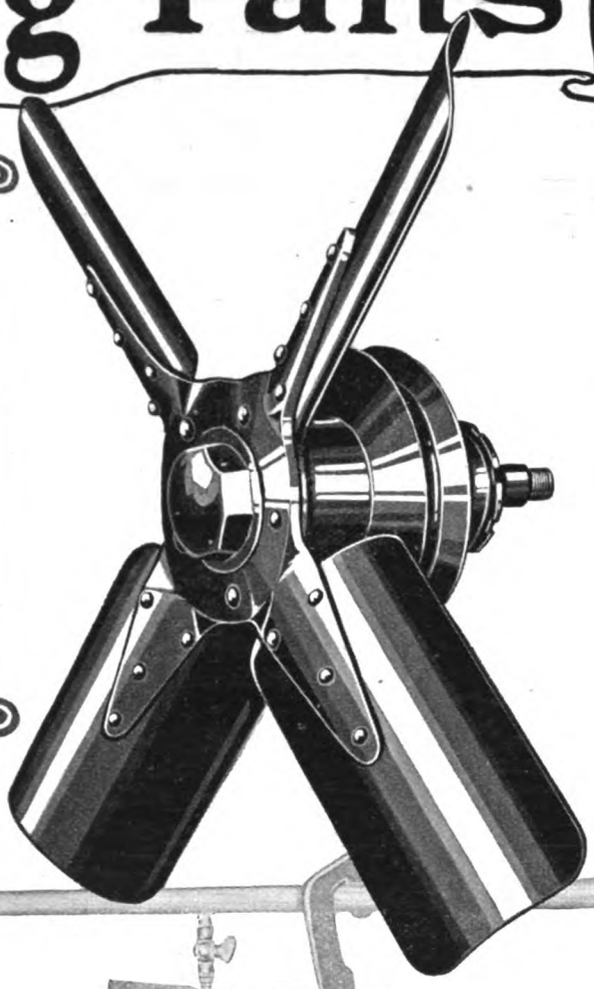
Below is shown one of a great number of special machines designed by us, and made especially for our use. This one in particular is a "double-header"—which assures perfect bearing alignment, one essential qualification for quiet bearings.

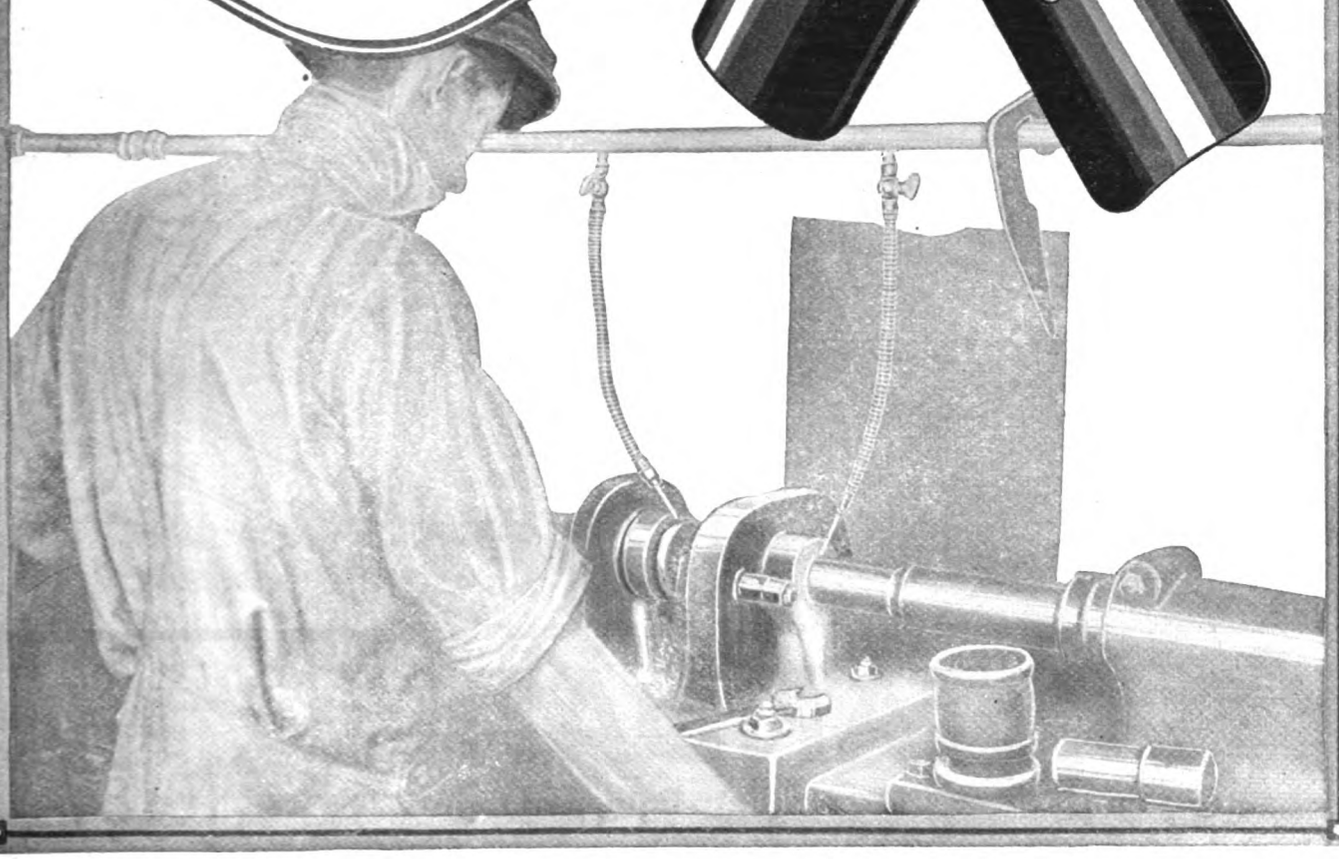
The Fan shown (designed for "V" belts) is another example of the many models, made in all their completeness, produced in the world's largest exclusive cooling fan manufacturing plant.

The new Oakes Experimental Laboratory is at the disposal of any motor car, truck or tractor maker, who desires to conduct experiments on cooling equipment.

The Oakes Company

Indianapolis U. S. A.





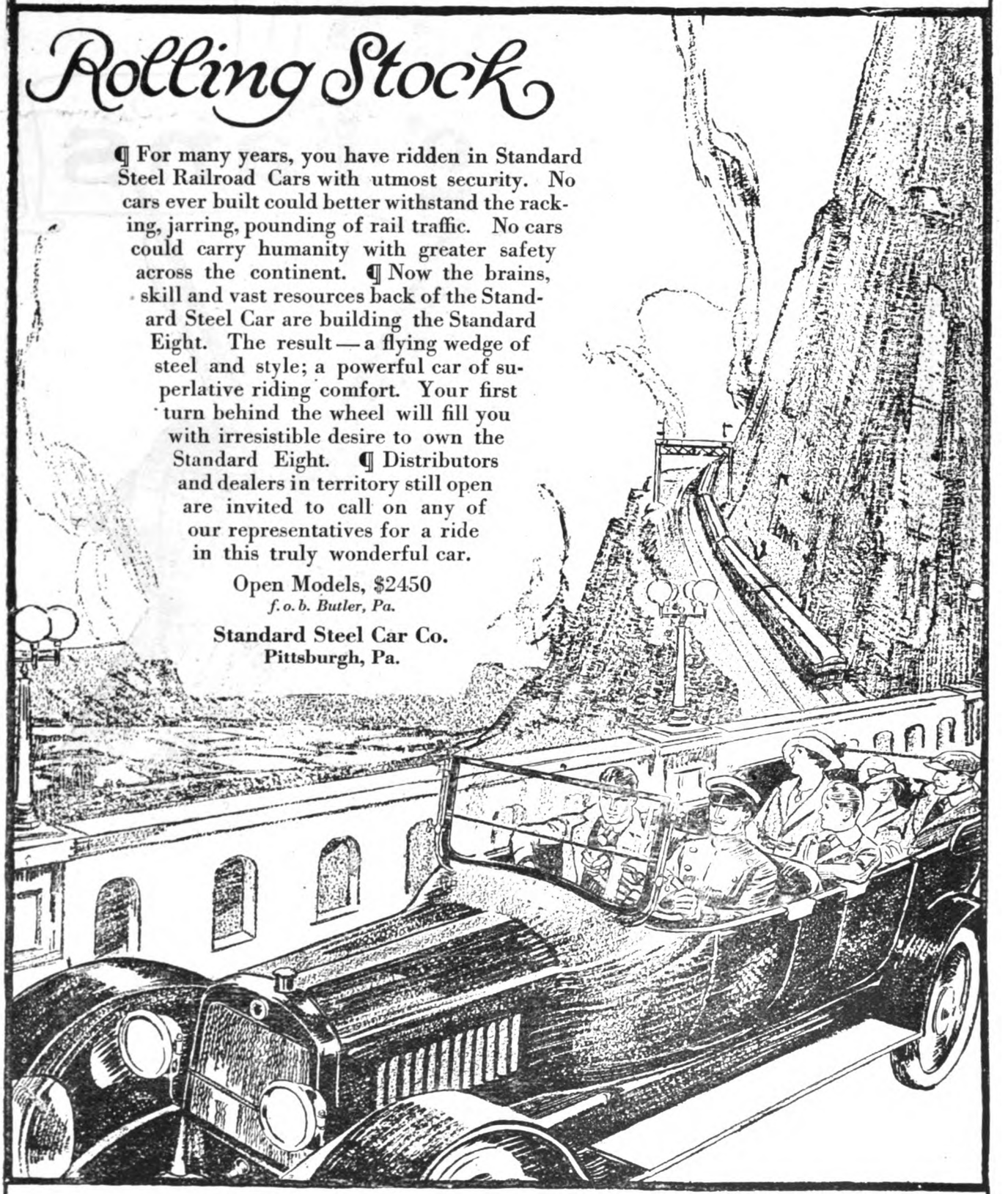
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Rolling Stock

¶ For many years, you have ridden in Standard Steel Railroad Cars with utmost security. No cars ever built could better withstand the racking, jarring, pounding of rail traffic. No cars could carry humanity with greater safety across the continent. ¶ Now the brains, skill and vast resources back of the Standard Steel Car are building the Standard Eight. The result — a flying wedge of steel and style; a powerful car of superlative riding comfort. Your first turn behind the wheel will fill you with irresistible desire to own the Standard Eight. ¶ Distributors and dealers in territory still open are invited to call on any of our representatives for a ride in this truly wonderful car.

Open Models, $2450
f. o. b. Butler, Pa.

Standard Steel Car Co.
Pittsburgh, Pa.



STANDARD "8"

STANDARD "8"

The Magneto Equipped Eight

STANDARD "8"

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YOU CAN SAVE TIME JUST AS MR. SMITH DOES



A. E. Smith

PURCHASING AGENT
THE TEETOR-HARTLEY MOTOR COMPANY.

Time is the biggest factor in business today. That's why men like Mr. Smith always have a copy of The Automobile Trade Directory within reach.

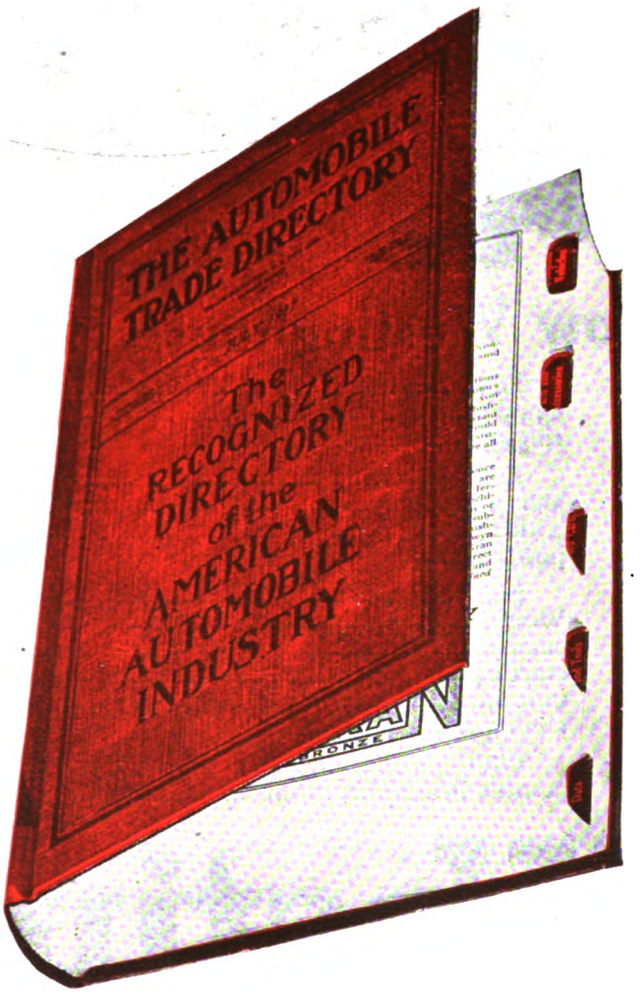
Don't waste time writing unnecessary letters for information as to who makes anything used in the automobile industry—consult your copy of the "Red Directory" and therein you will find the information instantly.

"It Hangs Everywhere"
A THOUSAND CATALOGS IN ONE

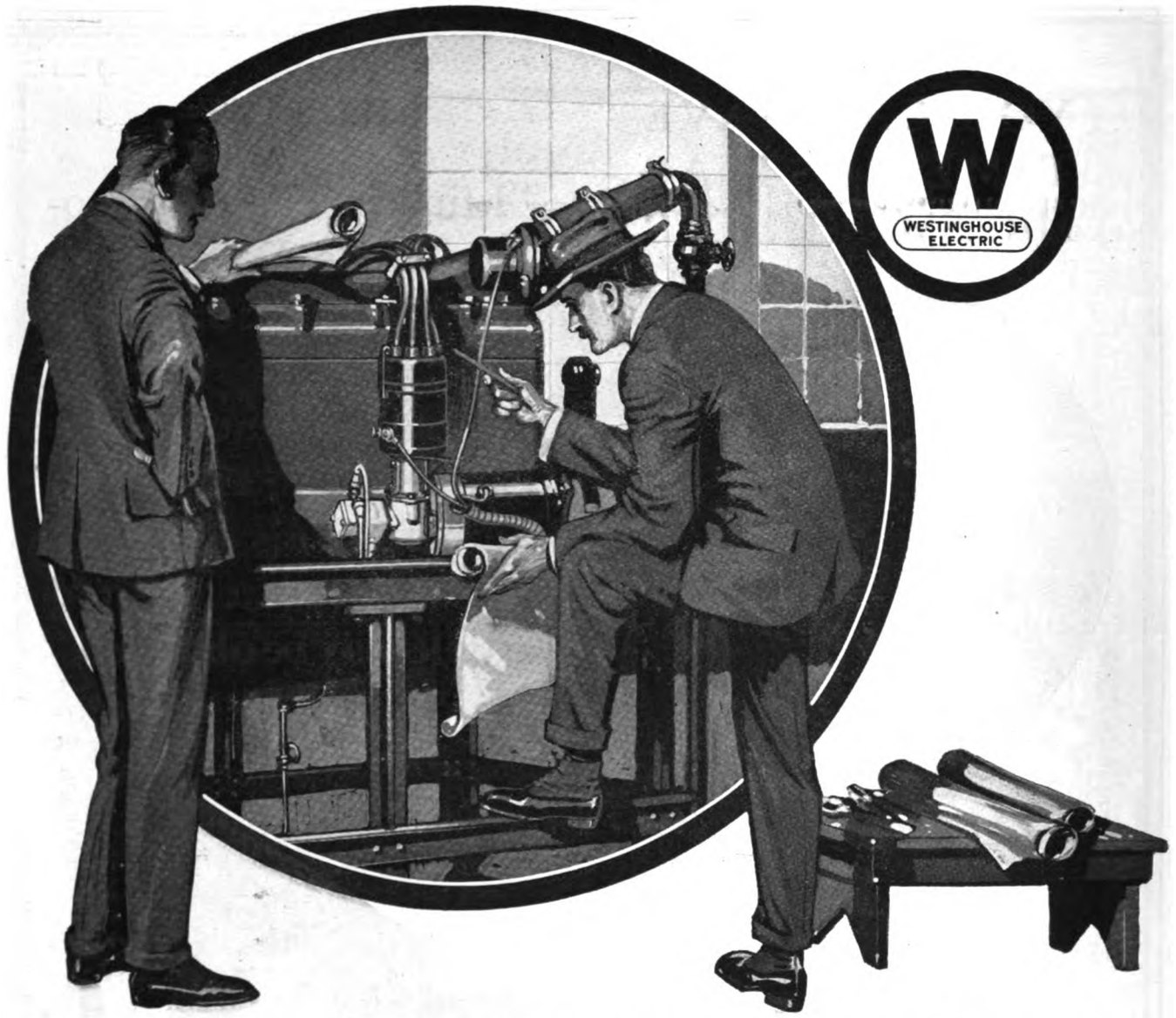
THE AUTOMOBILE TRADE DIRECTORY
ROBERT WOLFERS, President
243 WEST 39th STREET, NEW YORK CITY

HE SAYS—

"I find in The Automobile Trade Directory a wealth of information for the busy buyer—and the manner of its classification aids me in determining quickly just where the desired article may be obtained."



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How Westinghouse Helped to Design Your Car

To be effective, every part of the electrical equipment has to fit the engine as the piston rings fit the cylinder.

A good starting motor, a good generator and a good ignition unit might combine with a good engine to make a poor electric power plant.

Electrical efficiency is made certain in Westinghouse-equipped cars by Westinghouse engineering co-operation—by building the starting motor, lighting generator and ignition unit into the power plant instead of just adding it to the engine.

Westinghouse engineers work weeks, or months if need be, in the car builder's drafting room and factory, to assure plentiful current supply for battery charging, to determine just the force that will best start the engine and to provide for it in the starting motor and to protect the battery by a quick start with little current.

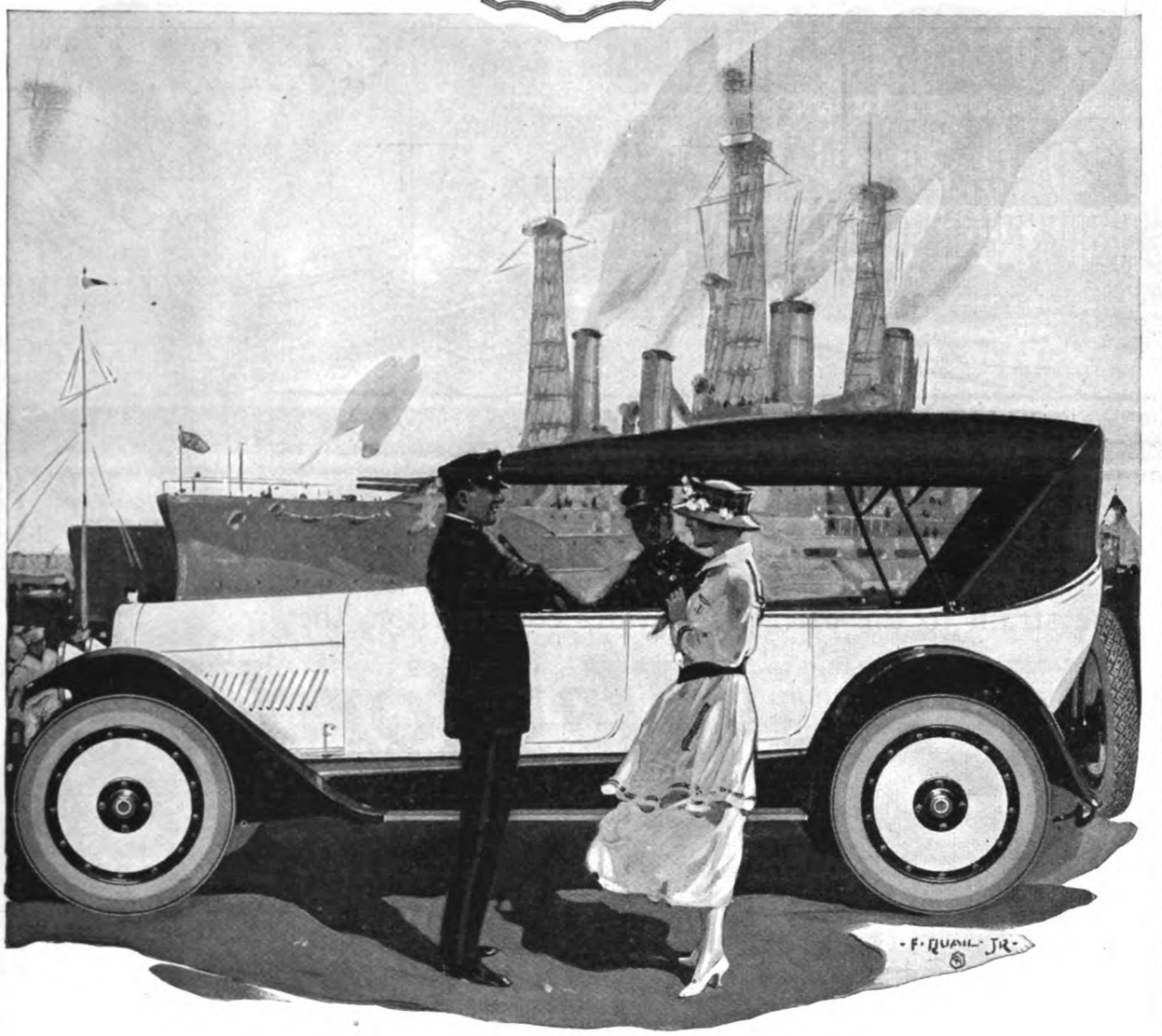
So, Westinghouse engineers are not only specialists in designing motor-car electrical equipment, but they co-operate with the car builder in the interest of the car user. And this co-operation is one of the reasons why buyers who know prefer Westinghouse-equipped cars.

WESTINGHOUSE ELECTRIC & MANUFACTURING CO.
Automobile Equipment Department
Shadyside Works Pittsburgh, Pa.

Westinghouse
STARTING, LIGHTING & IGNITION EQUIPMENT

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DISTEEL WHEELS



DISTEEL WHEELS

By screening from view in a large measure the springs, axles, rods and other underbody equipment difficult to get at and keep clean, Disteel Wheels perform a service that appeals to the motorist who is particular about the appearance of his car. We shall take pleasure in sending our proposition to dealers selling medium and high priced cars.

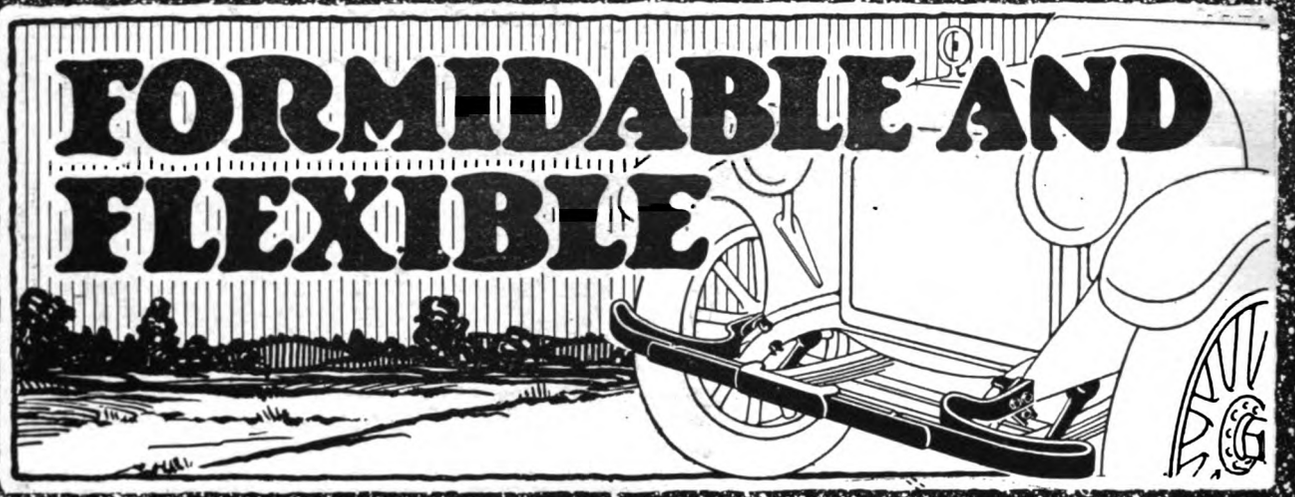
DETROIT PRESSED STEEL COMPANY
1800 Mt. Elliott Ave. Detroit, U.S.A.

DPS

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FORMIDABLE AND FLEXIBLE



THE "bumper" which presents a **rigid** front to the colliding object either bends or breaks beneath the blow, or transmits the strain to the car. Of ***flexible*** construction, the

Hartford BUMP ABSORBER
—more than a Bumper



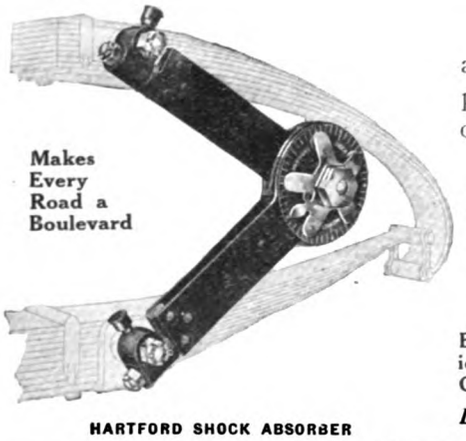
THREE MODELS

Large Car Type (three leaf) . . . $14
Medium Car type (two leaf) $12; Ford Car type $9.50.

Standard finish, black enamel with nickel center clamp. Nickel finish, $1 additional.

gives before the blow and, while giving, assimilates and dissipates the force of it by means of two powerful double-loops of spring-steel. It matters not from what direction the blow comes, as the Hartford Bump Absorber is built to give protection from tip to tip.

The Hartford Bump Absorber affords **real** protection. Moreover, it improves the appearance of any car. Bolts on without drilling and **stays bolted.**



Makes Every Road a Boulevard

HARTFORD SHOCK ABSORBER

EDWARD V. HARTFORD, Inc.
Heretofore known as Hartford Suspension Co.
144 Morgan Street, Jersey City, N. J.

Makers of the Hartford Shock Absorber, E. V. Hartford Electric Brake, Hartford Auto Jack, Hartford Bump Absorber

Branches: New York, 1846 Broadway, and Service Station, 1926 Broadway; Boston, 319-325 Columbus Ave.; Chicago, 2637 Michigan Ave.

Distributors in principal cities. Dealers everywhere.

The Easy Lifter



HARTFORD AUTO JACK

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Just Off the Press

A revised and enlarged edition of our well-known **Library of Automobile Engineering** is just off the press. This up-to-the-minute work answers fully 10,000 questions on the repairing of all types of pleasure and commercial cars. No car owner, chauffeur, garage owner or repairman can afford to be without it. Sign and mail the coupon! It will bring you a complete set for seven days' examination and actual use. If the books fail to please, return them at our expense. If you decide to buy, pay the low introductory price at the rate of **50c a week.**

Mr. L. P. Coester, Philadelphia, Pa., writes: "When I first got your books I was earning $18.00 a week as a repairman. Now I am paid a salary of $30.00 weekly, and make considerable extra money in my spare time."

Mr. M. C. Armel, Royston, Ga., says: "Since reading your books my salary has been increased $40.00 a month. I am now a garage foreman with seven men under me."

Automobile Engineering—1918 Edition

The 1918 edition of the **Library of Automobile Engineering** is the newest and most complete work of its kind obtainable. Practically every type of pleasure and commercial car is described and illustrated, including 1918 models. Two entire volumes are devoted to the various ignition, starting and lighting systems, and hundreds of new wiring diagrams have been added. Welding, vulcanizing and public garage operation are thoroughly covered. Five thick volumes, 5¾ by 8¼ inches, flexibly bound in genuine morocco leather, gold stamped; 2,500 pages, 2,100 illustrations, wiring diagrams, etc., that make difficult points as simple as A-B-C. Written in plain, every-day language. Concise and to the point. Carefully cross indexed for quick reference.

Sent for Seven Days' Trial—50c a Week

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Don't send a penny. Just put your name and address in the coupon and we'll send all five volumes to you. Pay only the small shipping charge when they arrive. Read them—study them—use them as if they were your own for an entire week. If you don't like them after 7 days—send them back at our expense. If you keep them, send only $2.00 within 7 days, and then $2.00 a month—**50c a week**—until the introductory price of $17.80 has been paid. The regular price of this set will be $25.00.

What the Books Cover

Explosion Motors, Welding, Motor Construction and Repair, Carbureters and Settings, Valves, Cooling, Lubrication, Fly-Wheels, Clutch, Transmission, Final Drive, Steering, Frames, Tires, Vulcanizing, Ignition, Starting and Lighting Systems, Wiring Diagrams, Shop Kinks, Public Garage Design, Equipment and Operation, Electrics, Storage Batteries, Care and Repair, Steam Cars, Motorcycles, Commercial Trucks, Glossary.

A Year's Consulting Service FREE

With each set we give you, absolutely free, a year's Consulting Membership. The regular price is $12.00, but you get it free with the set. Put your perplexing problems up to a staff of automobile experts. Ask them as many motor questions as you wish for a whole year free! A Chicago garage man writes: "This service alone is worth more than the cost of the books."

Mail the Coupon

Don't Send Us a Single Penny

Your name and address on the coupon brings the five books to you, shipping charges collect, for seven days' trial, returnable at our expense if they fail to please. This offer is open to every person within the boundaries of the United States and Canada. Act quickly before rising paper costs compel an increase in price. Send coupon today—NOW.

AMERICAN TECHNICAL SOCIETY Dept. A1891B CHICAGO, U.S.A.

AMERICAN TECHNICAL SOCIETY,
Dept. A1891B, Chicago, Ill.

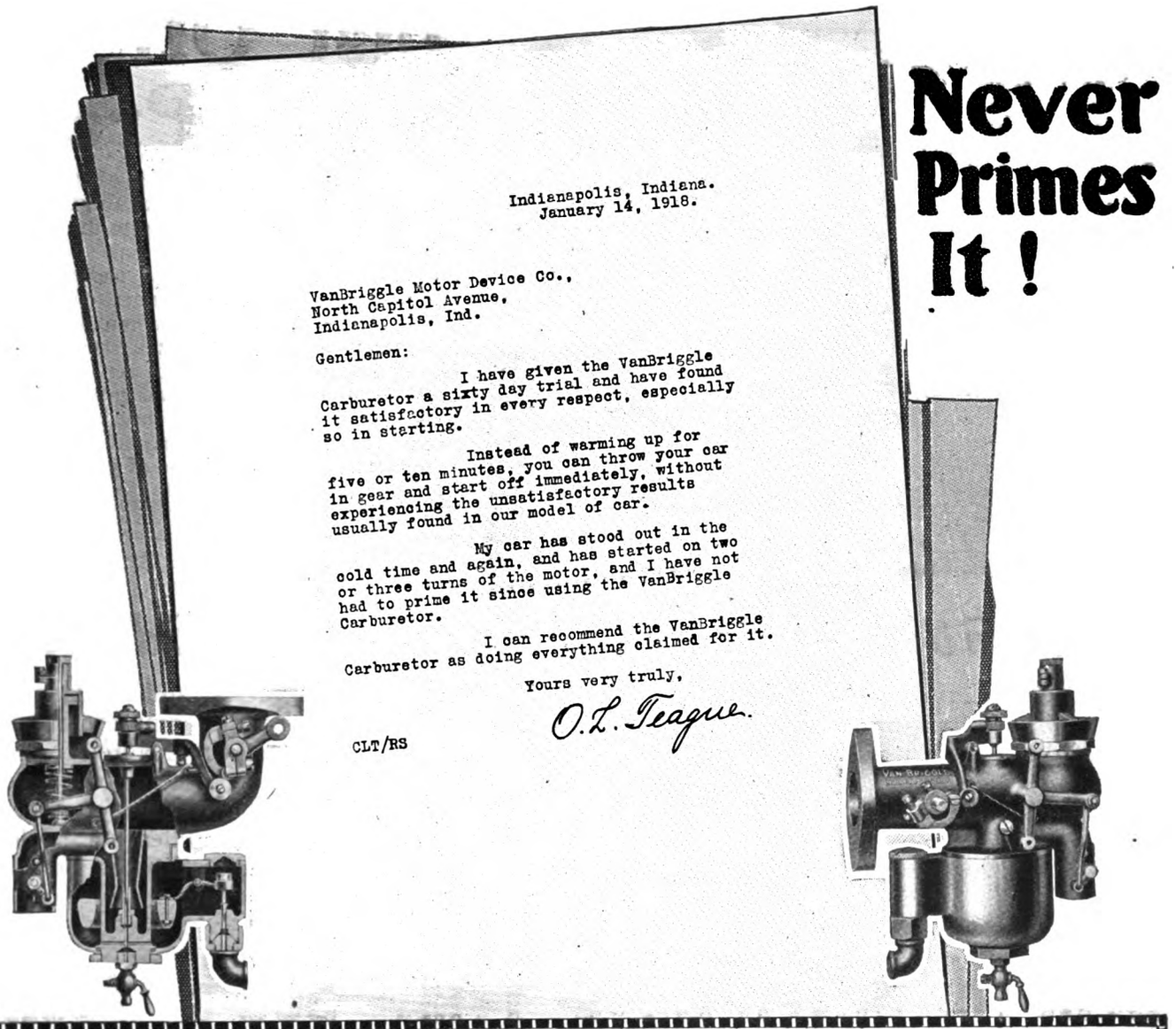
Please send me the 5 volume Automobile Engineering (1918 Edition) for 7 days' examination, shipping charges collect. If I decide to buy, I will send $2.00 within 7 days and $2.00 a month thereafter until $17.80 has been paid. Then you will send me a receipt showing that the $25.00 set of books and the $12.00 Consulting Membership are mine and fully paid for. If I think that I can get along without the books after the seven days' trial I will return them at your expense.

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Never Primes It!

for Passenger Cars, Trucks, Tractors

VAN BRIGGLE CARBURETOR

One Principle for all Motors

Instant **Starting! No priming—no spinning—no "warming up"—even in *coldest* weather! These, among the many other unusual Van Briggle features, are timely points which cause hundreds of users to write us letters like that of O. L. Teague's above. Illustrated descriptive booklet free on request. *Send for it.* ¶ JOBBERS AND DEALERS: The Van Briggle is as easily handled as tires. Small stock meets any need. New opportunity for profit and service. Write for proposition.**

KEY TO DIAGRAMS: PRIMARY AIR (P.A.); AUXILIARY AIR (A.A.); GASOLINE (G); MANIFOLD (M.); MIXING CHAMBER (D.); VENTURI TUBE (V.); LOCATION OF MANIFOLD ON HORIZONTAL TYPE (Z.).

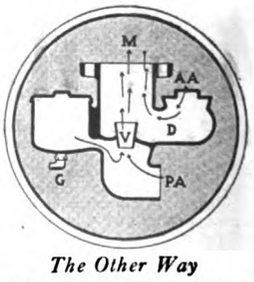


The Van Briggle Way

EXPLANATION OF DIAGRAMS

Because of the peculiar construction of the Van Briggle's primary air chambers, the primary air enters the venturi tube in a whirling, swirling movement, breaking even the poorest gasoline into the most minute particles. The primary mixture then enters the mixing chamber. The auxiliary air, traveling across to the manifold MUST PASS THROUGH THE PRIMARY MIXTURE. Two mixtures are thus assured in the Van Briggle Carburetor—each thorough and absolute. A thorough mixture and complete vaporization mean EVERYTHING to your motor. Compare the Van Briggle Way with The Other Way. There *is* a difference!

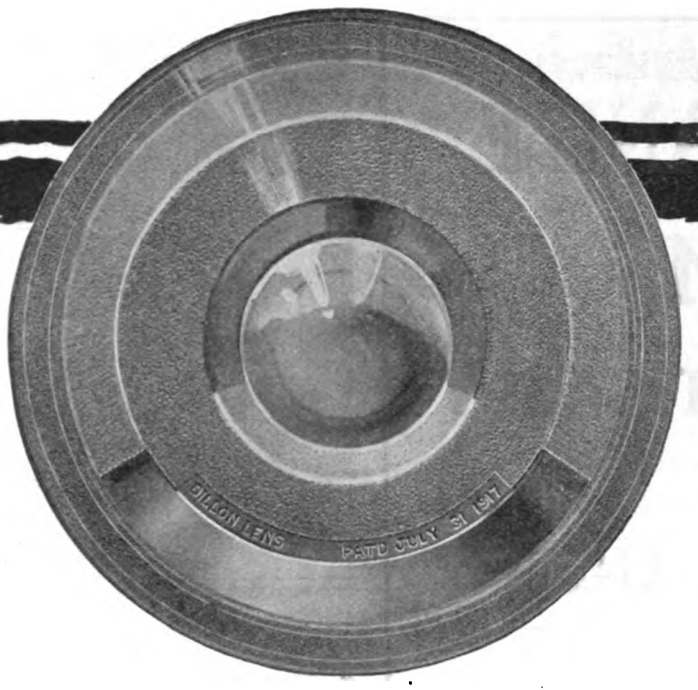
VAN BRIGGLE MOTOR DEVICE CO.
431 North Capitol Avenue, Indianapolis



The Other Way

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THE bull's-eye in the center concentrates and magnifies a long-range stream of light, which is deflected below eye level by the reflected light from the clear glass immediately above. The mottled glass diffuses a wide path of light, while the bottom portion of clear glass provides necessary side and front lighting.

$3.50 A PAIR

Any Size Anywhere in U. S. A.

Be Sure Your Lens Is Perfectly Adjusted!

TOO often a lens is blamed for poor performance when it is not the fault of the lens but of its adjustment.

You may argue that some lenses require no adjustment, but while this is claimed as a virtue by some lens manufacturers it is often a very real weakness.

The Dillon Multi-Vision is so designed that it gives perfect results only when perfectly adjusted. But you should remember that it is constructed on **definite scientific principles**—and, moreover, that it is quickly and easily adjusted.

Once adjusted, it cannot turn loose in the rim, and it gives permanent and uniformly dependable service day in and day out. The Dillon is the SAFEST lens in America—a statement that remains unchallenged, whether judged from the standpoint of the law or the viewpoint of the motorist.

Dealers: Play safe with your reputation. Sell the Dillon, satisfy your trade and increase your general business. See your jobber. Or write. Use the coupon below.

NATIONAL DISTRIBUTING BUREAU INC.

Exclusive Dillon Lens Distributors

Oliver Building Pittsburgh, Pa.

Pittsburgh

8

DILLON MULTI VISION LENS

MAIL THIS COUPON

NATIONAL DISTRIBUTING BUREAU, INC.
Oliver Bldg., Pittsburgh, Pa.

NAME.....

ADDRESS.....

JOBBER.....

JUST SIGN AND WE WILL SEND PARTICULARS

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GALVANIZE RIMS AUTOMATICALLY IN MEAKER UNITS

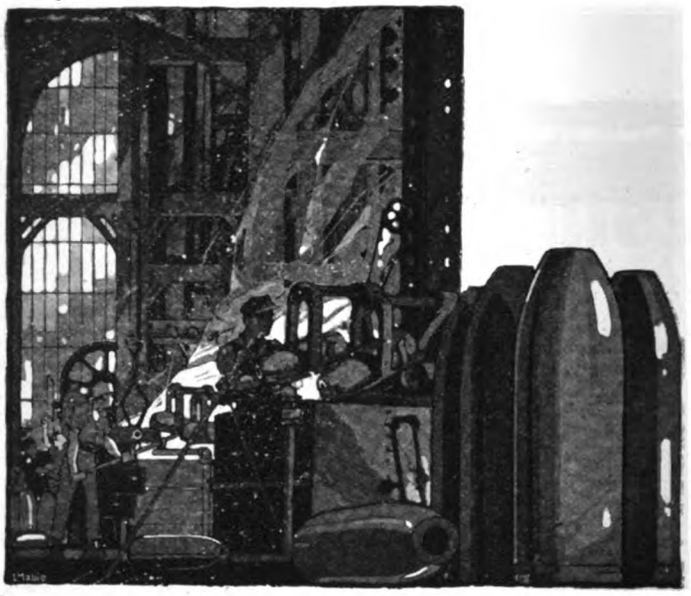
Deposit a heavy, bright, uniform coating of pure zinc on all rims for your cars—the galvanized finish that looks good and is good.

Well galvanized rims are bright when they come from our machines and just as bright after they have made many thousand miles on your machines.

Superior Meaker Galvanizing will not cost you as much to produce as out-of-date, inferior, dark-colored, thin zinc coatings that do not even protect rims from rusting while they lie in storage.

Forward us a set of rims and felloe bands and we will give you some interesting figures.

MEAKER GALVANIZING COMPANY
1249 Fulton Street Chicago, Illinois



Going to make Munitions?

OAKITE CLEANS

High Explosive Shells and Shrapnel, Time and Percussion Fuse Parts, Rifles and Machine Guns, Cannon and Armor Plate, Torpedoes and Mines.

Munitions or Automobiles?

OAKITE Materials and Methods are speeding up production and cutting down costs—saving labor and minimizing danger.

Whether you are making munitions or automobiles, a line to our Service Department will put at your disposal information and service which will be invaluable to you. Write for it!

OAKLEY CHEMICAL CO.
28 Thames Street New York, N. Y.

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QUALITY
SNAP RINGS
ARE MADE COMPLETE IN OUR OWN FACTORY. NOT ONLY DO WE MAKE OUR OWN CASTINGS BUT ALL IRON IS CAREFULLY ANALYZED & TESTED IN OUR OWN LABORATORY



Quality Snap Rings are shipped promptly and in perfect condition

THE Piston RING COMPANY
SPECIALISTS IN PISTON RINGS
03 Sanford St. Muskegon, Mich.
Makers also of Sta-Tite Rings

RUSCO
BRAKE LINING

Rusco brake lining has been the choice of leading manufacturers for a number of years, because the peculiar construction and long wearing qualities of Rusco have earned for it an unequaled reputation for long, consistent and efficient service.

Rusco is woven on specially constructed looms, and has for a base a superior quality of long fibre asbestos. This is impregnated with our secret wear-resisting, oil, water and dirt proof compound.

Rusco brake lining always comes out pre-eminent in every test to which it is subjected. The character and severity of these tests has been left entirely to the car manufacturer, and it is because of the success of these tests that Rusco has been chosen by them for their regular factory equipment.

If your cars are not now equipped with Rusco brake lining, we will welcome an opportunity to send you samples or put at your disposal the services of our engineering experts, who are prepared to offer suggestions regarding your particular requirements.

Why not make us prove our claims in your own way? We await the opportunity.

37 factories representing an equipment of 25,000 shuttles and 450,000 sq. ft. of floor space guarantee immediate deliveries.

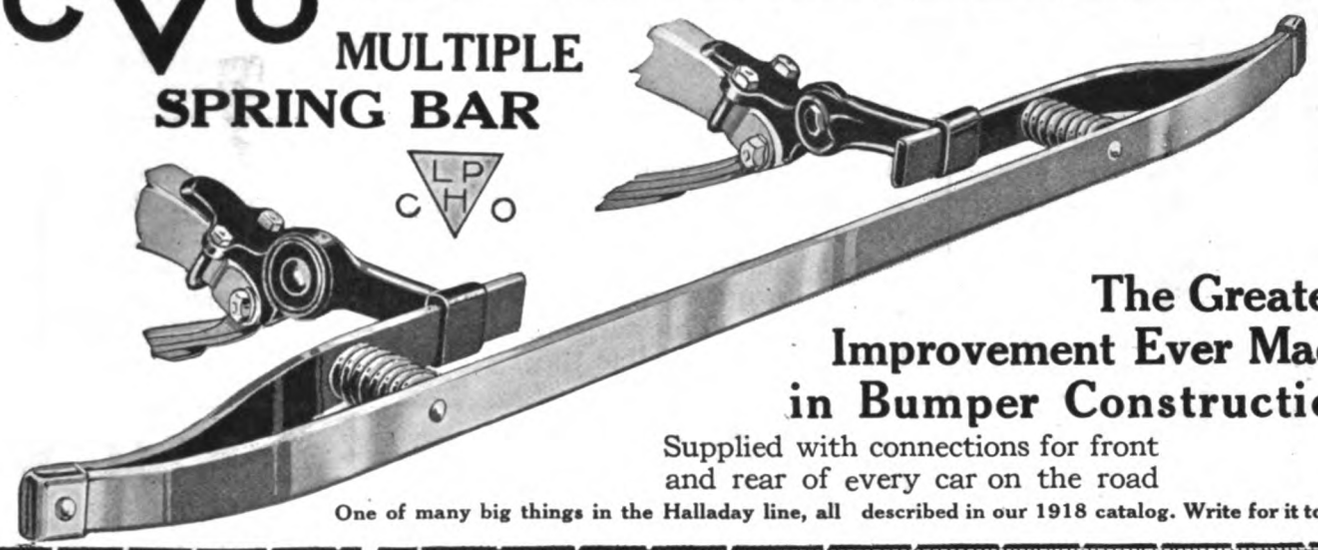
Also makers of
Clutch Discs—Cone Clutch Facing

THE RUSSELL MFG. CO.
Main Office and Factory
Middletown, Conn.
New York Office: 349 Broadway
Detroit Office: 549 Delaware Ave.
Chicago

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HALLADAY BUMPERS

MULTIPLE SPRING BAR



The Greatest Improvement Ever Made in Bumper Construction

Supplied with connections for front and rear of every car on the road

One of many big things in the Halladay line, all described in our 1918 catalog. Write for it today

L.P. HALLADAY Company.

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ZAPON

NECESSITY

"The mother of invention, so 'tis said"

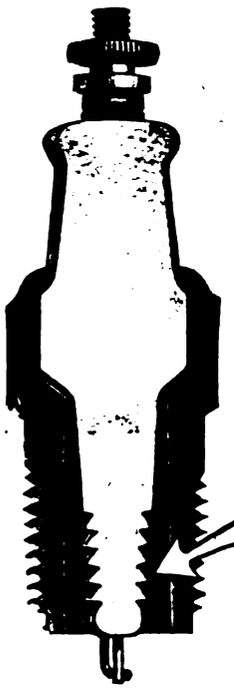
We recognized the necessity for a good leather substitute over a score of years ago. ZAPON LEATHER CLOTH, today, as then, is still a necessity. Necessary, now, to the final finishing touch of the modern automobile.

The test of time alone tells the story!

ZAPON LEATHER CLOTH CO.

New York Detroit

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A C Carbon Proof
For Fords, Overlands and Studebakers

How Often Must You Clean Your Plugs?
Ford—Overland—Studebaker Owners

The new *AC Carbon Proof Plug* will permanently rid you of plug trouble and keep your motor running on *all* cylinders *all the time.*

The Reason

A deposit of carbon on the smooth surface of the porcelain is what causes short circuit with ordinary plugs. With the AC Carbon Proof plug the porcelain is provided with a number of ribs having saw tooth edges which attain a sufficiently high degree of heat to burn away the carbon. This keeps the edges free from deposits and breaks up any possible short circuit.

AC SPARK PLUGS
The Standard Spark Plug of America

Champion Ignition Company
Sole Manufacturers Flint, Michigan

SRB Annular Ball Bearings
(Single and Double Row)

Stamford SRB Taper Bearings
(Special for Fords)

STEEL · BALLS

Rudge-Whitworth Wire Wheels

MAYO Radiators

Factory resources and service go hand in hand with
STANDARD ROLLER BEARING PRODUCTS

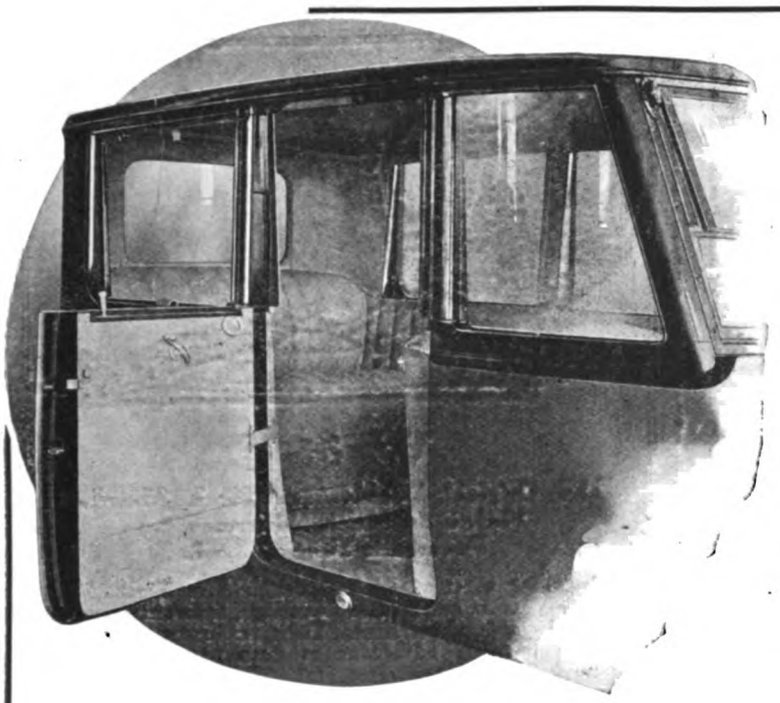
Sales Offices:

DETROIT	936 Woodward Avenue
CHICAGO	2206 S. Michigan Avenue
INDIANAPOLIS	822 Hume-Mansur Building
BOSTON	163 Massachusetts Avenue
CLEVELAND	2062 Euclid Avenue

STANDARD ROLLER BEARING CO.
Philadelphia, U.S.A.

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H & K Metal Stampings have been developed and refined to a point approximating perfection, and are setting new standards of economy and dependability everywhere.

ENCLOSED CAR BODY MODE

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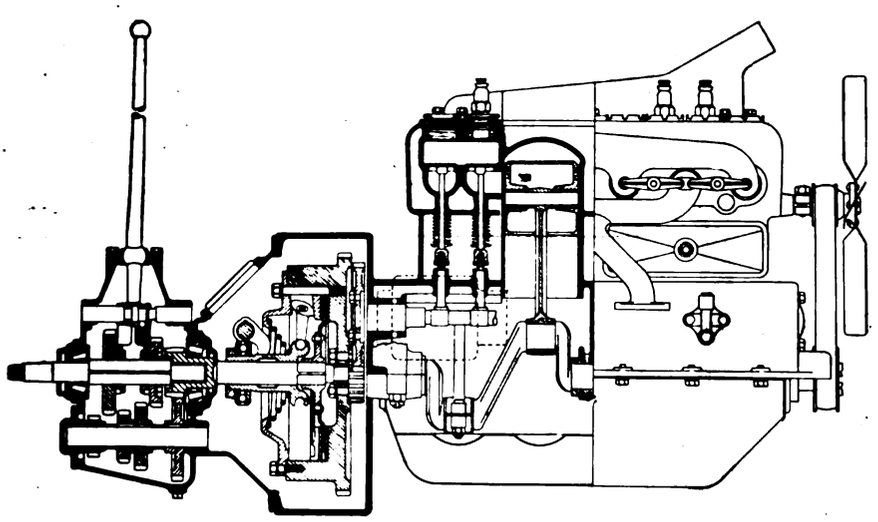
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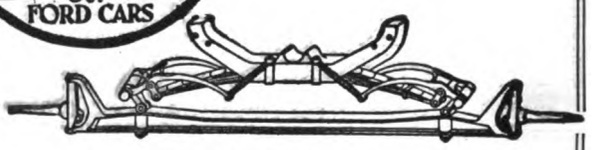
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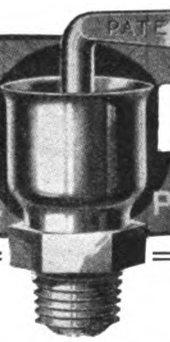
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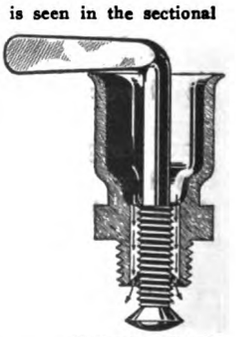
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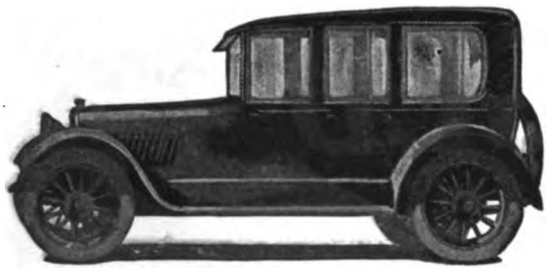
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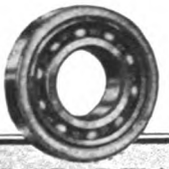
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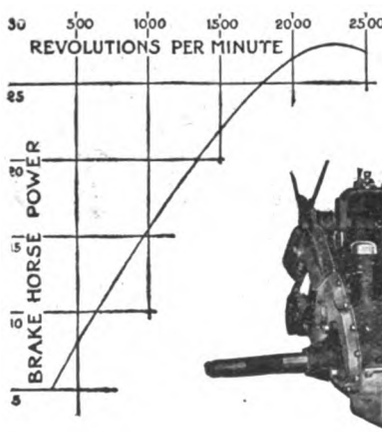
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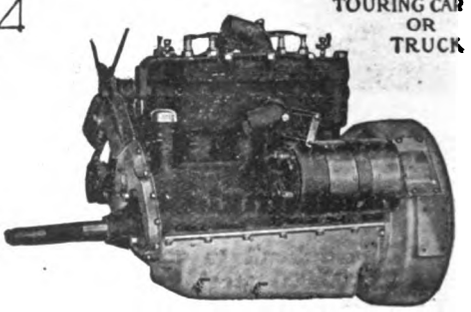
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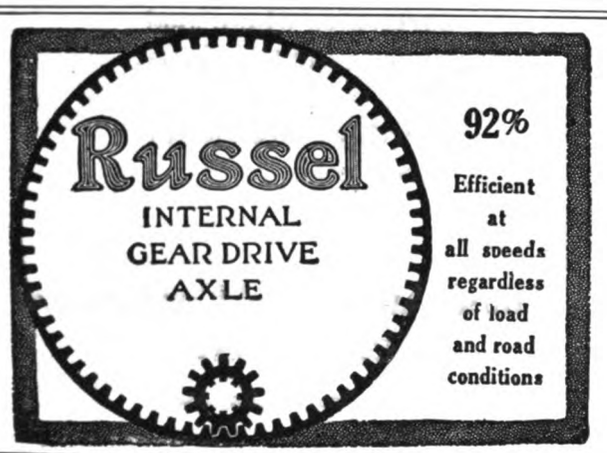
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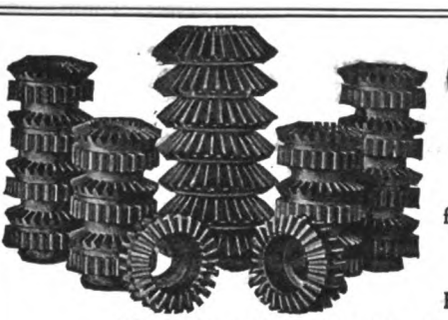
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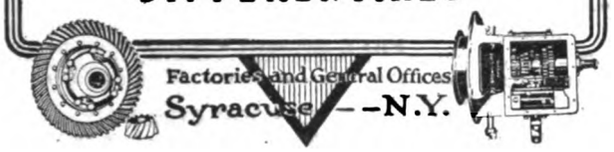
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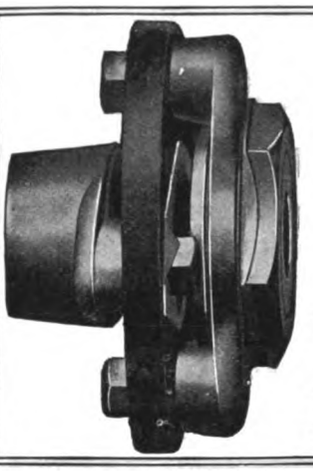
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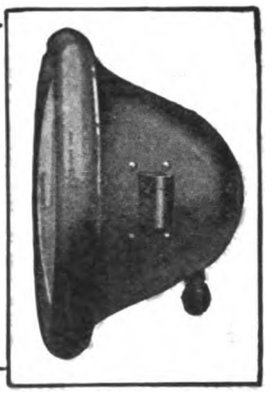
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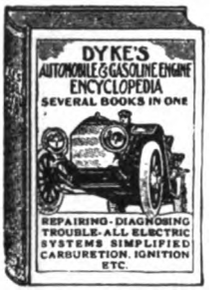
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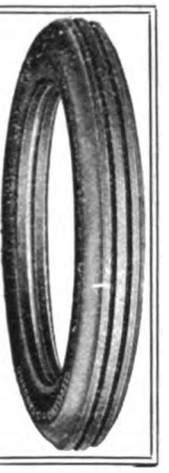
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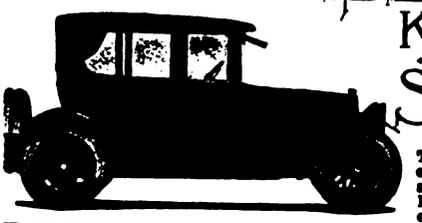
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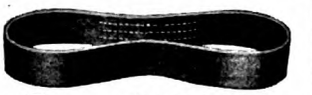


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MODEL 354 AMMETER
On Your Dashboard or Cowl

It is the reliable means of determining the proper rate of charge or discharge of your battery for various speeds. It enables you to determine that the generator is working and that the storage battery is receiving its proper charge. *Write us.*

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8 Weston Ave., Newark, N. J.
28 *Branch Offices in the Larger Cities*

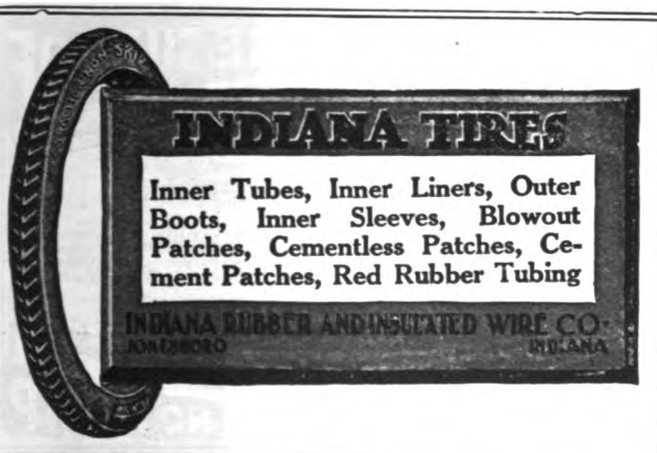
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The Quality Mark of Good
LEATHER



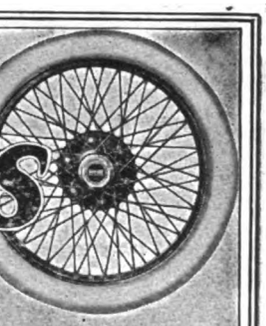
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Do You Want PERFECT Winter Lubrication?

Then fill the transmission case, differential and all compression cups with

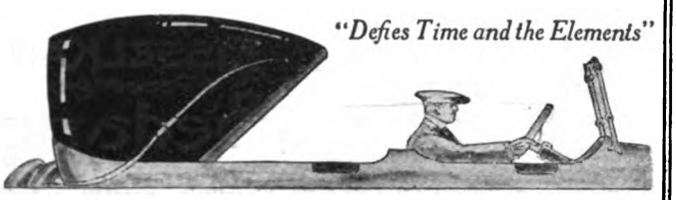
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"The Accepted Standard"
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Sales Offices in All Principal Cities.

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No uncertainty as to service or wear of
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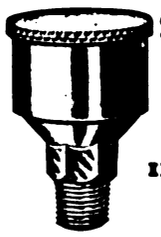
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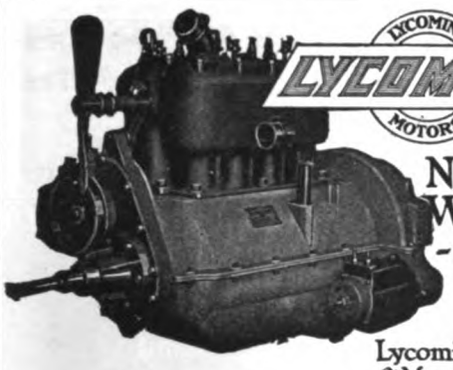


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IN LARGE QUANTITIES
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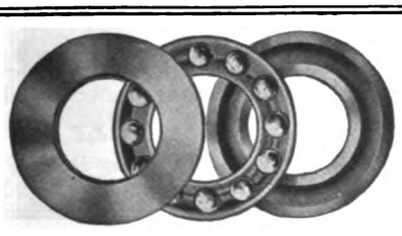


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A single bearing does the work of two. Carries both radial and thrust loads on a single row of balls.
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BALL THRUST BEARINGS
RETAINERS FOR CUP AND CONE, THRUST AND MAGNETO TYPE BALL BEARINGS.
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THE BEARINGS COMPANY OF AMERICA
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SKF
BALL BEARINGS
See our advertisement in January 24, 1918

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Duesenberg Motors

MARINE—AIRPLANE—AUTOMOBILE

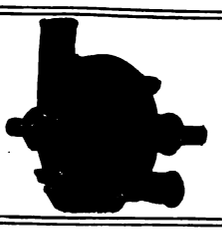
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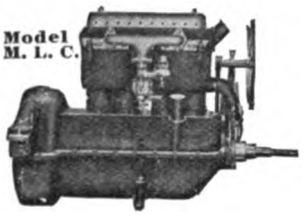
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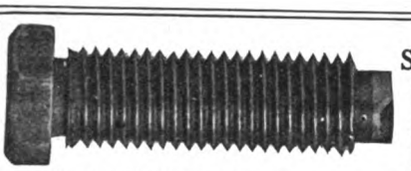
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In Spring Suspension for Automobiles
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Manufacturers Write
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Bulletin No. 37

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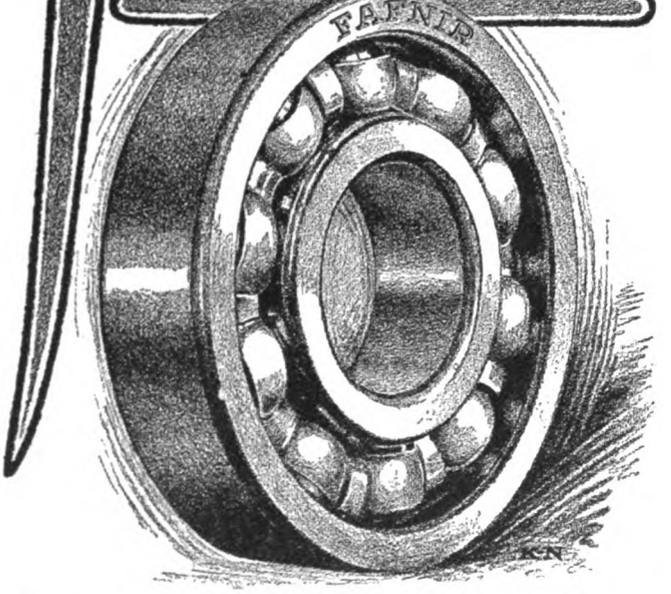
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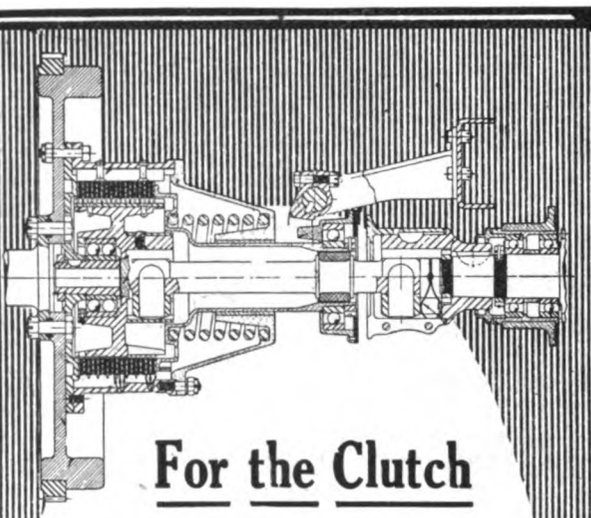
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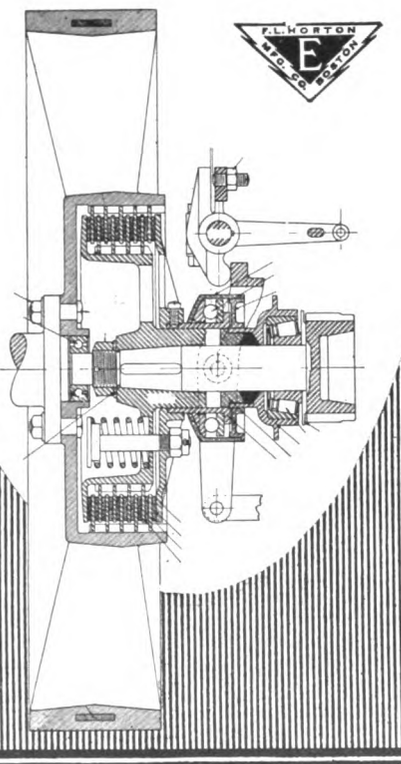
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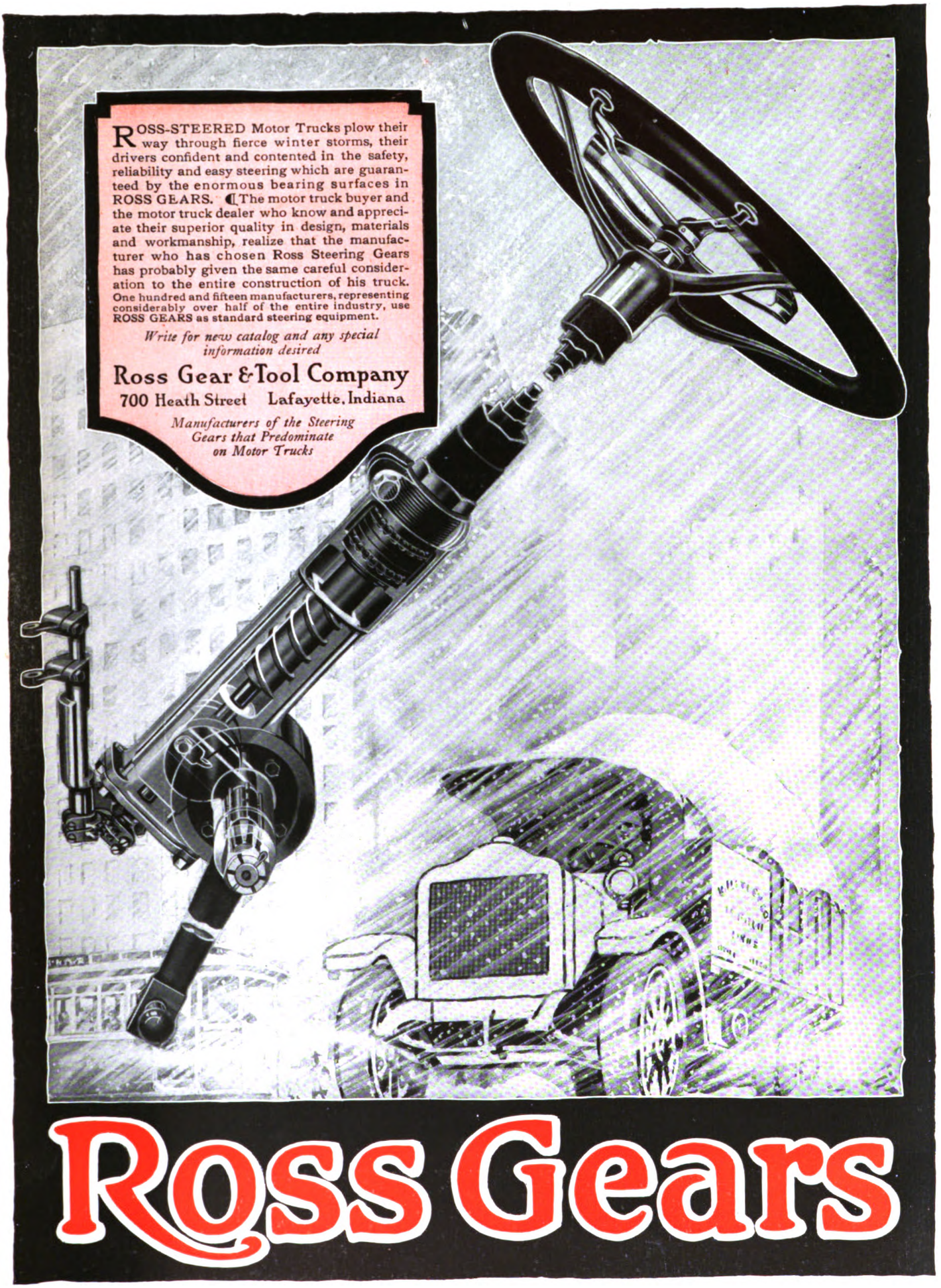
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The AUTOMOBILE

Vol. XXXVIII
No. 6

NEW YORK, FEBRUARY 7, 1918

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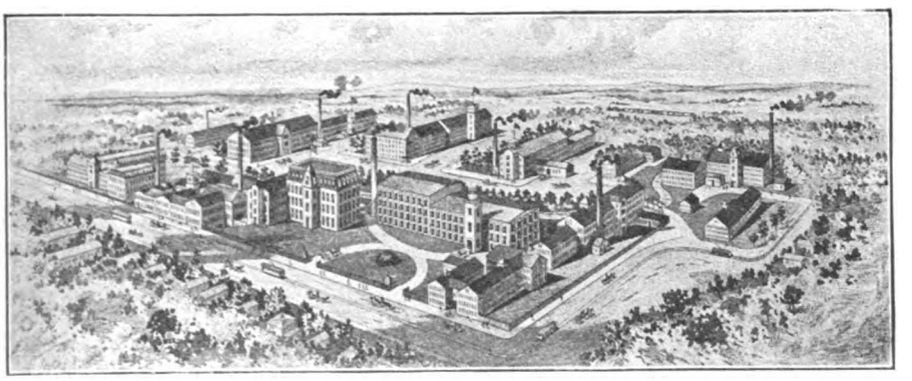
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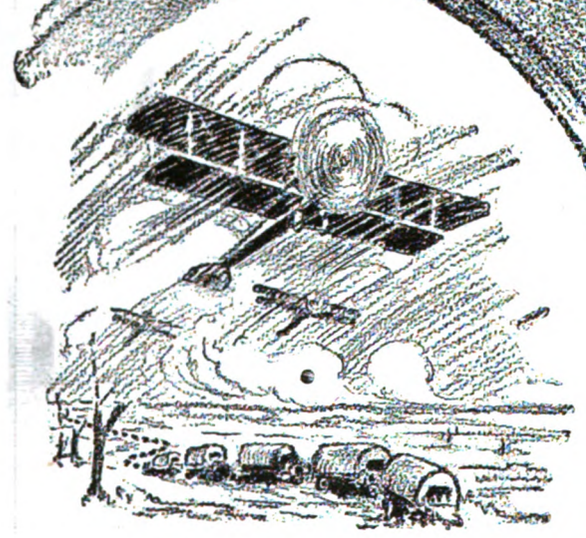
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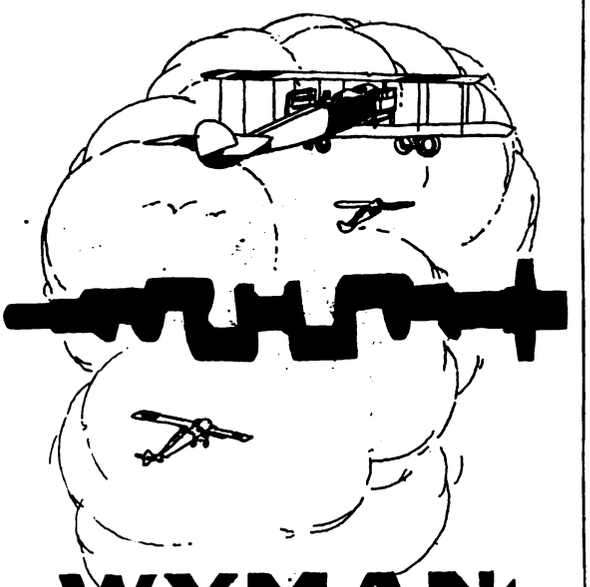
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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XXXVIII NEW YORK—THURSDAY, FEBRUARY 7, 1918—CHICAGO No. 6

Tractor Problems Discussed at Chicago Meeting

Fundamentals of Tractor Design, Engine and Transmission Gear Design Dealt With—Industry Too Young to Permit of Rapid Standardization —Meeting a Success

CHICAGO, Feb. 1.—To-day's tractor session of the Society of Automotive Engineers marked one of the first real steps in advance in this department of the society's work since the broadening of its field to fully include all automotive products. Broadly speaking, the work accomplished to-day was more the laying down of a future program of development than an accomplishment of progress in engineering detail. The work of the S. A. E. to-day was the sketching of the outline into which the picture of future developments will fit as the industry shapes itself and becomes more mature. The registered attendance was 239.

As President Kettering said, "Not five per cent of the demand for tractors has been filled." The industry is in its infancy, and we know so little of the tractor and so little of the problem which confronts us that it would be absurd to attempt to deal with detail at this early date.

This feeling was common to the other engineers present, with the result that the broadest aspects of the tractor problem were considered. To again quote President Kettering, the tractor problem is fifty per cent engineering and fifty per cent psychology. Unless a tractor company studies the psychology of the farmer along with the engineering problems of the tractor itself, it will fail.

The program of the meeting included four papers on tractor service, tractor design, tractor engines and tractor transmission, presented respectively by George Cormack, Appleton Mfg. Co.; George Strite, consulting engineer; H. C. Buffington, Minneapolis Steel & Machinery Co., and E. R. Greer, Emerson-Brantingham Co. These four papers gave a well-balanced program and one which was worthy of a much longer time for discussion than was afforded by the brief three-hour session. Discussion was necessarily curtailed by the shortness of time, but what there was showed an interest which ranks as high as in any topic ever handled by the society.

George Cormack's paper on tractor service struck the true keynote of the meeting in departing from the mere technicalities of the subject and outlining with the broadness of the idealist the true purpose of the tractor. Cormack outlined the service that the tractor is to render this country in the time when agricultural products are such a vital factor in the welfare of the world. He spoke on the ethics of the manufacturer in forgetting the fact that he is primarily engaged in manufacturing for the purpose of making money rapidly.

In other words, tractor service means something more than the mere maintenance of the tractor in the field and in the repair shop. It means the broadest kind of service which can be rendered by machines which are built by concerns who do not put out a product in which quality is slighted and profit only considered. The author touched a responsive cord when he stated that manufacturers who have the good of their country at heart will not produce machinery which they know to be defective when this machinery draws from more worthy purposes the labor and material which are so sorely needed in these times.

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The other three papers were concerned more strictly with the engineering phases of tractor development and fittingly rounded out the program so that President Kettering's estimate of the subject as 50 per cent engineering and 50 per cent psychology was reflected almost exactly.

Probably the biggest lesson in the engineering end of the program is held up for the attention of automobile manufacturers who are endeavoring to enter the tractor field. The differences in fundamentals between tractor and automobile engineering are so great that automobile men must bear them continually in mind unless they wish to waste vast sums of money in learning the lessons that are at their disposal if they will only recognize with an open mind the facts which have already been discovered by men who have studied the tractor field for the past decade.

As summed up by President Kettering, the tractor engineer must remember that the tractor differs from the automobile in one very important respect: "It will not coast for any appreciable distance when attached to three or four plows." When a machine is rated at 20 hp. it must deliver 20 hp. continually from one end of the day to the other. There can be no shirking on the part of the machine because when it is needed by the farmer it is needed badly and must run with or without attention so that it performs its tasks in the desired manner.

The War Dinner

The culmination of the program was in the war dinner held in the evening. More than 1200 were gathered at the biggest function ever held by the S. A. E. This war dinner was patriotic from its Hooverized menu to its highly patriotic speakers drawn from both military and civil life. A letter of greeting from President Wilson extending his appreciation for the efforts of the S. A. E. during the war and his hope for the best efforts of the organization for the future was read by H. L. Horning. A telegram of response to the President was dispatched to Secretary Tumulty asking him to present to the President the earnest wishes of the organization that the strength of the President should be reserved to carry the burdens of his great responsibility and to renew the pledge of the resources of the S. A. E. in aiding the government in attaining any ends that it may have in view.

The speakers were General Kener, commanding Camp Grant; H. L. Horning, and W. H. VanDervoort, who presided jointly; C. F. Kettering, president of the S. A. E.; Major W. G. Wall of the Ordnance Department, and a major attached to the French army. The speakers without exception dealt with the national problems in connection with the war and told how we are overcoming the great difficulties of raising within a few months an army that normally would require years to get together.

Volunteers for Ordnance

Captain Donaldson, of the Ordnance Department, asked for volunteers, during the afternoon meeting, for men to go to France as ordnance officers for all-around engineering service. He secured nearly twenty applications during the afternoon from men who are strongly interested in the tractor service and will probably have an increased number from the engineers in attendance.

No discussion followed the paper by George Cormack on tractor service, which was really as much a paper on manufacturing ethics as it was on pure tractor service. Mr. Cormack, in a short summary after he had read his paper, cited the fact that last spring tractor engineers in this country had received cablegrams from the other side asking for 35,000 to 40,000 tractors, and for information as to where to get them.

As a result of this, representatives of the largest tractor companies met and discussed the subject, with the result that it was necessary to reply that we could not furnish them at the present time owing to the fact that the industry was not developed to an extent where satisfactory machines are being produced. Certain companies had stated that they could furnish the machines, but in the final analysis their own engineers had refused to stand back of them.

George Strite touched on the demand for the highest power, on the part of the farmer. He said that even in the days of the big tractor pulling eight or ten plows the pressure and influence exerted by the customer for just a little more power was almost irresistible and the temptation was continually to build something larger, although sound engineering knowledge pointed out that the smaller machine was sure to come into favor. Mr. Strite dealt with the difficulty of clearly explaining horsepower to the farmer, and stated that power should be rated as in terms of displacement or simple pull in pounds.

H. L. Horning, in discussing this paper, stated that the matter of the standard Liberty tractor for government use had come up in Washington from time to time and it was proposed at one time to adopt the Ford tractor as England had done, and other types were also considered, but finally no standard was adopted. It was the consensus of opinion that the tractor is not old enough to standardize. We are just starting on an era of big things in the tractor work and we will greatly regret it if we try to go too far with standardization which will hamper future progress.

C. F. Kettering spoke of the differences between automobile engineering and tractor engineering, and stated that owing to the fact that the tractor is continually under full load it is necessary for the automobile engineer to entirely revise his ideas concerning engine performance. R. E. Davis of the Moline Plow Co. stated that automobile and tractor engineers could learn much from each other, and one point which should be particularly closely studied is that of the automatic lubrication of parts. The farmer will not stop to lubricate his machine, and so it is necessary to so design the bearing parts that oiling is of an automatic nature as far as it is possible to make it so.

There was no discussion on the papers by H. C. Buffington or E. R. Greer. Mr. Buffington touched on the essential points to watch in the design of tractor engines.

E. R. Greer dealt with tractor transmission. He divided practice into two main schools in which one favored the rough open gearing and large plain bearings as opposed to those who insist on inclosed gears with anti-friction bearings. He also stated that the question of wheels as opposed to other methods of traction is far from settled. In his paper, which is printed elsewhere, he states that wheels must be of sufficient size, and should be five feet or more in diameter with tractor of 8 to 15 hp. draw bar for general farm work. He stated that the standard type of truck transmission does not need tractor requirement, and with necessary reduction of from 30 to 100 to 1 it is necessary to use several reductions.

"Of all the problems we have to contend with to-day, the fuel problem is the biggest. There is nothing moved on this earth to-day except what is done with the sun's energy. This has been stored up in all forms in the earth and we have used it lavishly. Have we overdrawn our account? To-day there is arising a question: Can we go ahead? Must we curtail? It is the greatest question which confronts us, and yet we are not giving it proper consideration."—*President Kettering at the S. A. E. war dinner.*

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Traction Transmissions*

No Uniformity of Practice in Tractor Transmissions Yet Discernible and Little Chance for Standardization at Present—Pros and Cons of Different Transmission Features

By E. R. Greer

WHEN we speak of a tractor transmission we generally mean the entire power-transmitting device, from the engine to the ground and including the pulley for belt work. Tractor transmissions are still in an early stage of development. They are composed of a number of groups of parts that are arranged differently in nearly every case, so that they cannot be classified without dividing them or making a special class for nearly every tractor now being manufactured.

There are differences of opinion among tractor men regarding many of the most vitally important features of tractor transmissions. Some believe in rough open gearing and large plain bearings; others insist on cut hardened inclosed gears and anti-friction bearings.

The question of wheels for traction versus the caterpillar is far from settled. The right size of wheels for wheel tractors seems to be further from being agreed upon than anything else, and it is one of the most important things in tractor design.

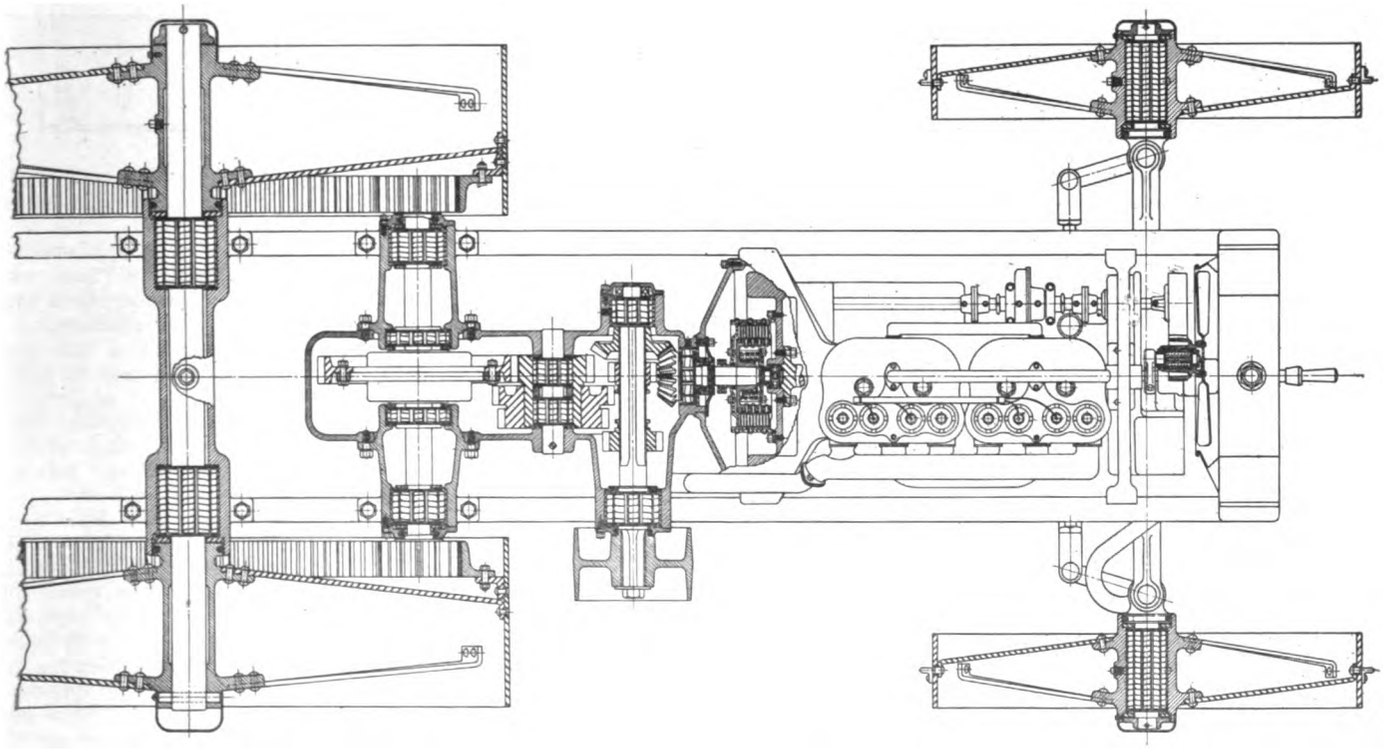
The design of a tractor transmission is affected greatly by the design of the wheels or caterpillar tracks which are to give the traction. The matter of traction is of first importance to a successful tractor, and it is right here at this point that opinions differ widely. The transmission design is largely affected by the decision as to the kind of traction to be used. The caterpillar with its large surface contact has an advantage on marsh land or sand where the top soil is tougher than the ground beneath. But it is at a disadvantage when just after a rain the ground is muddy on top and harder below. It can bridge a small ditch, but becomes blocked by one too large to bridge, and side hills or side draft cannot be taken care of as efficiently as when wheels are used.

Wheels must be simple and relatively inexpensive, and must be of sufficient size and provided with lugs to give good traction. For if a tractor wheel once starts to dig, it will not climb out of its hole unless the load is released. On smooth, hard ground a very small wheel gives efficient traction, but on newly plowed sandy soil or on land where there are washed out ditches a large wheel must be used. The matter of suitable lugs is of utmost importance. On some kinds of ground a spiral cleat at about a 45-degree angle will give double the tractive effort that can be obtained from the same wheels with straight cleats or spikes.

Large Reductions Required

For efficient general farm work with wheel tractors of 8 to 15 drawbar hp. the drive wheels must be 5 ft. in diameter or more, and the problem of the best way to drive the wheel is very important. The effort being applied to the

*Paper presented at the tractor meeting of the S. A. E., held in Chicago on February 1.

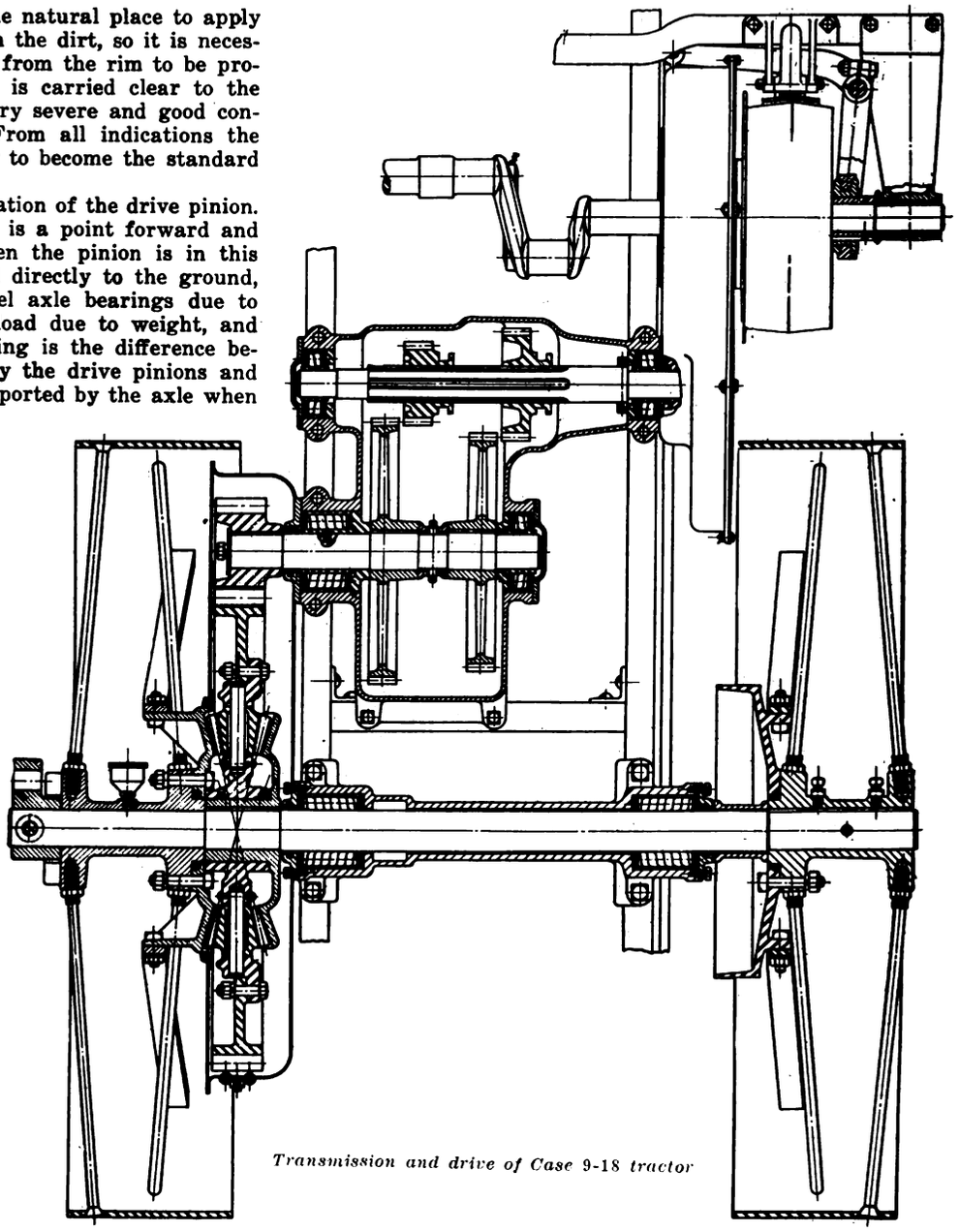


Plan view of tractor with four-cylinder engine, multiple disk clutch, two speed and reverse transmission and internal gear drive

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ground, it follows that the rim is the natural place to apply the power, but the rim runs right in the dirt, so it is necessary to take some point far enough from the rim to be protected from the dirt. If the drive is carried clear to the axle the tortional strains become very severe and good construction expensive and difficult. From all indications the inclosed internal gear drive is likely to become the standard traction wheel drive.

The next important item is the location of the drive pinion. There is one best location, and that is a point forward and a little below the wheel axle. When the pinion is in this location the driving force is applied directly to the ground, so that the load on the drive wheel axle bearings due to power delivered is opposite to the load due to weight, and the resultant load on the axle bearing is the difference between the driving effort delivered by the drive pinions and the weight of the tractor that is supported by the axle when the tractor is standing. In other words, the drive axle bearings are practically floating when the tractor is pulling a certain load. At less load the bearing pressure is down and at greater load the pressure is up. The strain of the drawbar pull is carried by the drive pinion bearings through the pinion teeth to the drive wheel rim.



Transmission and drive of Case 9-18 tractor

Raising of Forward End

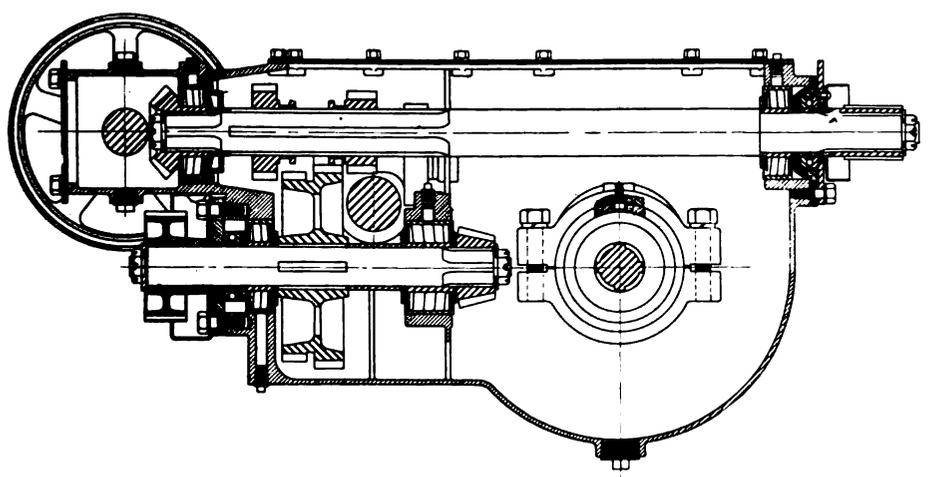
It is the lifting effect on the front end of the tractor that results in its forward movement. There are a number of tractors that have enough power to raise the front end clear of the ground so that the front end weight is the limit of their pulling power. These tractors are very difficult to guide and are of no use at all on hills. Enough dead weight must be carried on the steering wheels so that the tractor can be guided on the steepest hill.

The front wheel drive offers an easy solution for hilly ground, as in this case the reaction from the load is down on the rear steering wheels. There is no tendency to tip up, and the harder the pull the more positive is the control. The rear wheels must be ample to carry the additional load, and the difficulty is in arriving at a suitable arrangement to handle the implements when the front wheels are the drivers. While the steering mechanism may be complicated, the power transmission can be simple, the weight can be placed mostly on the drive wheels, and ditches and hills can be easily negotiated. The four-wheel drive immediately suggests itself, but the mechanical complication and expensive construction make it prohibitive.

Protection of working parts is not easily accomplished in tractor transmissions. An argument used by those who favor open rough cast gearing is that farmers cannot keep transmission grease or oil clean and that some grit is always put into the case at every filling. They claim that as long as parts cannot be kept clean, they wear out and may as well be made simple, open, and to operate without lubrication or when covered with dirt.

One unprotected drive known as "the roller pinion drive" has been quite successful on small tractors, as it can be made to last a season, is very cheap, and is easily replaced. Perhaps the worm drive can be taken as the opposite extreme, because the excessive tooth pressures, together with the vibration and dirt, have prevented its being a success no matter how carefully it is built.

As the users of tractors become



Vertical section through Emerson-Brantingham transmission

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educated so as not to abuse their machines, then thoroughly protected, well-made parts will become more general. To-day simplicity is vital if a tractor is to be successful, but education is increasing the demand for well-made, efficiently protected parts.

A notable advance in tractor transmission design is that anti-friction bearings are becoming so widely used. It has been found that an ample, non-adjustable, anti-friction bearing may last indefinitely in tractor service. Transmission bearing trouble has been a common tractor fault in the past, and its elimination is a step ahead.

Shafting used is usually ordinary mild steel, as gears and bearings generally have to be of such size that the shaft sizes are ample. It is very important that splines be used instead of keys.

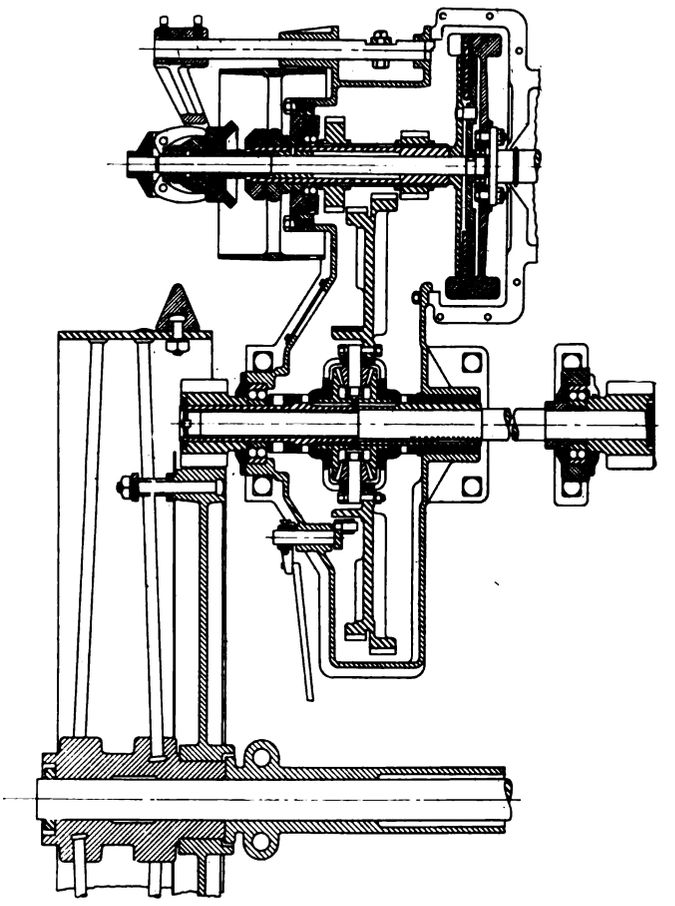
Truck Transmission Not Suitable

The standard type of automobile or truck transmission does not meet tractor requirements at all. The amount of gear reduction is too small, no belt pulley is provided for, the change speed is wrong, the parts are not ample, and it cannot be applied to a good tractor design.

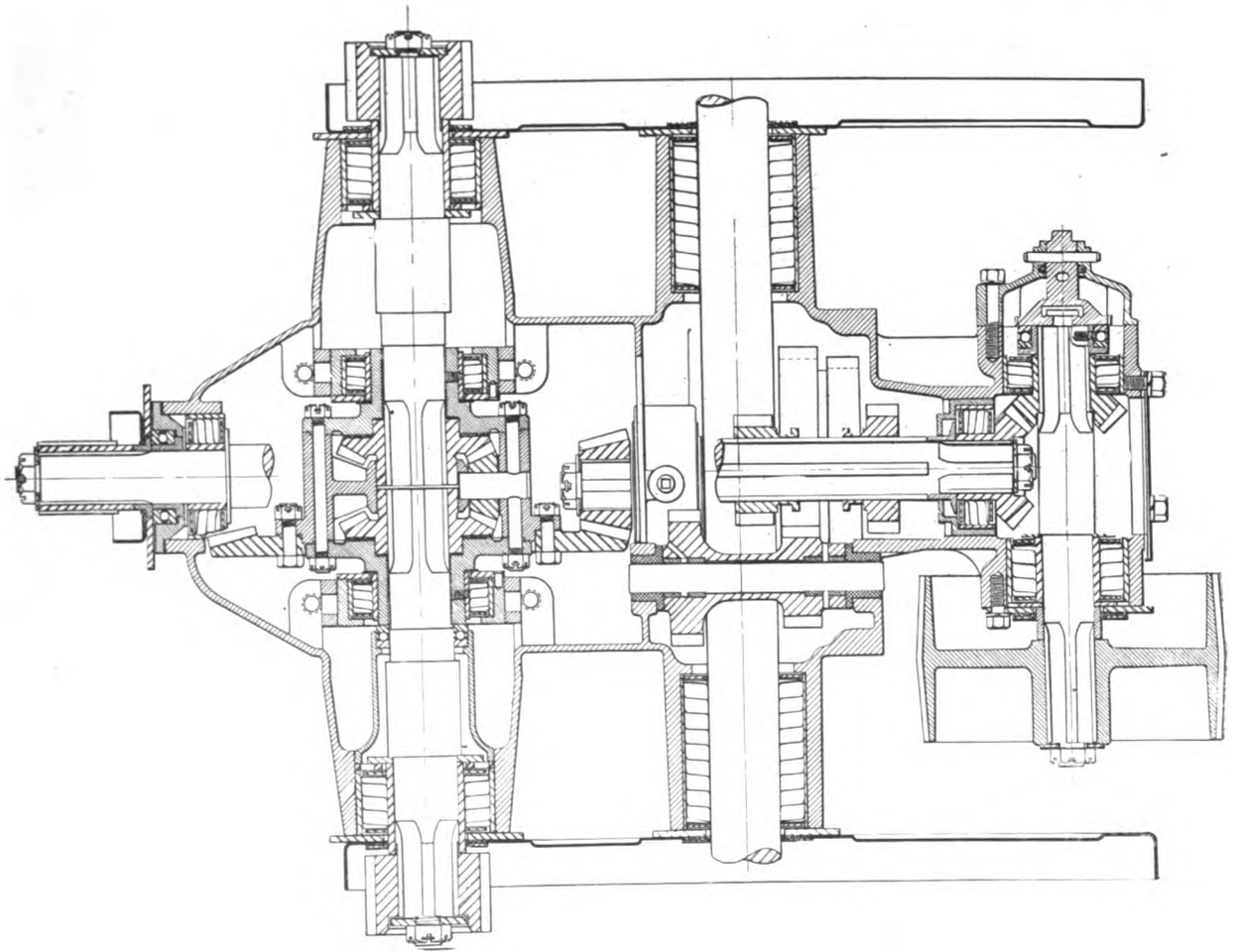
The total gear reduction in a tractor varies between 30 to 1 and 100 to 1, so several reductions have to be used. I think it is best to discuss each reduction separately and especially to consider the final reduction by itself, although in some cases entire transmissions are built as a single unit.

In general all tractor transmissions are driven from the engine through a friction clutch and without the use of universal joints, except that some clutches are designed to take care of any misalignment. Cone, disk, shoe, band clutches and friction drives are in use. The cone clutch and the internal expanding shoe clutch are most common.

First reduction gearing may be almost any kind that one can imagine, and the amount of reduction from 1 to 1 to as much as 8 to 1. The change in speeds and the reverse are often worked in on the first reduction, but also it is very common to have the second reduction used for this. Where

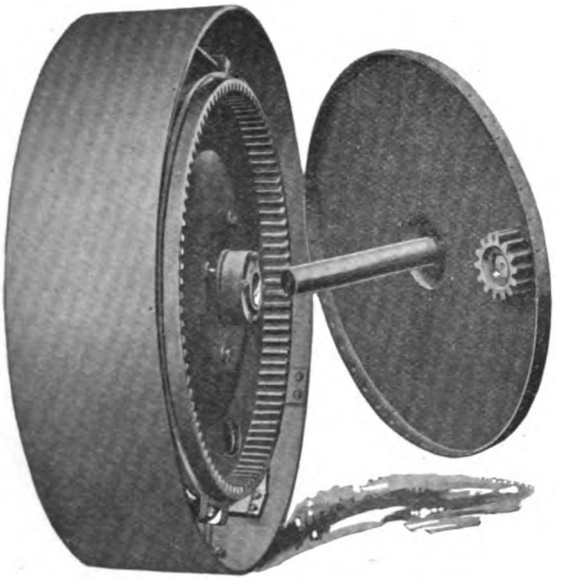


Parrett clutch, transmission and drive

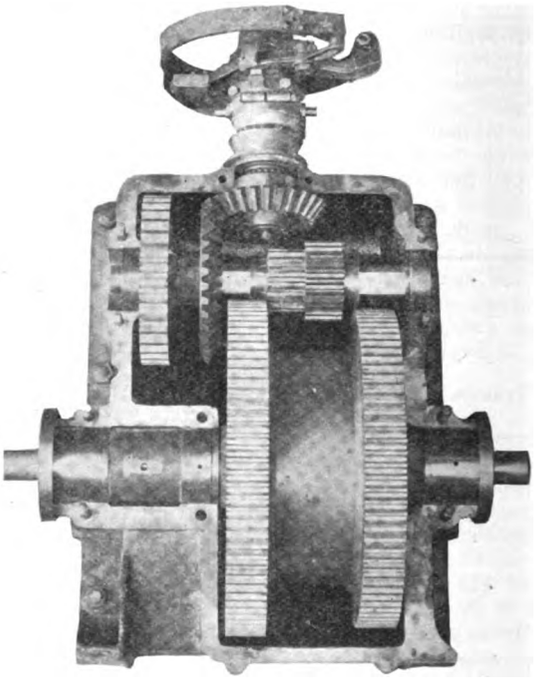


Horizontal section through Emerson-Brantingham transmission

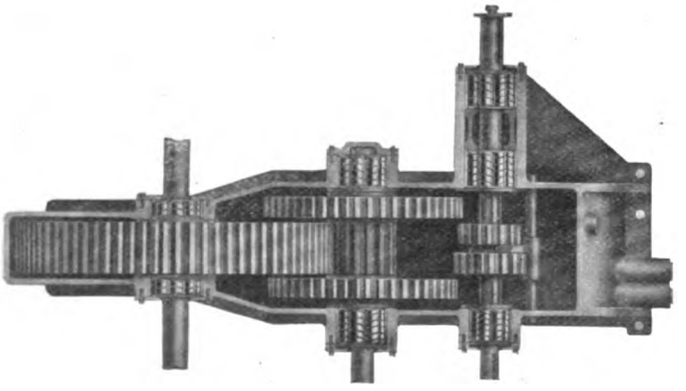
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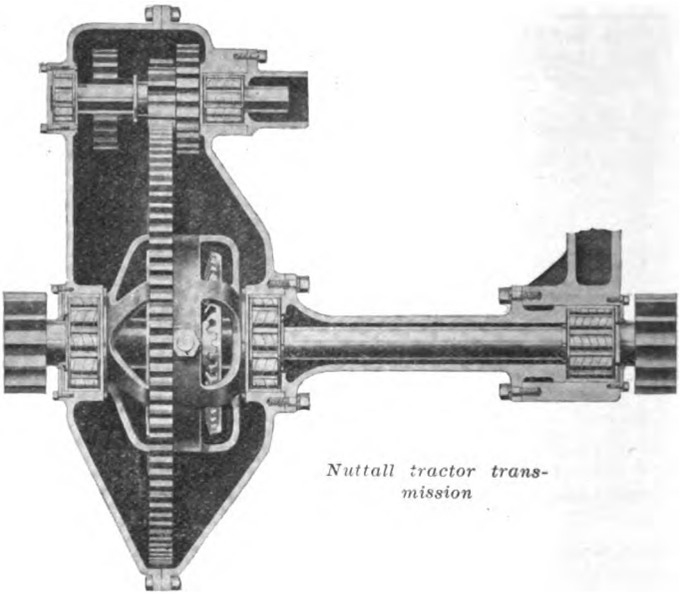
Minneapolis Steel & Machinery Co.'s internal gear drive



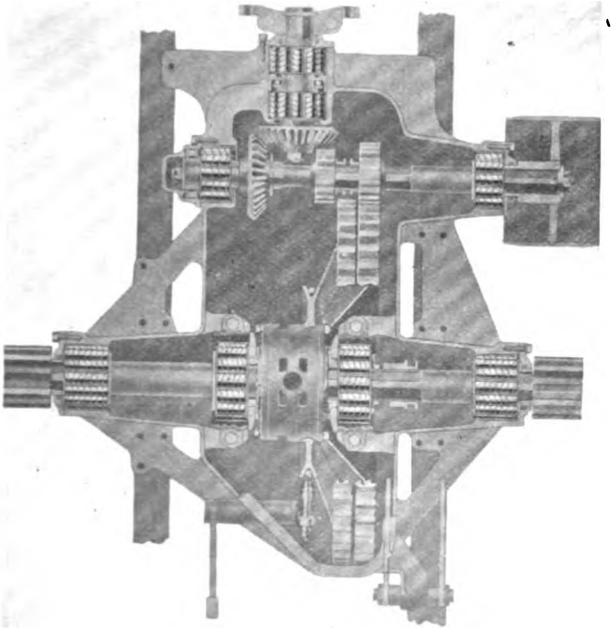
Minneapolis Steel & Machinery Co.'s clutch and transmission



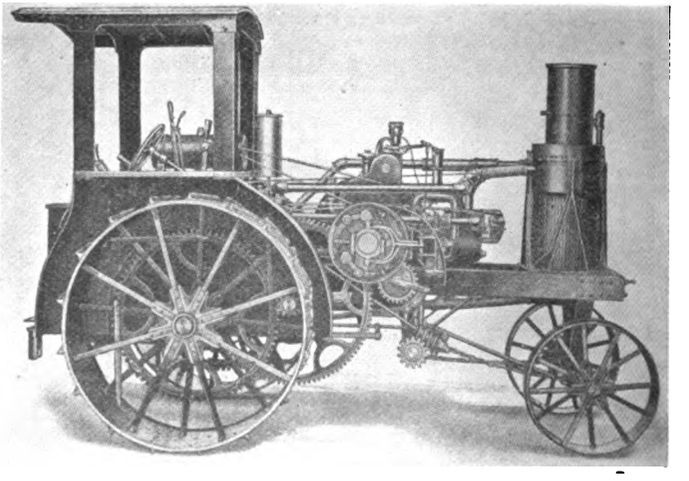
Transmission of the Gray tractor



Nuttall tractor transmission



Conventional tractor transmission



Avery tractor, showing large exposed transmission gears

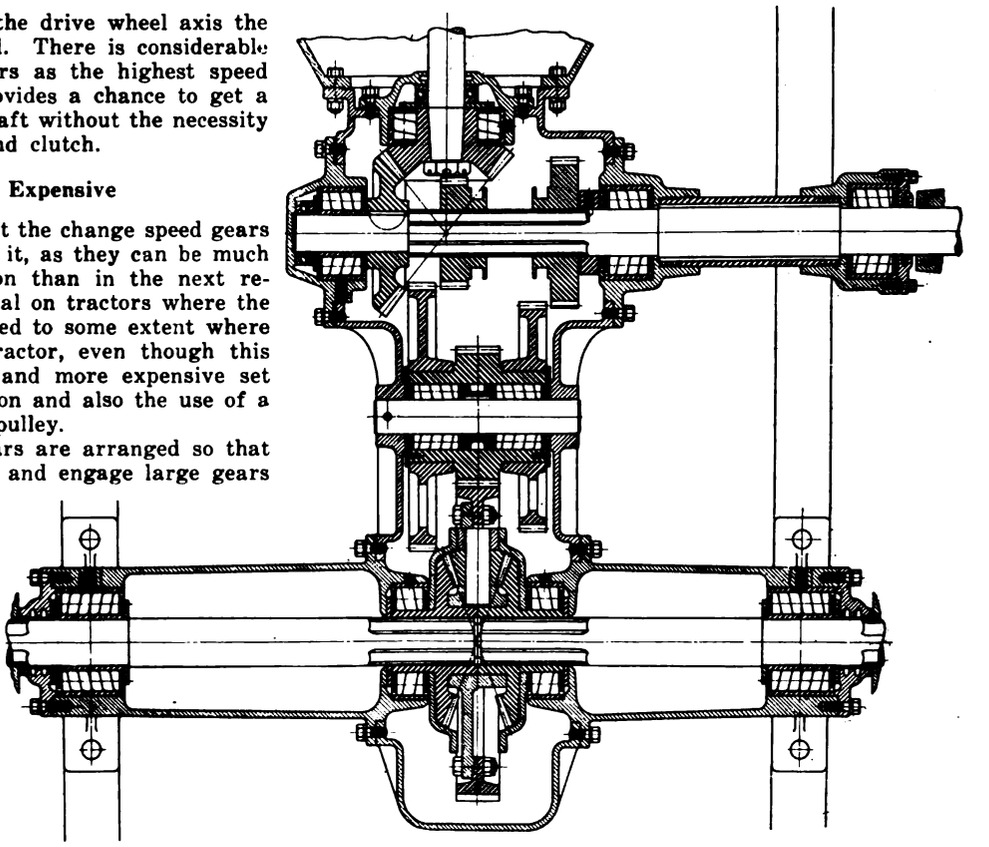
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the engine shaft is not parallel to the drive wheel axis the first reduction gears are often bevel. There is considerable advantage in having the bevel gears as the highest speed gears. It reduces cost and also provides a chance to get a belt pulley on a fairly high-speed shaft without the necessity of using a separate set of gears and clutch.

First Reduction Change Gear Least Expensive

When a spur reduction is used first the change speed gears and reverse are generally a part of it, as they can be much smaller and cheaper in this position than in the next reduction. This arrangement is general on tractors where the engine sets crosswise and is also used to some extent where motor shafts are lengthwise the tractor, even though this arrangement necessitates a larger and more expensive set of bevel gears in the second reduction and also the use of a separate set of gears for the belt pulley.

It is usual that change speed gears are arranged so that the pinions slide on the drive shaft and engage large gears on the driven shaft. No divided shafts or counter shafts, as are found in automobile transmissions, are used, except for reverse gears. This arrangement means that all gears are disengaged except the ones actually being used, and also that no idle gears or extra reductions are necessary for different speeds. Another advantage in this arrangement is that all change gears are disengaged when the belt pulley is to be used. Tractors are used for belt work for long continuous runs and gears or shafting running idle are undesirable because they waste power.



Tractor transmission with a first reduction by bevel gear

The second reduction is sometimes the final drive, though this is not often the case. Usually it is the drive to the shaft which carries the differential. If the differential can be placed in this position, ahead of the last reduction, considerable expense can be saved because the parts can all be made much smaller.

Differentials have to be very strong and ample, as tractor wheels are always slipping and keeping the differential parts working all the time. Differential locks are considered good practice. Brakes for holding one side for short turning are often used, but brakes for stopping, while necessary, are not very important.

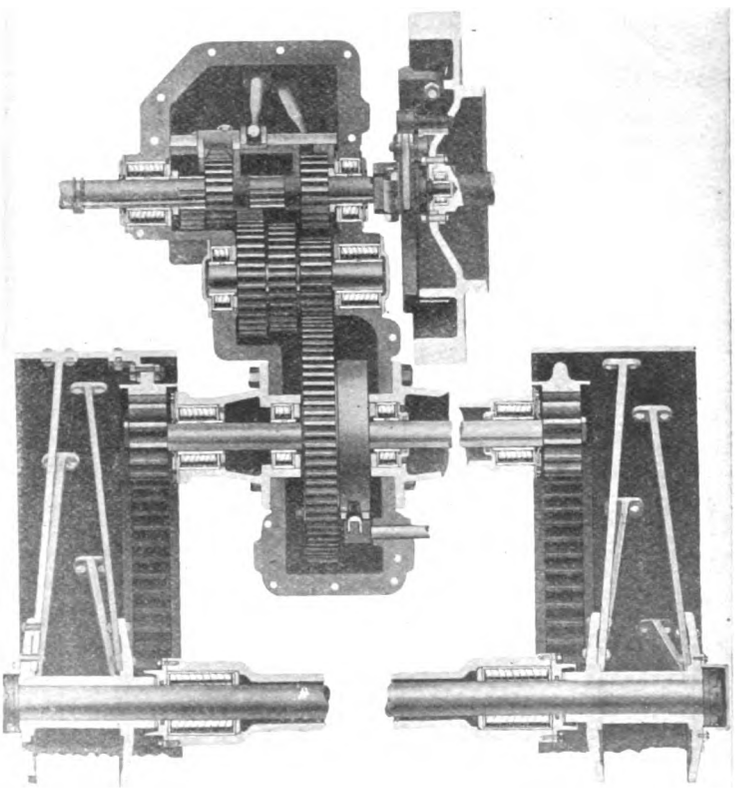
In cases where more than three gear reductions are used the extra reduction is used either to gain compactness or to provide for some special arrangement of parts.

Number of Speeds Provided

Tractors are used for plowing a large per cent of the time, and generally are operated at from 2 to 2¾ m.p.h. Many have only a single speed, but most of the late designs have two or three speeds. When there are three speeds one is lower and one is higher than the plowing speed, and when only two speeds are provided the second speed is usually slower than that for plowing. The difference between speeds is nearly always between 30 and 40 per cent.

A tractor transmission is really a series of compromises, each part being affected by those related to it, so it is no wonder that there is such a difference in design. A difference of opinion as to the proper location of the belt pulley alone will very materially affect the entire transmission arrangement. At present there is little chance of valuable transmission standards. It will require more time and many tests to prove what is best.

SOME time ago it was announced that a successful incombustible substitute for celluloid, manufactured from soya bean cake, had been discovered in Japan. Further particulars of the new product have come to hand. It is called "Satolite," after the inventor, Professor Sato, and a company for its manufacture has been started with a capital of £200,000. Satolite is a galalith made of the glucine of soya bean, coagulated by formalin. It is said to be produced much more cheaply than celluloid.



Three speed transmission and internal gear drive of the Waterloo Boy tractor

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Fundamentals of Tractor Engine Design*

Substantial Crankshafts, Liberal Bearing Surfaces, Removable Cylinder Heads, Voluminous Water Spaces, Long Strokes, Conservative Rating as Kerosene-Burning Engines, Force Feed Lubrication and the Greatest Possible Accessibility Among Features Advocated

By H. C. Buffington

So much has been said about the fundamentals of tractor engine design that an attempt to write upon the subject at this time, when the tractor is undergoing such rapid changes, is apt to incite derision. However, we all have our own ideas, gathered from experience, and the only way to be convinced as to whether or not we are right is to express ourselves publicly.

"Fundamentals of Tractor Engine Design"—the subject seems simple at first thought, and immediately the general outline of a four- or six-cylinder engine flashes through one's mind. We picture a smooth iron-clad masterpiece solidly mounted upon the frame of a racy looking tractor. We do not at first consider the carbureter, magneto and all the other contraptions necessary to make it run.

Presently we ask ourselves, What are the essentials of a successful tractor engine; what have we gathered from actual experience and not from theory? What the writer has in mind is not an engine of higher speed and light construction, nor a heavy two-cylinder engine, but a four-cylinder one with certain elements of construction which have proved their worth, and these elements of vital importance are the ones which the writer wishes to dwell upon.

Crankshaft

The crankshaft being the essential element around which the engine is constructed deserves first consideration. Too often this part has been neglected in the fight for lightness and cheapness; the following proportions, however, have shown up well under trying conditions. Personally the writer prefers the three-bearing shaft. There are, however, some points in favor of the two-bearing type, in that the two center cylinders can be placed close together, and, of course, the doing away with one bearing is an advantage. On the other hand, a very heavy shaft is necessary, and, generally speaking, the three-bearing type is best suited for large engines.

The crankshaft stress should not exceed 12,000 lb. per square inch, with an explosion pressure of 300 lb. per square inch. This will give a good solid shaft free from vibration, which is so destructive to bearings.

Bearings

A good proportion for the crank pin bearings is to take 57 per cent of the cylinder diameter for the pin diameter and 1.2 of this diameter for the length. This will give a projected bearing area of half the cylinder area, thus keeping the pressure down to 600 lb. per square inch. The main bearing pressures should not exceed 400 lb. per square inch for the front bearing, 400 lb. for the center and 250 lb. for the rear, taking the center of the bearings as the points of reaction. You will note the rear bearing pressure is very low, but this is necessary to take care of the extra pressure caused by the transmission shaft, if it happens to be out of line with the engine, which is often the case.

Removable Head

Whether ell-head or valve-in-the-head is rather a matter of choice. Those who prefer the ell-head perhaps use it because, as I heard it expressed, "It is a good old family horse." On the other hand, the valve-in-the-head is chosen

*Read at S. A. E. tractor meeting, Chicago, Feb. 1.

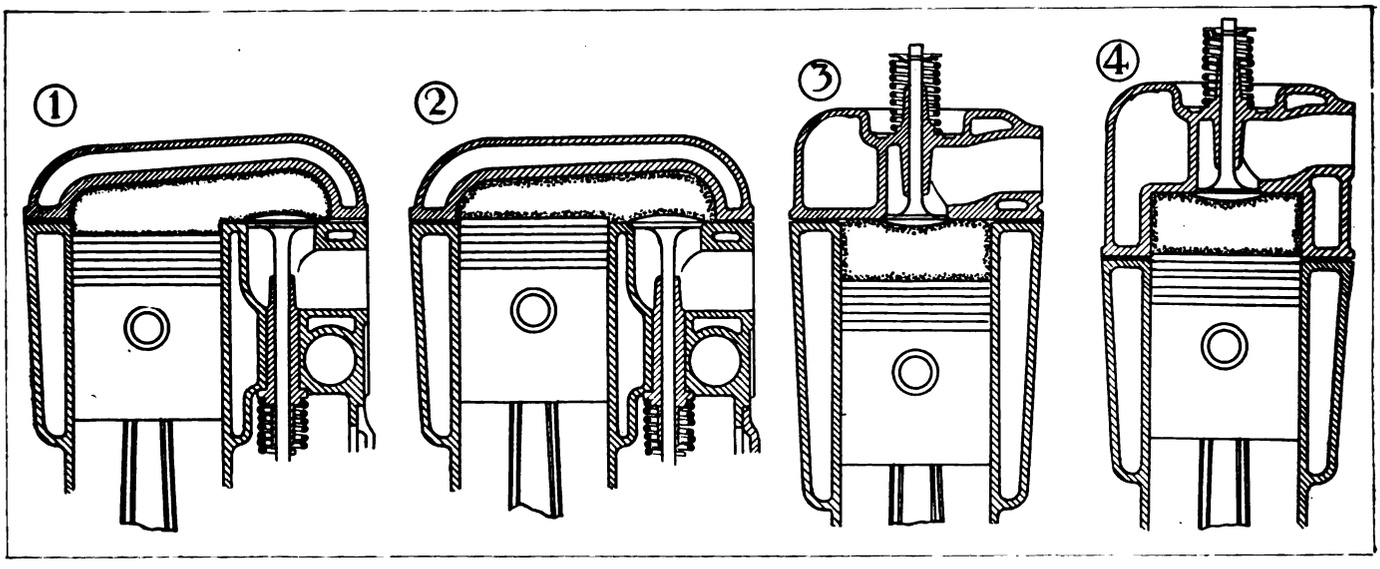


Fig. 1 Fig. 2 Fig. 3 Fig. 4

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by the more particular who do not want to be outdone in points of efficiency. The removable head, which has been recognized by a great many engineers as a necessity, has not been appreciated by some. There are several important reasons why the removable head should be classed as essential, i.e., cleaning carbon, grinding valves, doing away with the troublesome valve cover plug, or valve cage and making it possible to adjust the compression for high altitude. The cylinder head should part on a line with or a little below the top of the piston, and not above, as the latter method makes it harder to clean and the piston cannot be removed without first removing the carbon from the cylinder walls. Figs. 1, 2, 3 and 4 show this difference. The difference in compression can also be taken care of much easier. There are many tractors working in altitudes as high as 8000 ft., and the changing of the head is a simple matter as compared with the changing of pistons.

Water Jackets

Liberal water space around the head should be given very close attention, as, unlike the automobile engine, a maximum load must be expected for a period of hours. An even thickness of combustion chamber walls is very essential for the same reason, and means for checking up the thickness should be very seriously considered. If, for instance, there be a hot spot in one cylinder, the carbureter must be adjusted for that cylinder or the result will be very disastrous. There will then be either preignition in one cylinder or excessive fuel leakage by the other three pistons.

Long Stroke Preferable

Theoretically, a tractor engine should not be pulled down below normal speed, but this is often done; in fact, at least 50 per cent of the time the operator will have his engine overloaded, and it is for this reason that the stroke should be at least 1.4 the cylinder bore. The long stroke engine is also very desirable, because with it the difference between the engine speed and final drive is not so great and permits of holding down the transmission gear diameters.

The transmission itself has a great deal to do with the necessity of flywheel capacity, and the higher the efficiency of the transmission, the greater should be the flywheel energy. The less efficient transmission acts as a shock absorber and lessens the shock on the crank pins, while, on the other hand, the shock is transmitted almost directly to the crankshaft. It can readily be seen why some engines with a small flywheel do not have half a chance to stand up. In calculating the flywheel, double the horsepower should be taken with 10 per cent variation in speed. The speed control on the engine should be about 10 per cent above normal.

Engine Rating for Kerosene

Engine rating on kerosene should be based on 800-ft. piston speed, and this rating should not be over 75 per cent of its maximum capacity on gasoline. Actual laboratory tests have shown the power output on kerosene to be within 8 per cent of that on gasoline, but under actual working conditions it is not practical to expect this.

A tractor engine before leaving the test block should not use more than one pint of kerosene per horsepower-hour when pulling its rated load. This fuel is to have a gravity not lower than 42 deg. Baume, and an open flash point of not over 120 deg. F.

Engine builders to-day are at a great disadvantage in not having a standard fuel with which to develop their engine. I wish to suggest that the S. A. E. establish a standard kerosene and a standard gasoline.

Manifold Head Control Essential

One reason why it is difficult to successfully run tractors on kerosene in the country is that the grade of kerosene used in small towns, which may be termed lamp oil, although its specific gravity is not so low, has a very high open flash point, and to use it in engines it is necessary, in order to vaporize it, to heat it to a very high temperature. This high temperature, of course, reduces the power. This fuel gives a very good light and there is no danger from explosions, but it costs more than the so-called distillate, which in most cases is an excellent fuel.

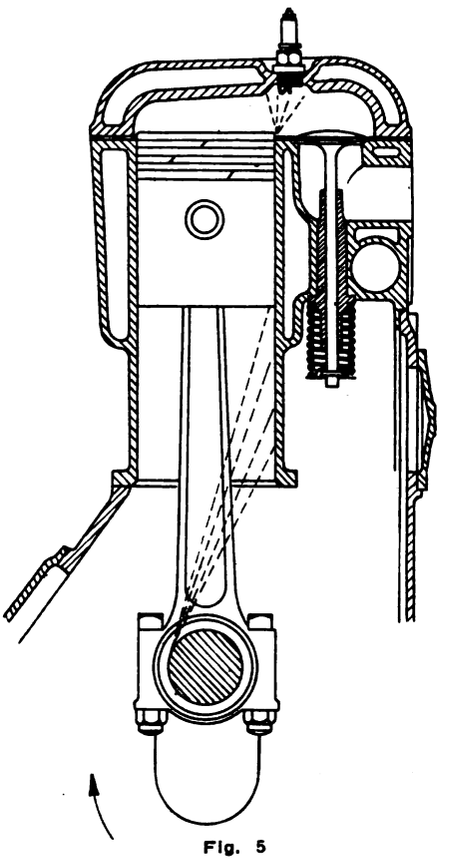


Fig. 5

This point pertaining to difference in fuels is mentioned merely to point out the necessity of controlling the heat between the carbureter and cylinders, and it is very essential.

The writer has often been advised as to the location of the spark plug, but after many experiments and sad experiences it has proved that the trouble is due largely to lubrication.

Proper spark plug location without a doubt would cure 50 per cent of the magneto troubles, and yet engines are designed without attempting to determine the proper location of the plug. Without hesitation the designer will place it over the intake valve on an ell-head engine or on the intake side of the valve-in-head type. Spark plugs should not be placed near the line of cylinder bore where oil from the piston will splash on the plug (see Fig. 5) or in line with the intake gases when using kerosene as fuel. A careless operator will either use too much fuel or too much water with the fuel, and with the plug directly in the path of the gas flow this will cause improper ignition.

The direction of crankshaft rotation will sometimes make it necessary to shift the plug to the opposite side, as the excessive oil thrown from the crankshaft will always lodge on one side of the cylinder (see Fig. 5). If the plug is on this side it will become fouled much quicker. Placing the plug over or near the exhaust valve has often been criticized, but aside from the fact that the spark plug itself will have to be replaced more often, it is the most reliable position.

Lubrication

Lubricating the tractor engine is the hardest problem in engine design at the present time, and it will continue to be so until a better method of using kerosene as fuel is employed. A most excellent oiling system has been developed for the automobile; in fact, it is as nearly perfect as anything that could be produced, but it has turned out to be a miserable failure when an attempt is made to use kerosene under actual working conditions in the field.

We dislike to throw lubricating oil away, and before doing so every effort should be made to prevent it, but, figuring from an economical standpoint, it is cheaper to use the lubricant only once and let it drain from the crankcase than it is to cause the destruction of the engine by too great economy of oil, as time is lost in making adjustments and repairs which are caused by the used-over oil, as it gradually becomes thinned by the fuel passing the pistons. The most reliable method of lubrication is to force fresh oil to each moving part, crank pin bearing, main and camshaft bearings, gears and cylinders and drain it into a reservoir from where it is drawn from time to time.

Every care should be taken to clean the air drawn through the carbureter and breather, as the oil supplied the crank pin must pass through a drilled hole, and any dust entering

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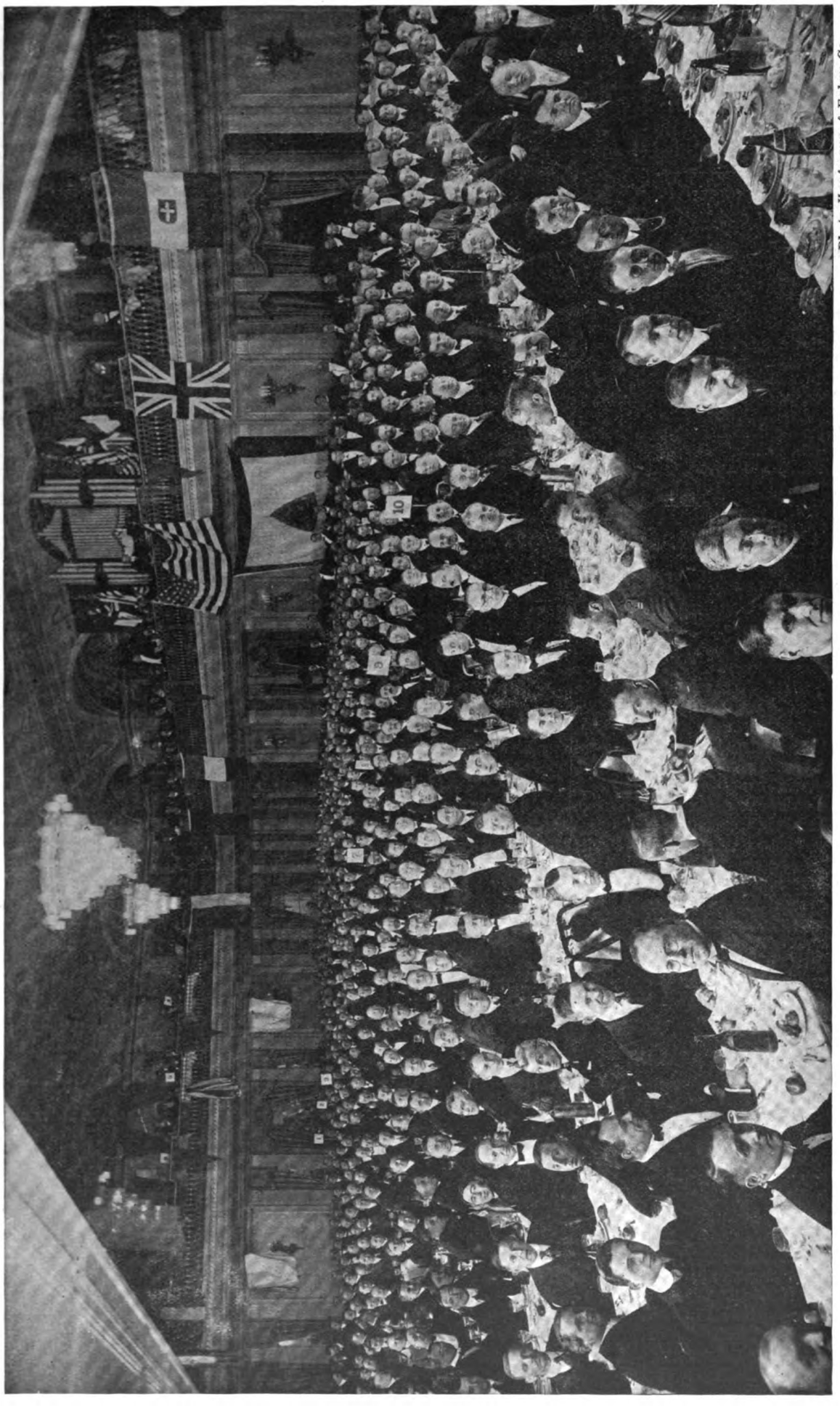


Photo Kaufmann & Fabry Co.

War Dinner of the Society of Automotive Engineers at the New Morrison Hotel, Chicago, February 1, Which Was Attended by More Than 1200 Persons

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the crankcase will gradually clog the passages. Any other method where oil is used twice, whether forced or splashed, will cause rapid wear. This is not the case with carefully operated engines, but we cannot expect unusual care from the average operator.

Accessibility

Hand holes placed in the side of the crankcase to make it possible to inspect the bearings are quite necessary, and the base pan should be light and easily removed. Every effort should be made to make it easy to remove wearing parts in making repairs and avoid crowding small nuts into corners and out-of-the-way places.

In conclusion I wish to say a word to the tractor designer on a subject which, though not relating to the essentials of engine design, is essential to the success of its operation.

Every effort should be made to provide accessibility to the engine, not only on the carbureter side but on all sides, and especially should sufficient clearance be allowed underneath. Allow plenty of room for removing the base pan; avoid, if possible, fastening tractor parts to cap screws and nuts used in fastening engine parts, especially the cylinder head bolts, as this only tends to discourage the operator in making necessary adjustments.

I cannot lay too much stress upon the importance of flexibility between the engine and the transmission drive shaft. It has been necessary to provide extra large bearings at the flywheel, to take care of vibration caused by the transmission and engine shafts being out of line, but this destructive feature can be remedied. I suggest designing a self-contained clutch mounted upon a stub shaft bolted to the flywheel flange bolts, and also a flexible coupling placed between the clutch and transmission. This construction not only takes the extra pressure off the crankshaft, but also allows the transmission bearing to run freely (see Fig. 6).

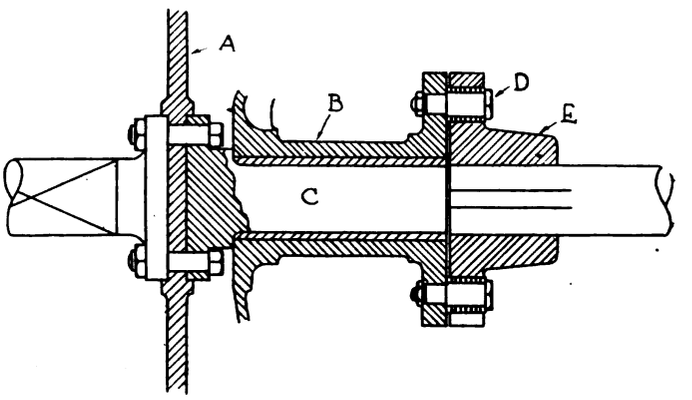


Fig. 6

War Problems Outlined at Automotive Dinner

CHICAGO, Feb. 2.—The war dinner of the Society of Automotive Engineers, held last night in connection with the tractor session, takes first rank as one of the most notable ever held by the organization. The attendance exceeded 1200, the banquet hall of the New Morrison Hotel being filled to overflowing.

The meeting opened with a letter of greeting from President Woodrow Wilson, expressing his hope that the organization would lend every effort to the great tasks ahead. General Kener, in command of Camp Grant; C. F. Kettering, president of the S. A. E.; Major W. G. Wall, of the Ordnance Corps, and a major attached to the French army were the speakers. The dinner was presided over jointly by Past-President W. S. VanDervoort and H. L. Horning.

C. F. Kettering's talk was the feature of the evening. In this he outlined the scope of the future work of the S. A. E., particularly in reference to the tractor field.

Major Wall spoke of the accomplishments of the Ordnance Department during the past nine months, and gave detailed figures on the munitions produced under the direction of this department.

General Kener spoke of the great necessity for man power and universal military training, and the major of the French army traced the progress of the military industries of France since the beginning of the war. Both W. S. VanDervoort and H. L. Horning spoke of the great work of the civilian experts in government work in Washington and also of the notable achievements of the members of the S. A. E. who are now enrolled in the Officers' Reserve Corps.

Past-President VanDervoort told how the Government is looking to the S. A. E. for so much of the Government work, and how proud the organization should be of such men as Howard Coffin, W. G. Wall, Howard Marmon and many others.

He bitterly spoke against what he called the "greatest of criminal errors" in not permitting the country to prepare during the three years that the other nations were at war. He stated that the criticism of the administration now going on is untimely, and that now is the time to uphold the President and not to criticise him. He said that a great work is being accomplished in doing in a few months what Congress should have had done during the last three years.

VanDervoort said that this is not the time for labor to talk of a certain number of hours' work, such as 8 hours or 7 hours, but now is the time to lengthen the period of labor only by the strength of physical endurance.

The men in the trenches need our support at home, and if we are privileged to have all the home comforts to which we are accustomed we should more than do our share in the tasks at home.

Major W. G. Wall told how the appropriations for the past few years for the Ordnance Department were inadequate, and hence this department was greatly unprepared until the beginning of the war. The Ordnance Department for this reason was up against a task the equal of which had never been known. Munitions for 3,000,000 men had to be prepared in 18 months. It is a big engineering problem.

Much of the material had to be made new, and some of it interchangeable with French—for instance, the 75 mm. and the 155 mm.—and necessarily there was some little delay before this could be brought into line for manufacture.

The greatest problems are the big guns and howitzers. It takes 9 months to complete one of the large guns, and the machinery to make them had to be built.

There are now eight large forge shops and many machine shops working on these, so that by next fall we will have more than 8000 cannon. Besides this there are thousands of the Enfield and the Springfield rifles which are the best rifles in the world.

There are ten large factories making the four-wheel drive units which are fitted with all types of bodies. A thousand of them, for instance, have machine shop bodies and others have gasoline tanks, anti-aircraft guns, etc.

In addition there are a number of types of Government trailers. There are 9000 tractors of caterpillar type in construction weighing from 18 tons down.

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What the Automobile User Is Demanding*

How the War Is Affecting the Demand for Passenger Cars—Higher Weight Efficiency, Lower Fuel Consumption and Easy Starting in Cold Weather Called For

By J. Edward Schipper

THIS is war time. Even though we are more than 3000 miles from the nearest battlefield, the fact that we are at war is carried home to us in practically every activity of our daily life. The war has its influence on our business regardless of what it is. It has its influence on our home life, and naturally it has its influence on our mode of transportation.

The business man of America depends upon his automobile for quick transit. In one or two of the largest cities of the country he is not permitted to use it to the extent that he should. The horse had such a long start on the automobile that our cities are still horse cities and not automobile cities, in spite of the fact that our municipalities have neglected to consider the question of the proper handling of automobiles during the business day. The parking problem is on the hands of every police department in the country, simply because the cities of America, and in fact cities of the world, are horse cities and not automobile cities. Nevertheless, the business man of America is using his automobile to such an extent that it has become a necessary part of his business life in spite of the fact that he is compelled to put up with inconveniences in the way of parking and storage during the business day.

Since the automobile is a part of the business life of every executive in the country, whether the business over which the executive has control is large or small, whether it concerns the welfare of an entire organization, or whether it only has to do with his own personal business, the war has touched his best means of transportation and is a vital factor in the matter of what the automobile user is demanding of the automobile manufacturer to-day.

War Consumes Metals

The war is like a gigantic metal whirlpool into which metals are drawn from all over the world to find their way into the guns and into the thousands of other war instruments which are necessary in the carrying out of a modern battle.

Many of these metals and many of the other materials used in the construction of motor cars are used at the front, and many of the other metals and other materials which are used in the automobile are necessary to the factory which is making munitions for the front, and so the question of materials becomes one of prime importance in the automobile of to-day.

This may seem like a matter which is entirely up to the car manufacturer, and yet it has as much to do with the consumer as with the maker of the car. In spite of the fact that cars are increasing in price almost from month to month, the demands of the user for performance are also increasing from month to month. While the average price of automobiles has gone up several hundred dollars, if we leave out of consideration for the moment the very lowest price cars, the average price that the user wants to pay has not gone up nearly as much as the price, and therefore we see performance, which was formerly expected only in the higher priced cars, demanded as a matter of course from cars which at the present time do not cost nearly as much.

No one knows better than the automobile manufacturer that the car buyer wants performance. The carbureter manufacturer is familiar with the same thing. He knows that the public is demanding that he produce an instrument which is capable of throttling to speeds hardly in excess of two miles an hour and upon application of the throttle of picking up rapidly and surely to speeds in excess of 50 m.p.h. on fuels which are forever going down in quality and volatibility. What does the average user demand? He wants a car that does not cost him too much, in the first place; he wants a car which will be tied up in the service station for the minimum amount of time. It is a matter of pride with every user that his car is dependable, and it is a matter of necessity with most users that the car will be able to perform more than 300 days a year without a falter. If we took an average of all the users in the country, we would probably find that there is a demand for 15 miles to the gallon of gasoline; that there is a demand for quick acceleration, good hill climbing, easy gear shifting, comfort in the seats and springs, accessibility for small adjustments and repairs, a minimum, or rather an absence of rattle, and when it comes to tires, anything short of 8000 miles is always occasion for a fit of peevishness.

Americans Want Acceleration

It is a certain fact that the American public demands the appearance of great size in its cars. The largest car selling for a given price will carry large sales, simply due to its size. Coupled with this demand for great size, the American public also demands acceleration. Size means weight and weight certainly operates against the quality of acceleration to such an extent that the torque requirements of the engine must be increased greatly to give the pick-up desired with the large car.

In Europe there are cars which, by a scientific use of the wheelbase, give all the necessary room at a greatly reduced weight, and consequently can supply all the acceleration demand with an engine of greatly decreased developed horsepower. The fact that the car weight is less allows the engine bearings and all other parts to be reduced accordingly and at the same time have factors of safety which are largely those used in average American practice, giving a greater endurance and a smaller service factor than can be expected from the large, heavy, high-powered design which engineers have been forced into much against their will.

Time for Economy and Efficiency

As mentioned at the beginning of this paper, this is war time. It is a time for economy and efficiency; therefore, let us appeal for a car design which is efficient and economical. It is exactly what the public wants, but owing to the education which we have given them through unhappily worded advertisements and by other means, the public believes that

*Presented before the Cleveland Section, S. A. E.

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its demands are met in proportion with the size of the car. Tire economy and miles per gallon of gasoline and other desirable requirements have been sacrificed because it is believed that acceleration and comfort in riding can only be secured with the car of long wheelbase. As a matter of fact, careful design, coupled with compactness in engine units, will allow several inches to be taken from the wheelbase of the car without any sacrifice of room, without a great loss in riding comfort, if any loss exists at all, and at the same time with a gain in materials, a saving in weight, a saving in tires, a saving in gasoline, a saving in space required for parking, and a saving in every direction which can be thought of. It costs less to build a shorter car, and this money could either be taken from the price of the car, which would certainly be another factor in what the user is demanding, or it could be put in refining the design, with the result that probably even greater lightness would result and better upholstery, better painting, and better trimming could be applied which would tend to make the result a high-class car throughout.

Trend Toward Smaller Cars

For some reason or other, high priced cars in this country have nearly always been big cars, due to the necessity for catering to the taste for size, and yet the very trend of public demand shows that exactly what it wants can be met in a medium priced small size car which incorporates all the beauty of design to be found in the highest priced products, and all the excellent materials which are used in cars which to-day are only sold in long wheelbase.

Engine size has nothing to do with performance. Torque-weight ratio is the governing factor in acceleration and hill climbing, the two greatest demands made by car buyers in this country. The demand for reserve torque will probably exist for years to come, and the value of horsepower is something which has been greatly exaggerated by means of the literature of engine and car manufacturers. The words "high power" are fascinating to the layman's mind, and he has been led to believe that if he has a powerplant capable of a high maximum output under his hood, he has an engine which will enable him to run away from other cars with a powerplant not capable of developing such high output. This, of course, in the face of real analysis is untrue, because the high horsepower may not be reached until such a high number of revolutions per minute that the car speed would be prohibitive under ordinary gear ratio conditions.

All the performance desired in a five-passenger car can be secured with an engine under 200 cu. in. piston displacement. All the acceleration wanted and all the hill-climbing ability would be incorporated in such a car. The ration of engine torque to weight could be made very high in such a car at the speed at which such a ratio is most desired, and if an engineer were told to get out a five-passenger car in which all the performance demanded is incorporated, together with an economic use of materials and an economic maintenance factor maintained, he would be wrong to go much above the 200 cu. in. limit. The idea that a perfect-riding car is one of infinite weight should not be the goal.

Pounds Per Passenger Too High

Weight of car per pound of passenger weight is too high in America. The tendency toward long wheelbase and big engines is responsible. A five-passenger car should not weigh more than 3 lb. per pound of passenger weight if it is to be considered a truly economical design. With a designed load of 750 lb., a 2250-lb. car would be about right.

If this economy in material and maintenance were carried out there would be much less talk regarding material shortages, and this vital means of transportation would not be threatened to be put in the class of non-essential industries. It is impossible to picture the farming districts of America without automobiles. It would set the country back like nothing else in the realm of imagination.

This presents the picture from one side. We all know what the public demands because we know exactly what we like ourselves in a car. We like to step into a roomy, comfortable front compartment, into which we do not have to squeeze in order to seat ourselves behind the steering wheel. We are always pleased when our first glance tells us that the control members can be readily seen and readily reached. We want the engine to start almost on the first touch of the starting button; we like the starting pedal to engage with little effort, with the engine running smoothing and quietly; we want a clutch pedal which is depressed by very light touch of the foot and which when engaging gives a smooth pick-up without unnecessary slipping and without excessive grabbing. In shifting gears the clutch should release instantaneously and positively, so that there is no drag in the gears, and the gear lever itself should throw into mesh with a minimum movement and with a minimum amount of reach required to place the hand upon the shifter cane. In picking up, the operator should be able to depress the throttle almost as quickly as possible without creating undesirable conditions of knocking, choking, spitting back, or laboring of the engine. In other words, carburetion, gear reduction and engine capacity and torque output should be so attuned that a smooth accelerative ability is given. Here, of course, lightness again enters.

The Cold-Starting Problem

Winter is now upon us, and to the list of requirements given above must be added that of starting rapidly on a cold morning. This is the most pertinent point of all at the present time.

All the hot spot intakes and exhaust jacketed carbureters in the world will not do one thing toward making the car easier to start. The carbureter manufacturers have provided us with very efficient chokes; even at the speed attained by the average starting motor on a cold morning these chokes are capable of shooting into the cylinders a supply of raw gasoline which would go a long ways in operating a dry cleaning establishment. Sometimes some of this raw liquid is ignited during the first three or four minutes of cranking, but quite often the motorist helps the situation along by distributing ½ pint more of gasoline between the four, six, eight or twelve cylinders. This joins the supply which the efficient choke has put into the combustion space, and ignition starts only, however, after a liberal supply of the raw fuel has leaked its way past the piston rings and gone down into the crankcase to help form what is sometimes called "crankcase soup."

Oil Dilution Serious Matter

If the car starts in 30 seconds the user is fairly well satisfied. He does not think, however, of all the gasoline that can be drawn into the cylinders and leak past the piston rings in the space of 30 seconds, he does not consider the fact that his lubricating film has been destroyed to a large extent by this gasoline, and he does not stop to consider how much the supply of lubricant in the crankcase has been deteriorated due to dilution of the oil by the heavier constituents of the gasoline.

This situation is probably the most serious one which confronts the designer to-day. The automobile user is demanding service, and he will not get good service from an engine which is being treated in this manner. The first few minutes of running with an engine in this condition are working considerable damage to that powerplant, and the problem must be met quickly or else a great amount of damage is going to be done during this winter to cars which are kept in unheated garages. The unheated garage is by far in the majority, it must also be remembered.

In these days when high prices of labor and material are forcing the price of cars upward, something must be done to meet the cold starting situation. A heating coil in the float chamber, or some other gasoline chamber, a water heating system connected with the radiator, or some other method which is equally effective, must protect the owner from the consequences of crankcase dilution. The average owner is wise enough to know that it is requiring a pint or more of gasoline for him to get his engine warmed up on a cold morning. He knows that he is not burning this pint of gasoline and all of it is not going out of the exhaust; therefore, the remainder forces its way into the crankcase, and cars

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which are fitted to combat this trouble are going to have a strong selling argument and are going to go a long ways toward meeting one of the biggest demands made by car users on the car manufacturer.

Preheating the Air

The heated intake has been studied so carefully by all manufacturers that it is useless to dwell upon it. Only one suggestion should be made, and that is that there are a great many manifolds which are erring on the side of too much heat rather than too little. It is practically impossible to meet the extreme ranges of temperature conditions, which range amounts to 100 degrees, or more in most of the cities along our temperate belt without some sort of adjustment. The air is always preheated to some extent and probably the means of adjustment to meet the outside temperature conditions is most rapidly effected by varying the amount of heat which is imparted to the initial air before it enters the carbureter. Too much heat makes the engine unsatisfactory, due of course to its reduction in volumetric efficiency, but the proper amount of heat, in spite of the expansion of the intake gases, will often result in an improved torque curve.

Economy Demanded

There is no Herbert Hoover controlling the gasoline situation in this country, but it might be due to his influence that the habits of economy are being instilled into the minds of the Americans more than ever before. It is a noticeable fact that this year's car users are demanding gasoline economy more than ever, and vigorous activitities can be noted on the part of carbureter manufacturers to supply this demand.

The carbureter, however, is not the only factor in economy. Lightness, which has always been important from a performance standpoint as well as that of economy, is a paramount necessity. Lightness does not only mean the reduction of weight by scientific design of parts, but it is possible to gain a far greater amount of weight by a scientific use of wheelbase length. In this country we have been wasteful of wheelbase. We have secured a minimum of passenger space with a maximum length of car. It has been possible in Europe, due to the use of shorter engines, shorter hoods and the more scientific location of parts, to get much more room on a given length of car, with the result that the car weight per passenger has been very much reduced. Scientific designing from one end to the other would make possible a great economy in materials and yet a very little sacrifice in performance; in fact, there need be no sacrifice but an actual gain in the way the car operates.

Silence and Appearance

The rear axle gears and in fact the entire transmission mechanism should be quiet and sturdy, the propeller shaft should not whip, and none of the parts beneath the chassis should be so filled with grease cups that the user of the car is fortunate, indeed, if he finds 25 per cent of them on his first greasy search beneath the chassis.

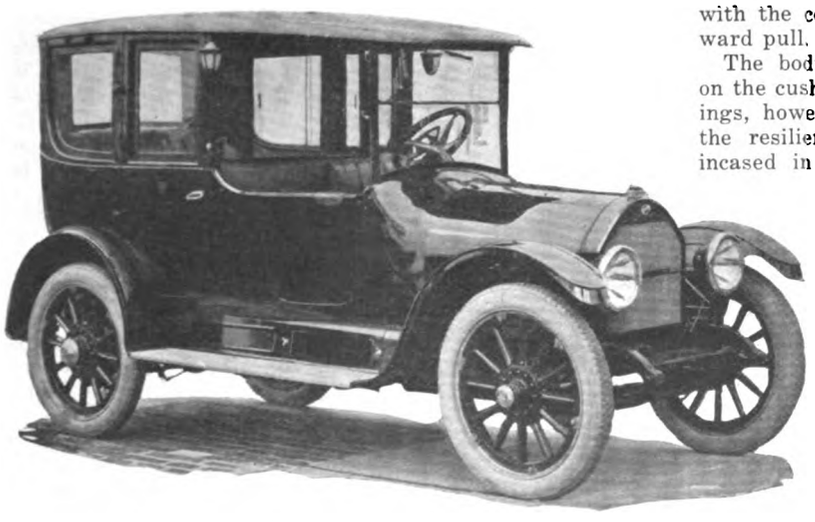
The appearance of the car should please the eye. Exterior appearance is a matter of choice, and like a great many things which are changed from season to season, it is impossible to lay down any rule as to what they should be like. Present-day style calls for long, straight lines without sharp breaks from radiator cap to the end of the tonneau. Another year this might be different. Nevertheless, the car should conform to the dictates of the moment. The upholstery should be good, and here it may be said that some of the latest of imitation leathers are rendering excellent service and are doing better in fact than poorer grades of genuine leather.

Buying Public the Arbiter

The top should be so designed that it is quickly put in place, and the side curtains should permit of ready view on all sides of the car. Some of the side curtains, with their small lights, shutting off the view of the driver, are a positive menace in city driving rather than an advantage. The windshield should be drip-proof and have the ventilating feature which has come to be demanded by everyone. The public is demanding a good car and an economical car, and the engineer must supply by scientific design what the public demands in the face of the fact that he is now under limitations of material which did not hinder him a year ago. The public demands are the ultimate factor in the sales of the car, and the closer that engineering design dovetails with the demands of the public and at the same time coincides with what is really scientific and efficient from an engineering standpoint, the better the ultimate car will be.

Willys Produces Knight-Engined Taxicabs

THE Willys-Overland, Inc., Toledo, has recently concentrated on the manufacture of a Willys-Knight chassis equipped with a special taxicab body. This car is being used to some extent in both New York and Chicago. The rear seat will comfortably carry three passengers, and two others may be seated on the folding auxiliary seats. The latter are deeply upholstered and attached to the partition between the front and rear compartments by means of sliding bars and channels. When not in use these seats fold back flush with the compartment and may be released by a slight upward pull.



Willys-Knight taxicab

The body is upholstered in Spanish leather, hand-buffed on the cushions, backs and sides. The panels, doors, and ceilings, however, are machine-buffed, and all cushions are of the resilient spring type, comprising many small springs incased in a canvas container. The additional equipment of the rear compartment comprises silk roller shades and a soft thick carpet, as is in line with the practice on high-priced private cars. A speaking tube, black enamel card case, aluminum pins for holding taxicab literature, and a compartment ventilator complete the equipment.

The standard finish of the taxicab body is rich dark blue, the wheels being painted to match, though, if desired, other colors are furnished. The fenders and trimmings are in black enamel, and the fittings are nickel and polished aluminum.

A feature of the cab is its roominess, which will make a special appeal to travelers carrying grips, etc., with them.

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First Class AA ¾-Ton Military Trucks Practically Ready

To Be Purchased in Great Numbers and Used in Many Departments, Including the Post Office

THE first four experimental models of the Class AA ¾-ton trucks are practically complete. Designed under the supervision of the Quartermaster's Corps, they are destined to play perhaps the greatest part in all the work of our standardized war vehicles for the reason that they will be purchased in great numbers, and will probably be used not only by the Q. M. Corps but also for the Navy Department, Marine, Signal and Medical Corps, and also for the Post Office Department.

All these departments were considered in the design of the vehicle, which in so far as possible include provisions for the particular class of work which must be performed by each of the departments.

Although the Quartermaster Corps will use a large number of the trucks as soon as they have passed through the preliminary road test, it is expected that the Medical Corps will require at least 3500 for immediate service as ambulances. It is likely several thousand will be purchased during this year and put into service over the 4000 miles of new parcel-post routes just laid out from Maine to Louisiana by the Post Office Department.

The fact that the chassis will serve as an ambulance perhaps affected its design to a greater extent than any other consideration. It was because of the fact that they will be used as ambulances that the vehicle was provided with a torque arm and radius rods notwithstanding the fact that the heavier Class A and Class B trucks both employ Hotchkiss final drive in which the torque and propulsion are taken through the rear springs.

Easy Riding a Prime Requisite

For ambulance work easy riding qualities are one of the prime requisites, and it was considered advisable in this service to make the springs carry only the body and the live load instead of both the driving and propulsive strains. The use of the radius rods and torque arm make for a slightly heavier and more costly construction, but when the lives of our men are in the balance these two elements are secondary in consideration. These details have not been finally settled.

As previously told, the trucks were assembled by the Reo Motor Car Co., Lansing; Federal Motor Truck Co., Detroit; Maxwell Motor Co., Detroit; and the Willys-Overland Co., Toledo. The fifth truck, which will be assembled later in Washington, as a check against the design, has not yet been started.

The progress of the work at the four plants was about the same. The vehicles were originally scheduled to be completed on Jan. 15, but this was not possible on account of various unavoidable delays.

The Federal and Reo companies received their orders from the Government to begin the construction of their trucks Dec. 19, 1917, while the Willys-Overland Co. received its order on Dec. 24. The Maxwell company was the last to get its word to go ahead, receiving its order on Jan. 7.

The Federal company received the engine, springs, frame and clutch on Jan. 2, and immediately began to assemble the various component parts. With the exception of the front and rear axles its job was virtually completed on Jan. 8. The Reo company went to work on much the same schedule and completed its truck as far as possible, at the same time.

The Willys-Overland company received its engine from the Northway Motor Corp. on Jan. 3, together with the frame parts from the Reo company and the clutch assembly from the Detroit Gear & Machine Co. The steering assembly arrived on the day following and the Willard storage battery and muffler on Jan. 8. The wood wheels, transmission and radiator, the latter from the Federal Motor Truck Co., were received on Jan. 10. The starting motor, fenders, hood, tool box and universal joints arrived on Jan. 11, and the dash, instrument board and fittings on Jan. 15. Actual assembly was begun on Jan. 16, and was finished as far as possible on Jan. 24, with the exception of the front and rear axles.

The Maxwell company started the assembly of its job on Jan. 11, the date on which the frame arrived, and finished the vehicle on Jan. 24, with the exception of both sets of axles. The delay in the delivery of the axles was because they required much new die work.

All of the principal component parts entering into the construction of the vehicle were ordered from the parts makers by the Government, which was therefore responsible for the arrival of the parts at the assembly plants at the scheduled time. All of the parts, with the exception of the front and rear axle, arrived in time to complete the job on schedule.

The mechanical features of the truck have already been explained in detail in these columns. It will be noticed that the engine is provided with detachable cylinder heads and with the dual-ignition system consisting of both a magneto and generator as followed on both the previous Class A and Class B trucks. It differs from both of the latter in that it is equipped with an electric starter. It has, however, many of the characteristics of the Class A and B engines, including the hot-spot manifold and a similar mounting of the distributor, water pump and magneto on the left side of the engine looking toward the front and the governor and generator on the right side.

Another unusual feature of the engine is that the crankcase is so designed that cylinders of 3¾-in. bore by 5-in. stroke are interchangeable with the 4-by-5-in. cylinders now fitted. The purpose of this construction

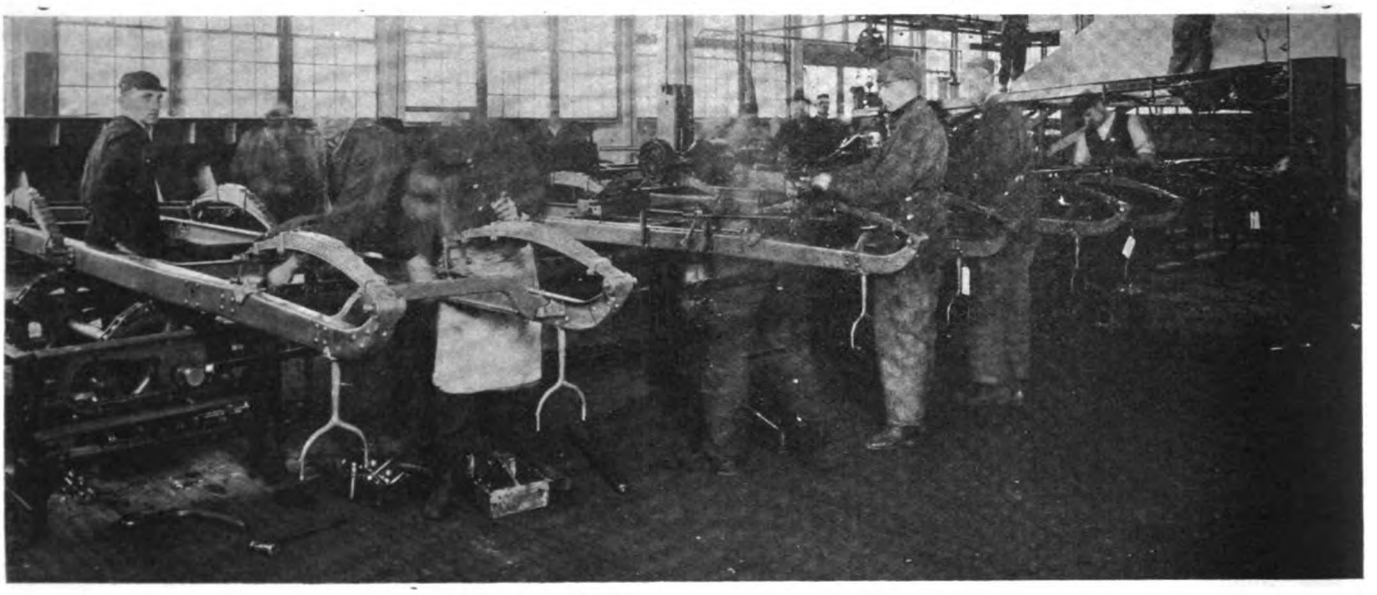
(*Continued on page* 345)

A number of photographs of these trucks assembled at the various plants handling the work appear on following pages.

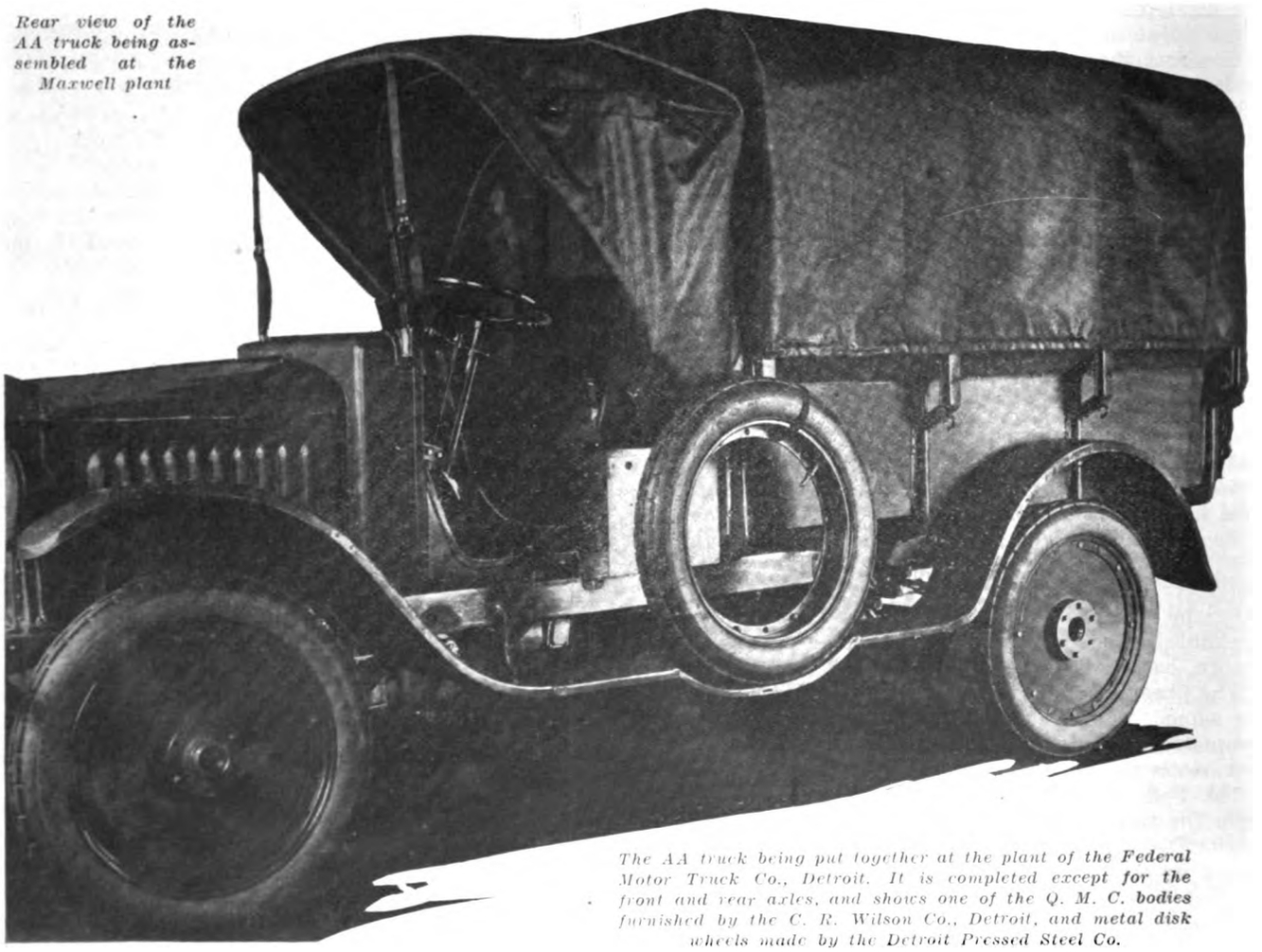
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Details of Construction of the Class A A Military Trucks

(*More photographs appear on pages* 320 *and* 321)

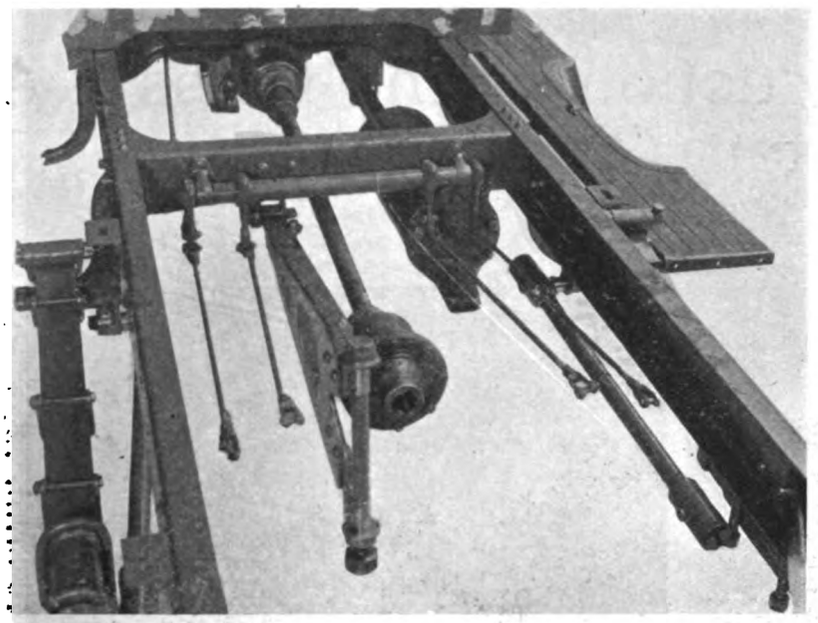


Rear view of the AA truck being assembled at the Maxwell plant

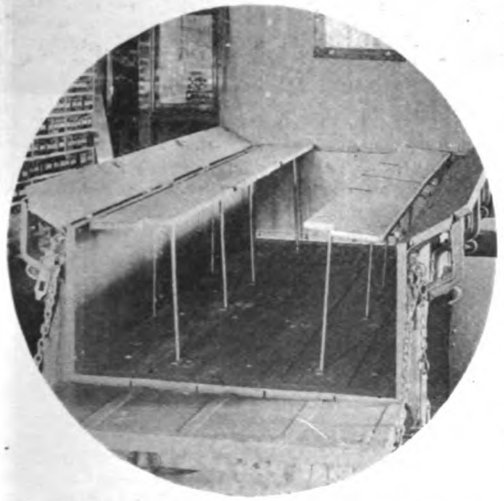


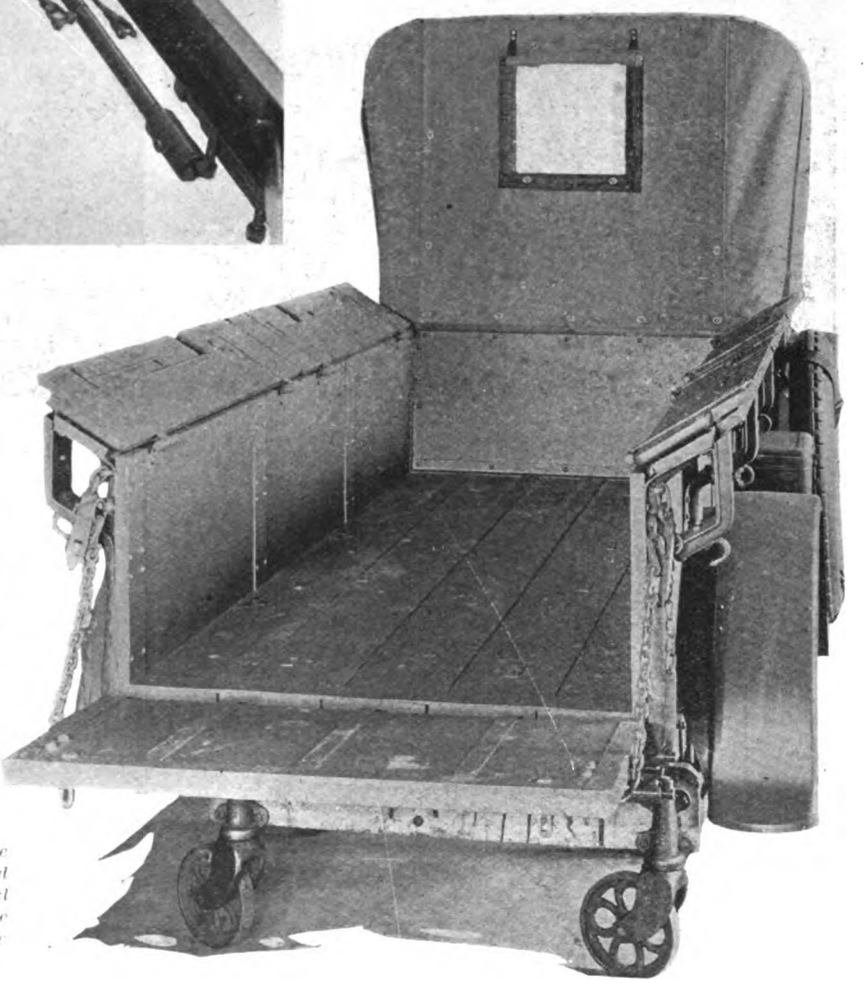
The AA truck being put together at the plant of the **Federal** *Motor Truck Co., Detroit. It is completed except* **for the** *front and rear axles, and shows one of the* **Q. M. C. bodies** *furnished by the C. R. Wilson Co., Detroit, and* **metal disk** *wheels made by the Detroit Pressed Steel Co.*

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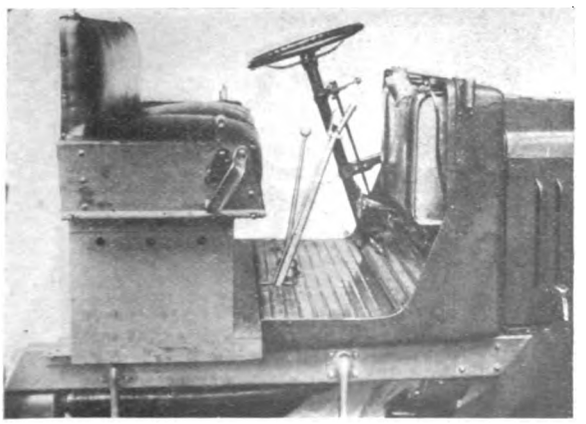


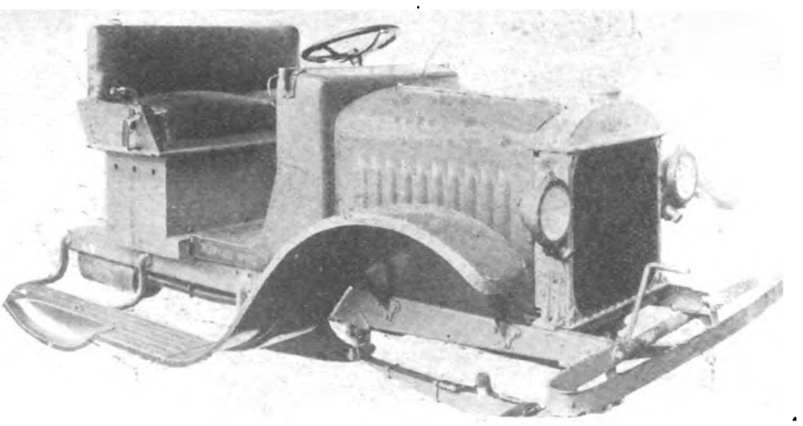
A three-quarter plan view as seen from the rear and showing the two metal universal joints on the driveshaft; the frame construction with the corner braces to take the strains of the towing hook, which will be inserted through the hole in the rear cross member and mounted on a coil spring





Rear view of the Q. M. C. body mounted on the Reo job and showing the hinged seats which fold back on the flareboards. Note also the pressed steel braces on the body sides and the hooks for the tarpaulin top. These are placed high on the pressed steel braces for convenience



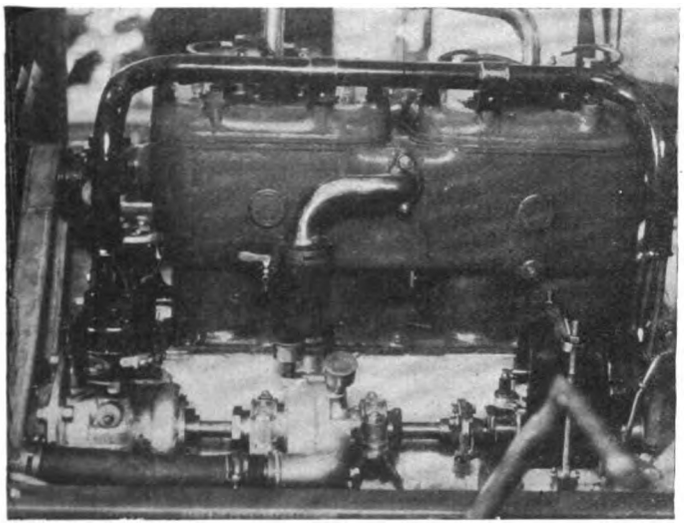


Two views of the Class AA chassis completed at the Maxwell plant, showing the well-upholstered seat, the arrangement of the control units and the substantial bumper with which the trucks are fitted

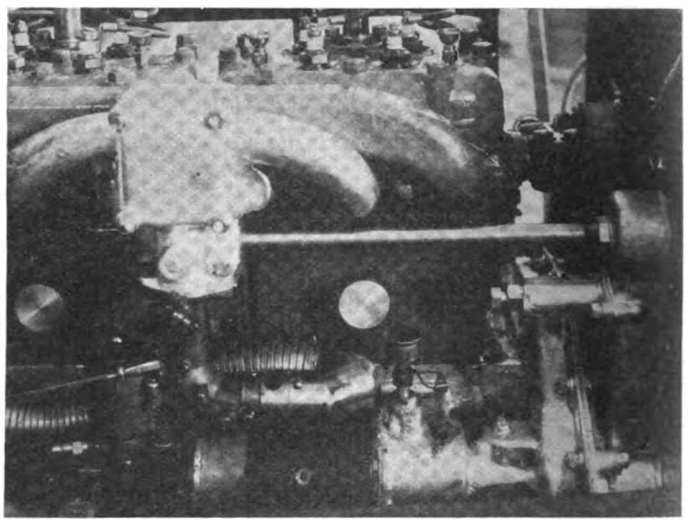
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Details of Construction of the Class AA Military Trucks

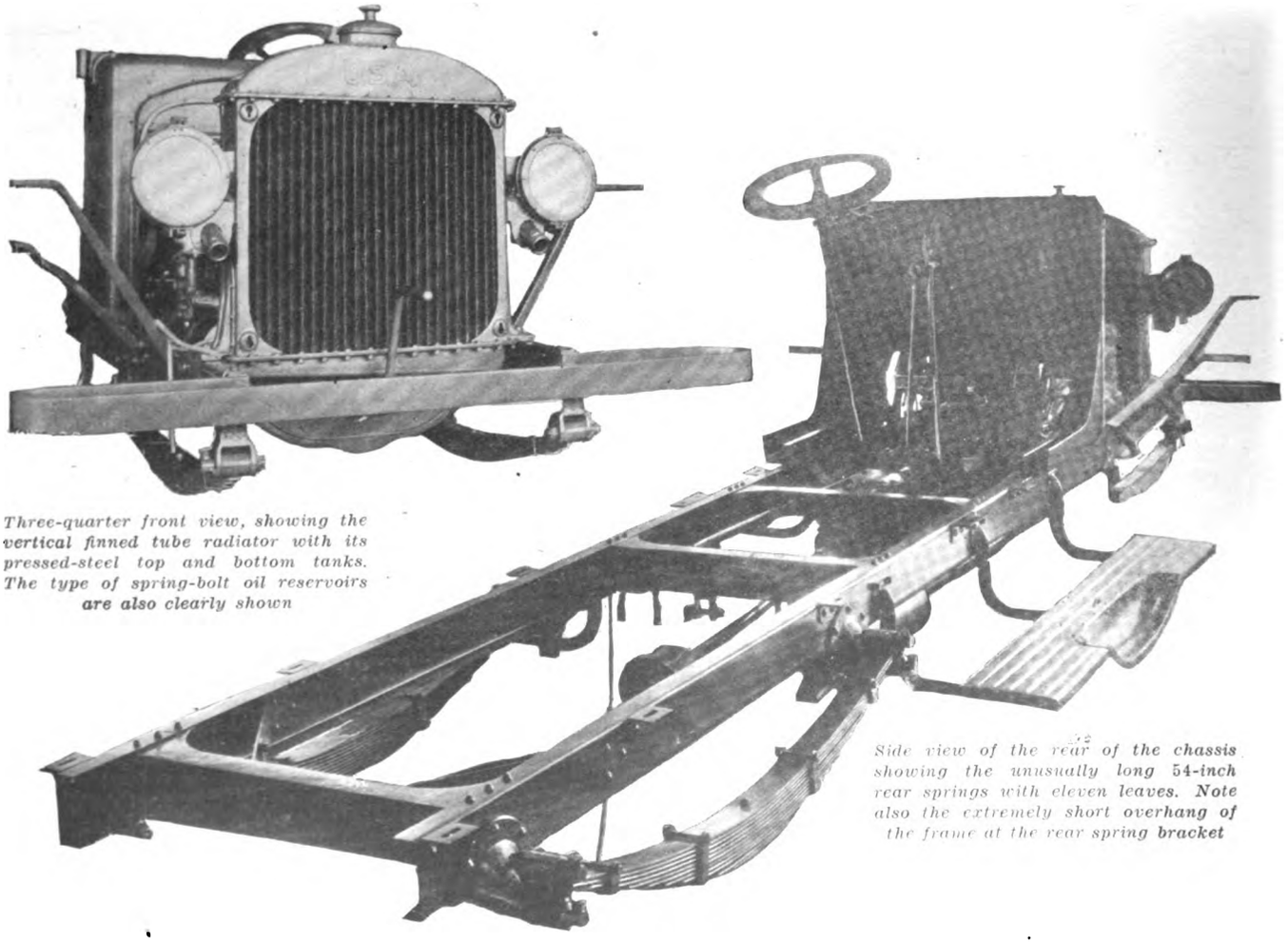
(*Continued from pages* 318 *and* 319)



Right side of the engine showing the Remy distributor, the water pump and the Bosch magneto on the same longitudinal shaft. Note the two sets of spark plugs and the detachable heads on the cylinders



The left side of the engine showing the hot-spot manifold, the Stromberg carbureter and the hot-air pipe leading from the exhaust pipe under the fuel tank on the dash. The starter is shown to the extreme left, the Westinghouse generator in the center and the governor at the left

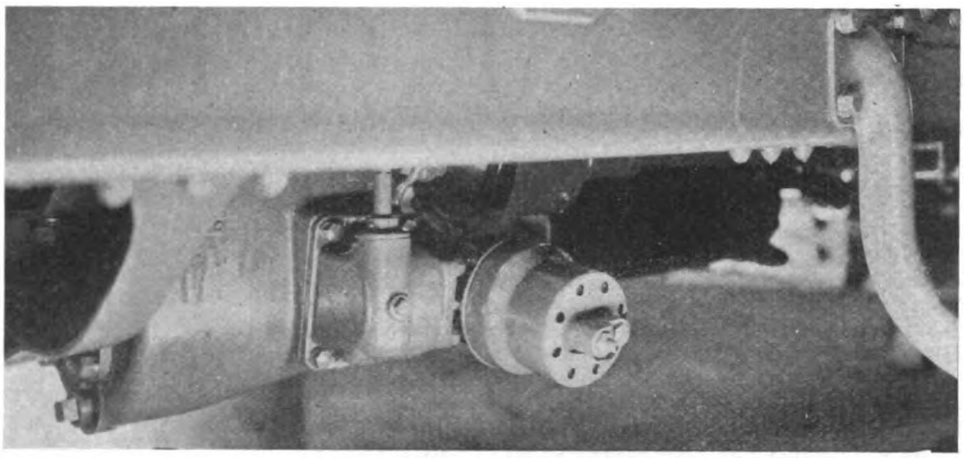


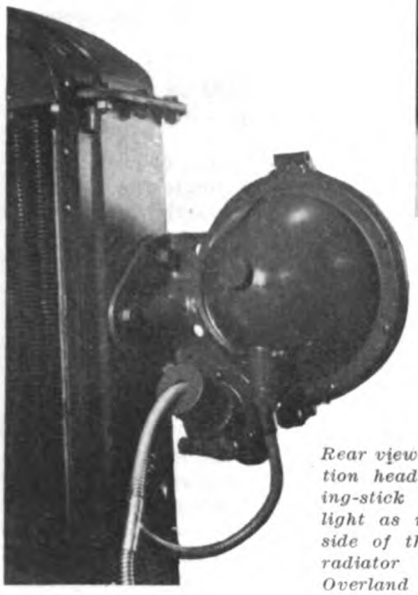
Three-quarter front view, showing the vertical finned tube radiator with its pressed-steel top and bottom tanks. The type of spring-bolt oil reservoirs are also clearly shown

Side view of the rear of the chassis showing the unusually long 54-inch rear springs with eleven leaves. Note also the extremely short overhang of the frame at the rear spring bracket

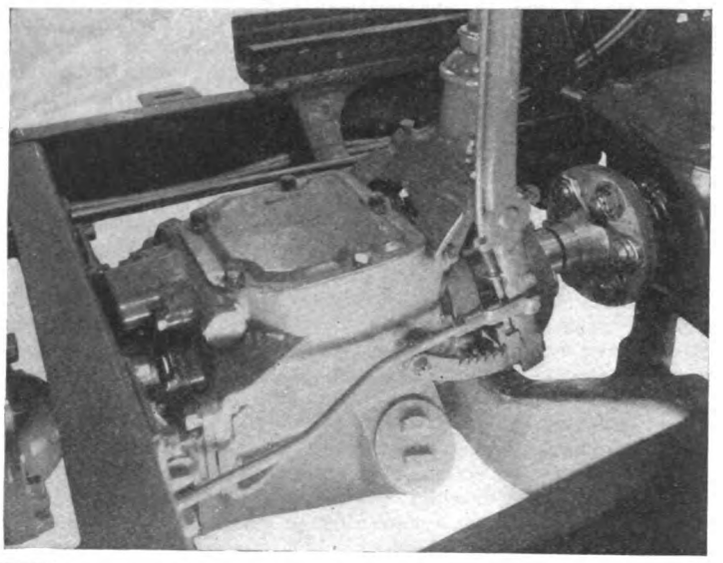
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The gearset from the left side of the truck looking toward the front and showing the Stewart tire pump fitted so that deflated tires can be pumped up on the road immediately after being repaired if punctured. This is very important when the vehicle happens to be operating far from its base or a repair station

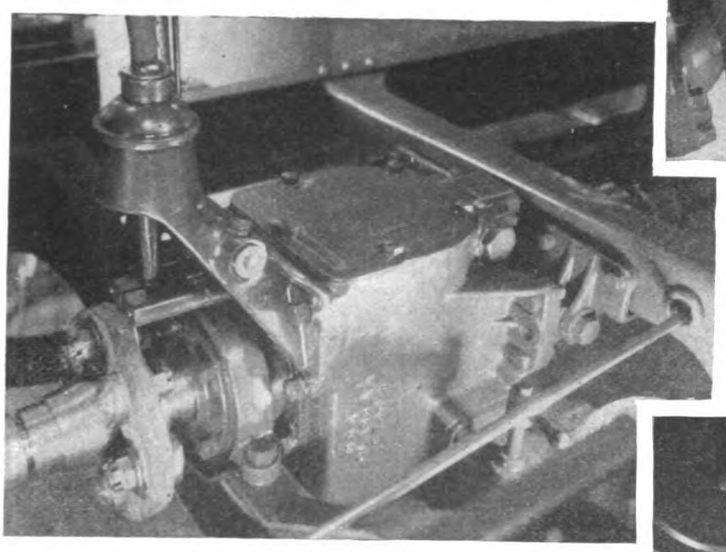




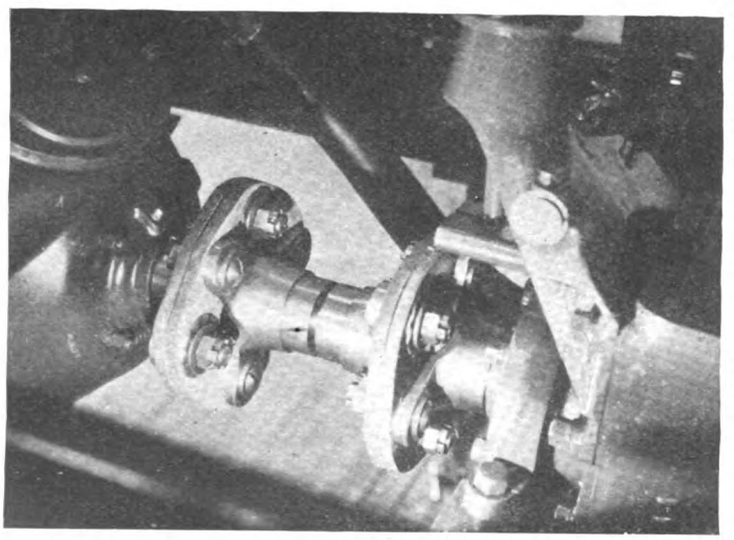
Rear view of the combination headlight and shaving-stick night driving light as mounted on the side of the pressed steel radiator casing of the Overland job. Note the manner in which the wires for the headlight and the small spotlight are carried in the same metal conduit



Right side of the gearset housing, showing the large filler plug and the method of mounting the brake lever on a special bracket on the cover so that it can be removed easily if the gearbox needs to be removed



The unusual three-point support of the gearset with the trunnion type bearing on the front and the two semi-universal-like supports at the rear



Plan view of the method of taking the drive from the clutch to the gearset by means of two Thermoid fabric universal joints. Note the amidship positioning of the gearset which makes it easy to remove it without disturbing the clutch

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The FORUM

Standardizing Balance

By N. W. Akimoff

A NEW sort of technical standard is being proposed by the author, that of balance, both static and dynamic. It will take several years to put through an idea of this sort, but by constantly pounding at people's common sense it is felt that this can eventually be done.

In five or six years a prospective purchaser will begin to demand that certified proof is produced to the effect that the initial unbalance in the car he wants to buy is *not over so much*, in pretty much the same way as he now buys sugar by the pound and gasoline by the gallon, instead of by the handful or bucketful, respectively.

Incidentally, no one ever bought a pound of sugar or a gallon of gas; the very conception of an exact pound or gallon would lead to complications that would discourage the buyer and would cost him much more than the goods themselves.

All the buyer knows, all he cares to know, is that the weight of a given quantity of sugar is approximately the same as the weight of an adopted standard, determined on a rational device that is not supposed to be out TOO MUCH; in other words, that the possible error is surely not more than so-and-so.

Now, since balance can actually be weighed, not necessarily in pounds but nevertheless in definite, rational units, why not insist on certain tolerances, outside of which we have unbalance, and inside of which balance is good, or at any rate practically acceptable?

For static balance the unit is *ounce-inches*, and the limit proposed by the author for a body not exceeding 150 lb. in weight and whose journals are not over 3 in. in diameter should be 0.4 oz.-in.

For dynamic balance, which really is due to the absence, or in general to the action, of a centrifugal couple, the logical unit is not the measure of a couple, say in foot-pounds or in ounce-inches, but a new unit, proposed by the author some time ago, *inch-ounce-inches*, or *ounce-inches square*. The advantage of this unit is that it brings out the very essence of the centrifugal couple, *minus the speed element*, which for our purpose is absolutely immaterial.

Now, for a body of the character outlined above the allowable dynamic unbalance is, according to the author's suggestion, not to exceed 12 oz.-in. sq.

The author has established these limits from numerous observations in his laboratory and feels that they are practically permissible, not inconsistent with the requirements of good production, yet capable of satisfactory results in operation.

Two main classes of manufacturers will bitterly oppose the introduction of such standards, not realizing that progress cannot be choked: 1. The man who feels that there is *nothing in it*. Our fathers made money without any balance at all, and why should not we? etc. 2. The man who believes that one degree of balance is exactly as good as another; that all balancing machines are alike, and the cheapest is possibly the best after all, regardless of the principle on which it works; also his twin-brother, the man who believes that he can build a *machine of his own*, just as if this were as easy as rolling a cigarette. This latter class of engineers is highly amusing and entertaining: they get the appropriation and just go to it!

The author has seen tens of thousands of dollars' worth of such machinery of "own" make thrown into a huge scrap pile, although in a few isolated cases the designers still stick to their creations with an ardor that would make Pygmalion himself fairly sick; all this at the dear public's expense.

Now there is an easy manner in which this chaotic condition can be remedied; here is a criterion that ought to be safe, and at the same time fair to everyone:

1. All machines which comply with what follows are balancing machines; those which do not comply cannot be advertised by that name or sold for purposes of balancing (think of a scale or a set of weights or of a 5-gal. measure that would not answer similar conditions).

2. A steel rod, ground perfectly straight, of about 2 in. diameter and 3 to 4 ft. long, when placed in the balancing machine and operated at 300 to 400 r.p.m. should exhibit no vibration.

3. Static unbalance of not over 0.4 in.-oz., caused by such means as suitably fastening a small weight to the periphery of the above-mentioned rod, should be clearly indicated by the machine at speeds not exceeding 300 r.p.m.

4. Dynamic unbalance of not over 12 oz.-in. sq., caused by such means as fastening two small weights to the periphery of the rod, at opposite sides and at proper longitudinal distance from each other, should clearly register on the machine at speeds not exceeding 300 r.p.m.

5. In actual balancing the amplitude of oscillations of the indicator will not exceed that secured under tests 3 and 4 respectively.

Under this plan no real balancing machine can be excluded from the field and no fake appliance can receive much encouragement; of course, people will get up new balancing machines right along, since it is not possible to restrict the art itself by patents or otherwise, but only separate, individual designs. But any such machines must clearly show that they can do the work.

Let the manufacturer prepare himself to the new situation, demand for standardized balance.

Overhanging Propeller Shafts

By H. R. Trotter*

THE writer's attention has been called to Mr. C. J. Schipplock's criticisms of the Howard Aero Engine in your issue of Dec. 6.

The use of an overhung pinion construction is not prohibitive, provided due care is taken in the design and selection of materials used.

It can be taken for granted that all shafts deflect and that deflection takes place even though the shaft be unloaded. This deflection also is accentuated with an increase in speed and cannot be prevented by the use of a so-called rigid type of ball bearing. The employment of this type of bearing simply results in the overloading of a few of the balls and a rapid increase in friction loss with consequent wear.

With the employment of a self-aligning type of bearing, these disagreeable features are entirely eliminated and the bearing capacity remains the same, independent of any position which the shaft may assume. The greatest advantage, however, obtained by the use of the self-aligning bearing is that there is no danger from excessive shaft stresses. Furthermore, there is no possibility of the bearings being unduly loaded beyond their capacity by inaccurate machining, as is very often the case with the rigid type of ball bearing.

When plain sleeve type bearings are used, inaccurate machine work is easily detected because of the fact that if the bearings are out of line, the shaft binds and in some cases will not rotate.

It is a well-known fact that the friction loss of a ball bearing remains practically constant, despite the increase of load. It is, therefore, possible to bind a rigid type of ball bearing and thus heavily overload the balls without any evidence of this overload being apparent.

A shaft running under this condition is also subjected to very severe reversal of stresses. These stresses constitute a danger which is always present if a self-aligning bearing is not used.

*Of the S K F Ball Bearing Co.

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Chassis Design of the Class B Truck*

A Chronology of Events Leading Up to the Work—Changes from Original Specifications—Reasons Behind Pressed Steel Frame and Hotchkiss Drive—Engine and Gear Box Mounting and Chassis Lubrication

By Cornelius T. Myers

IF there is an accomplishment any more representative of the spirit and constant endeavor of the S. A. E. than the design and building of the first class B Military Motor Truck it does not appear on our horizon at this moment. It represents one culmination of the ideals for which the Society has labored unceasingly, and that it is to be of service to our country at this time is a reward that few of us expected.

In touching on the chassis design the writer will put down just a little of the chronology of events leading up to the starting of the work, and will then touch upon a few fundamentals, following with notes as to details.

Chronology of the Truck's Design

On June 27th, 1917 (the day after the close of the semi-annual meeting of the S. A. E. at Washington), a large number of engineers representing truck builders and component parts makers met in Washington to discuss with Captain Britton, of the Quartermaster General's office, a military motor truck composed of standardized parts. These men divided up into groups, representing engines, axles, transmissions, chassis, etc., and after some discussion it was decided that the job could be done. A tentative layout for the Class A chassis was discussed. A layout for the Class A truck using the parts suggested by the parts makers groups was made and submitted at the next meeting, which was held July 9 and 10 in Columbus. The layout was discussed and a few changes recommended, which were incorporated and submitted July 20 and 21 for the second Columbus meeting. A layout of the Class B chassis was made and quite fully discussed. The Quartermaster General's office then took over the work, having decided that a truck standardized in all its parts should be designed. A number of the engineers who had been working on the chassis and parts designs were asked to go to Washington and complete the design under the supervision of the Quartermaster General's office. On July 30 these engineers reported in Washington ready to continue the work.

On August 27 the Schedule Committee on Design was organized and divided the work among parts groups, setting September 10 as the day on which the design should be completed. Between July 30 and August 27 much preliminary work was done by the parts-builders groups but no progress could be made with the chassis design, as there were differences of opinion among the members of almost every group of parts designers.

The parts designs were finished on September 10 and within a few days the chassis designs were so far toward completion that arrangements were made to produce two sample trucks. These were completed in an unbelievably short time, and their satisfactory performance began when the paint on the chassis was hardly dry. Driven from Rochester, N. Y., and Lima, Ohio, they arrived in Washington on October 14 and were presented to Gen. Chauncy B. Baker and by him to Secretary of War Newton D. Baker on October 19, which will always be held a red-letter day in the annals of the Society.

The chassis design was based upon the Quartermaster General's office specifications of May, 1917, which were closely followed. The principal changes were as follows:

	May Spec.	Actually
Wheel-base limit,	156 in.	160½ in.
Weight limit,	8000 lb.	8800 lb. (aprx.)
Rear tires, diameter,	36 in.	40 in.
Type of tires,	demountable	pressed-on
Radiator surface,	305-sq. in. frontal 322-sq. in. total	
Tractive factor (high),	0.0775	0.063
Tractive factor (low),	0.338	0.307
Ignition system,	dual	double
Differential,	locking	free acting
Chassis lubrication,	grease or oil cups	mag. oil feed
Gasoline tank,	30-gal. tank 6-gal. reserve	2 16-gal. tanks
Sprags,		added
Pennant stops for springs,		omitted

The following were the guiding factors in designing the Class B chassis; they are set down in the order in which they were given weight. (This tabulation was not official but was observed by the writer, acting as chief draftsman on this work, and it was generally followed):

(1) Reliability.
(2) Accessibility.
(3) Weight.
(4) Simplicity and ease of manufacture.
(5) Operating economy.
(6) First cost.

The item of efficiency was more particularly studied and cared for by the parts design groups. Wherever the location or suspension of a part had an important bearing on efficiency it was considered as having greater importance than the second item.

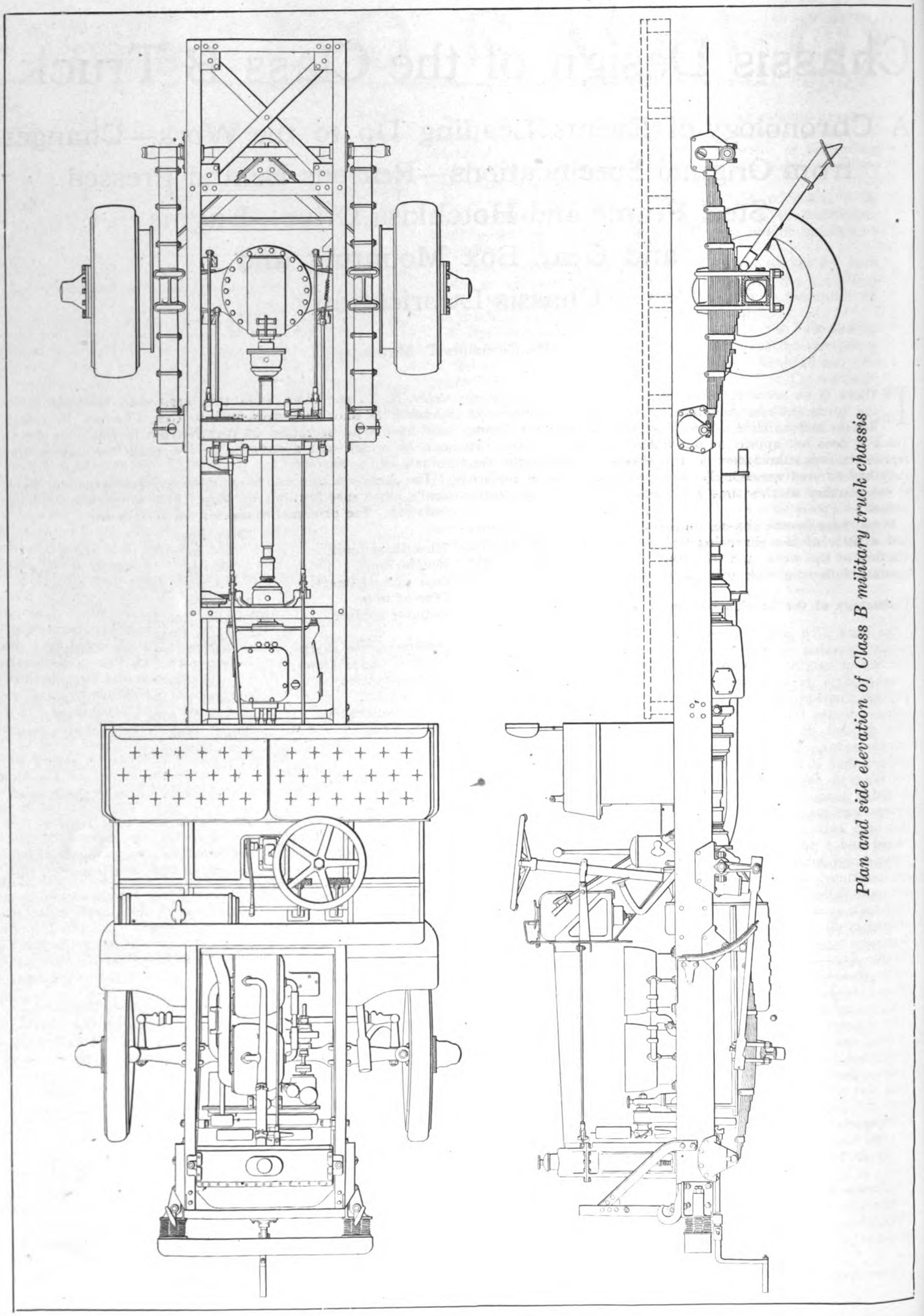
Possibly as good a way as any to describe the chassis design is to take up the units which enter into its construction, beginning with:

Frame Construction

The frame is of open-hearth steel pressed into shape. The side rails are channel section with parallel flanges which are tapered at the front to reduce weight and give greater room for the radiator. There is a heavy pressed steel cross-member in front of the radiator, one between the front brackets of the rear springs, and one at the rear. A lighter pressed steel cross-member supports the rear of the gear-box, while a

*Paper read at the S. A. E. Winter Meeting.

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Plan and side elevation of Class B military truck chassis

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forged cross-member supports the front of the gear-box and the point of the engine. The frame is designed to be as flexible as possible without in any way being flimsy or likely to buckle.

The pressed steel frame allowed better distribution of metal than a rolled section, its uniform thickness is of advantage in rivetting—there is better assurance of uniformity of metal, and the rounded portion where the flanges meet the web allow large fillets or brackets. The frame is a bit narrower than usual, 34 in. to outside edges, in order to allow a maximum turning angle for the front wheels and to save weight in cross-members and support brackets.

The springs are designed to be nearly flat under rated load. The axles are fastened to the middle of both front and rear springs. This permits the assembling of the front springs without fear of damaging the steering-gear linkage, as might take place if the front axle were not in the middle of the springs and the long end of the spring on a repair job was put where the short end should be. The spring seats are also reversible and the steering pivots are given a castor action by inclining the whole front spring. This also enabled us to get a good location for the ball on the axle steering arm and to insure a minimum of stress on the steering-gear and drag link due to axle motion.

Hotchkiss Drive Adopted

The rear springs form the driving connection between the rear axle and the frame a la Hotchkiss. The discussion at Columbus previous to the decision to adopt this type of drive was illuminating, and after all was said the only argument against it was its tendency to throw the rear-wheel brakes out of adjustment if the brake connections were not correctly designed or when the spring under load had a considerable amount of camber. To the writer's mind, however, one other point should be given careful attention with Hotchkiss drive —the slip-joint in the drive-shaft at the forward universal joint. Unless the slip-joint is carefully made, thoroughly protected from dirt and properly lubricated, the motion there will result in a serious end-thrust being developed on the universal-joint and the bearings behind it.

By placing the steering-gear behind the rear engine support-arm a long straight drag link was secured. The gear is held by a capped minion-bracket and can be readily removed without disturbing the engine or controls. One of the bolts in the gearcase extends through a lug on the bracket and thus relieves the column of any bending strains. The column is firmly braced to the dash. The steering-gear case is located so that the clutch can be removed without disturbing the gearcase. The cap for the gearcase carries a lug that supports the clutch and brake pedals and makes a very clean bit of design at this point where, on the average truck, lifting the floor boards reveals an entanglement of brackets, shafts and nuts that are impossible to adjust without a wrist like a flamingo's neck.

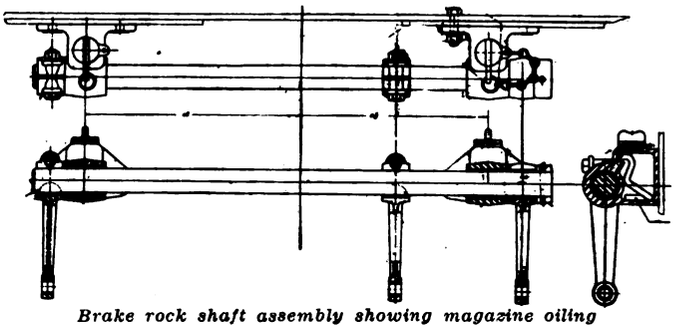
The tires specified were 36 by 5-in. single front and dual rear or 36 by 10-in. single rear. They were to be of the demountable type. After much discussion the change was made to the pressed-on type, saving some 400 lb. in weight and affirming the almost unanimous opinion of the engineers on the job and the tire makers that it was the better type. The evidence from across the water, also, was strongly in favor of the pressed-on type.

The 36-in. rear tires were changed to 40-in., which gave 2 in. more clearance under the rear axle, better adhesion, better rolling on bad ground, lower gasoline consumption, more tire mileage, and an 11 per cent increase in the truck speed for a given engine speed.

Mounting of Units

The wheelbase, named as 124-in. minimum and 156-in. maximum in the Quartermaster General's office specifications, was increased to be 160½ in. This was deemed advisable in order to keep the proportion of live load on the rear axle below 90 per cent, and at the same time have ample seat-width and a sufficient space between the seat and the steering column.

The mounting of the units in the frame was carefully considered from the following standpoints:



Brake rock shaft assembly showing magazine oiling

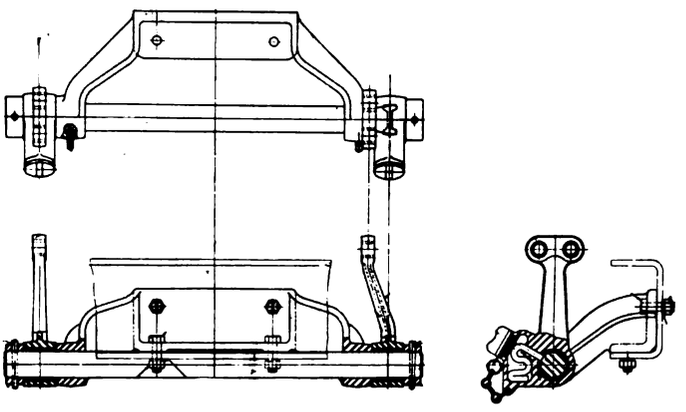
(1) Frame flexure.
(2) Accessibility.
(3) Independent assembling and demounting.
(4) Simplicity.

The radiator has two feet which rest on soft pads on each frame rail. The single holding-down bolt in each foot passes through a clearance hole in the rail and a coil spring between the foot and the nut allows the radiator to take its easiest position when the frame distorts. A rod from the flange of the top tank of the radiator is in an approximately vertical position.

The engine also has a three-point mounting. The two rear lugs on the flywheel housing rest in pressed steel pocket brackets rivetted to the frame rails. A vertical bolt passed through each lug bracket, and a heavy spiral spring between the bottom of the bracket and the nut. The bracket is so formed that the engine lug will be held in place even if the bolt is lost. It is lined, so as not to chafe the aluminum lug. The third "point" of the engine support is a cylindrical surface on the timing gear cover around the nose of the crankshaft. This swivels in a forged cross-member which is bolted to brackets on the frame rails. This construction is light, substantial and is easy to dismount when necessary. An odd feature is that the boss leading from the bottom of the radiator to the pump on the engine is jointed by a piece which is fastened to and passes through this cross-member. The clutch is housed in with the flywheel and the gearshift is mounted on the clutch housing. The hand-brake hand-lever is mounted on the side of the gearshift housing and is (to the author's mind) an objectionable feature as it subjects light aluminum castings and the stud threads in them to the heavy pull in the brake-rod. This pull can be severe when the rear springs flex violently, for the rachet on the hand-lever is non-yielding and there is bound to be some relative longitudinal motion between the rear axle and the brake rocker-shaft.

Gearbox Has Three-Point Support

The gear-box suspension is three-point. At the rear of the box two forgings bolted to it carry lugs for horizontal transverse pins which are carried by vertical clevis bolts in a pressed steel cross-member of the frame. The third "point" of suspension is in a forging around the nose on the front of the gearcase. This forging is held in brackets rivetted to the frame. The center-line of the main shaft in the gear-box is



Magazine oiling of floating brake levers

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a little lower than that of the engine. This gives a slight angularity to the front propellor-shaft and also some motion to the universal-joint trunnions; it also drops the gear-box cover below the top of the frame and gives more nearly a straight-line drive from the gear-box to the rear axle.

The design of the dash in connection with the gasoline system, which was considerable of a problem, was solved by locating half the supply of gasoline in a tank on the dash and the rest in a reserve tank under the seat. When this was first suggested a hand air-pump was to be provided, as was also a pipe from the reserve tank to the top of the service tank so that the reserve supply could be readily transferred. At present, however, the transfer is accomplished by means of a bucket or can.

In the chassis lubrication of both Class A and Class B chassis, as originally laid out, it was also planned to use oil at almost every point—grease to be used only in the wheel hubs and in the universal-joints. When in Washington last week the writer learned that this was not being carried out on the Class B chassis at some points where it could readily be done. On the Class B all the spring bolts, shackle pins and brake rocker-shafts are oil-lubricated by the "magazine system." Wicks convey oil by capillary attraction from pockets of considerable size in the bracket castings to the bearing surfaces. The pockets need to be filled but once a month. Dirt is not fed to the bearing surfaces even if the oil is dirty. The oil feeds only when the truck is in motion. Seepage from the spring bolts follows down the leaves of the springs and keeps them from rusting.

The front and axle-steering pins are designed in the same way and the steering connections are designed for small wick oilers. Grease cups have been put on the drag link to lubricate the steering balls, on the starting crank, on the brake spindle of the rear axle and at other points.

Paragraph 30 of the Quartermaster General's office specifications lays particular stress on the "tractive factor" of the truck as a measure of its ability for negotiating heavy grades and bad roads. The formula for "tractive factor" is as follows:

$$T\,F = \frac{8.4\ n\ b^2 s}{D\ W} \times \frac{R}{} \times E_m \times E_t$$

n—number of cylinders in engine.
b—cylinder bore, inches.
s—stroke of cylinder, inches.
R—gear reduction between engine and driving wheels.
D—diameter of driving wheels, inches.
W—total weight moved, pounds.

E_m—efficiency of engine compared with A. L. A. M. (now N. A. C. C.) rating as unity.

E_t—efficiency of transmission system from engine to road. Since 8.4 n b^2 s E_m represents engine torque in inch-pounds the formula can be written

$$T\,F = \frac{\text{torque} \times R \times E_t}{0.5\ D\ W}$$

It was predicted that the 4¾ by 6-in. four-cylinder engine would develop not less than 2700 in.-lb. average torque between 600 and 1000 r.p.m. The worm-gear reduction is 9.5; one-half the wheel diameter given in the specifications is 18-in.; the transmission efficiency given in the specifications is 85 per cent; the total weight moved is about 16500 lb. From these figures (on high gear)

$$T\,F_h = \frac{2700 \times 9.5 \times 0.85}{18 \times 16500} = 0.0734$$

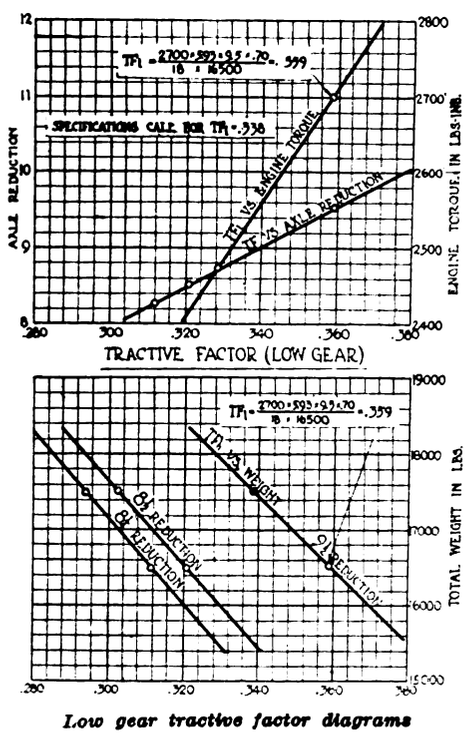
The low gear reduction in the gear-box itself is 5.93 and the specifications call for a transmission efficiency of 70 per cent. Whence (for low gear)

$$T\,F_l = \frac{2700 \times 5.93 \times 9.5 \times 0.70}{18 \times 16500} = 0.359$$

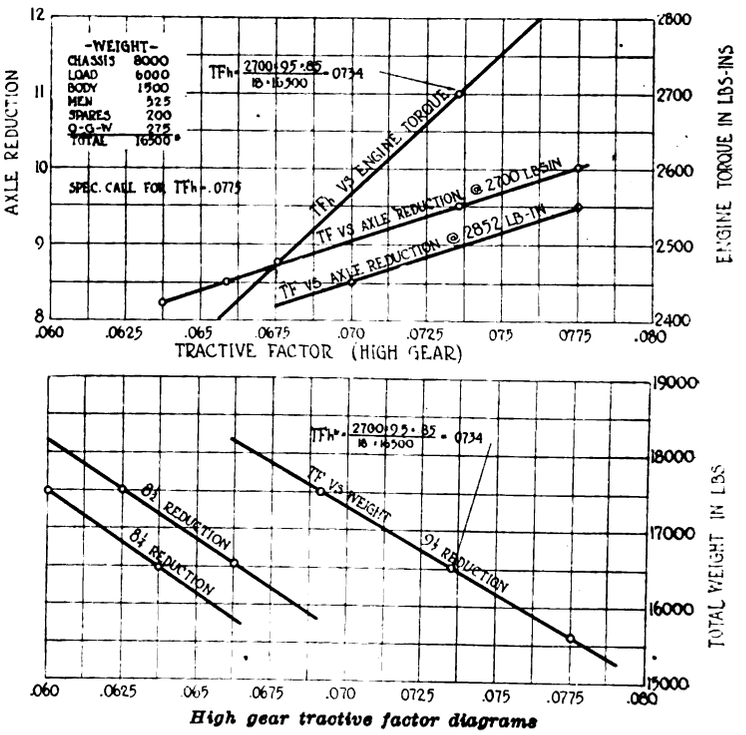
Deducting a road coefficient of 0.0175 as the rolling resistance over hard roads, these figures indicate that the loaded truck should take a 5½ per cent grade on high gear and a 34 per cent on low gear.

To get the "tractive factor" called for in the specifications (0.0775) with the reduction of 9.5 adopted, the engine would have to deliver a torque of 2852 in.-lb. On test the first engines developed in the neighborhood of 3000 in.-lb. torque. It is safe, therefore, to count on 2700 in.-lb. as a production standard.

As a commercial possibility the Class B chassis may be questioned on the score of speed, load rating and gasoline economy. Slight modifications, however, should make it the best 5-ton chassis that rolls. There are some details that are not yet fully developed for the service for which this chassis is intended, but these will undoubtedly be cared for and perfected. There is so much good design in the component parts and in the chassis itself that in many ways it will be a criterion for some time to come. To the author's mind, an English officer, after having examined the sample trucks and questioned some of our engineers regarding them, summed up the matter well when standing back and viewing one of them critically, he exclaimed, "Well, she looks a job; she looks a job."



Low gear tractive factor diagrams



High gear tractive factor diagrams

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Transmissions for the U. S. Class B War Truck*

Sequence of Events in the Design of the Transmission—Frankness Marked Discussion of Features—Specifications of the Gear Designed

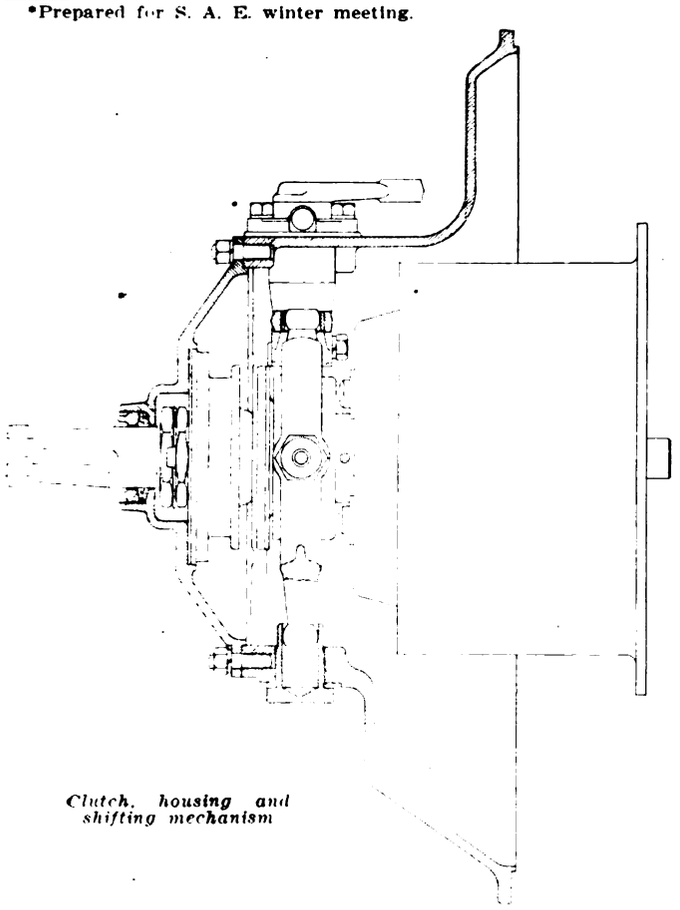
By A. W. Copland
President, Detroit Gear & Machine Company

THE first meeting of the newly formed Transmission Division of the S. A. E. Standards Committee was held May 2 and 3, 1917, in Cleveland. Some two weeks before this time the Motor Transport Board of the War Department had issued standard specifications for Class A and Class B gasoline motor trucks in the preparation of which the Truck Division of the S. A. E. Standards Committee assisted.

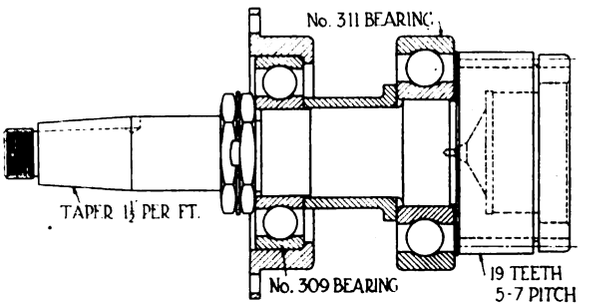
The first business taken up by the new Division was a study of the standard specifications as they directly or indirectly influenced the transmission and clutch design. Some minor changes in the specifications relating to transmissions and clutches were suggested. These were accepted by the Government and incorporated in the later edition of the specifications.

At this time the plan was to accept any commercial engine, transmission, and axle that would come within the specifications and use them in trucks that would measure up to the requirements. However, the design of the fastening points and connections for each major unit was to be standardized so that each unit would be interchangeable with any other unit of its class. The Transmission Division took up this work with great earnestness and held several meetings during May and June.

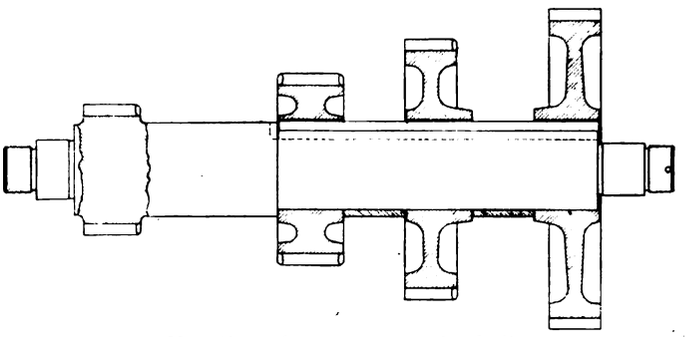
*Prepared for S. A. E. winter meeting.



Clutch, housing and shifting mechanism



Support of constant mesh pinion



Mounting of gears on countershaft

Nearly every transmission maker in the country submitted at least one design and some manufacturers presented a new design at every meeting. It was found necessary to make changes in the fastening points of every transmission then in production which was submitted for consideration; in most cases the gears and countershaft were the only parts not changed. One maker insisted on having the size of holes in the rear supporting-arms of his transmission made the standard, declaring it was the only thing on the outside of his design that had been left to him. Real constructive work was accomplished by the free discussion and friendly criticism of each other's designs.

The following incident will illustrate the practical value of these frank discussions: Mr. A. remarks: We have never had an entirely satisfactory thrust bearing and throwout device for our clutches; we attempt to lubricate the thrust bearing by delivering oil from the transmission through a passage in the shank of the drive-gear. This passage was connected by radial holes with the thrust bearing. If we make these holes large enough to insure sufficient lubrication at all times, occasionally the flow will be so excessive as to drain the transmission. We have tried a felt damper in the drive-gear but this has proved only partly successful because so many different kinds of transmission lubricant are used. Now, I have noticed that Mr. B. does not provide any means for lubricating the thrust bearing, but uses a type of thrust bearing quite different from ours. As he has been using this bearing for a long time we have decided to adopt Mr. B.'s type of thrust bearing.

Mr. B. squirms a bit and then confesses he has not been

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entirely free from thrust-bearing trouble and even has thought seriously of trying the type Mr. A. was about to abandon. Everyone was thus brought into the discussion, and it was decided to make a careful study of the problems involved in the design of the clutch throwout. This was done, and eventually led to a new arrangement of the parts which insures uniform distribution of pressure on the bearing and permits lubrication from the outside with a minimum of trouble.

A gratifying amount of constructive work was brought about by these confessions. Patriotism impelled each one to disclose everything he knew about transmission design and to state freely his experience with the devices suggested. Those with improvements which they expected to incorporate in their product sometime in the future submitted ideas with commendable frankness. With nearly all the transmission makers of the country working together with such a splendid spirit, great progress was made, and at a meeting held June 2 in Washington, four makers decided to join in designing a new transmission for the Class A truck. Several other makers signified their willingness to adopt the new design later if they were called upon by the Government to make transmissions for Class A trucks.

As so much preliminary work had been done in previous meetings and by the engineering departments of transmission makers the main features of the new transmission design were quickly decided on, and the Ball and Roller Bearings Division of the S. A. E. Standards Committee was requested to recommend bearing sizes. The sizes of ball bearings it recommended were considerably larger than used in commercial practice, but the bearing engineers insisted that for military use they could not approve smaller sizes. Stress diagrams were made for all bearings, gears and shafts. At the meeting held June 20 in Columbus a tentative design was submitted. At this time drawings of most of the details had been made, but at this historical Columbus meeting the Government told us it would adopt one design only for each detail part of the A & B Trucks "to the last screw, bolt and nut." The transmission makers had progressed so far in this direction that it was an unbroken continuance of their work to consider the transmission and clutch for the Class B truck, which the Government stated was needed first.

Design Started July 30

The Government asked for volunteers among S. A. E. members to go to Washington and design two sizes of military trucks. The desired number quickly volunteered and were called to Washington July 30, when the different groups commenced at once to consider their particular problems. The B transmission is of the amidship type with four speeds forward and one reverse. The main shaft and countershaft are located in a horizontal plane with the idler gear-shaft above and to the left looking from the rear forward. The horizontal type was adopted in order to get the ground clearance specified, 18 in. below the transmission at a point midway between the front and rear wheels.

The transmission weighs about 230 lb. The case is of aluminum. The front is supported by a 6-in. trunnion within which is mounted the outer drive-gear bearing. The rear is supported by two steel forgings bolted and doweled to the back of the case. The fact that the main shaft and countershaft are in a horizontal plane, and that the idler gear is placed above minimizes the depth below the main shaft.

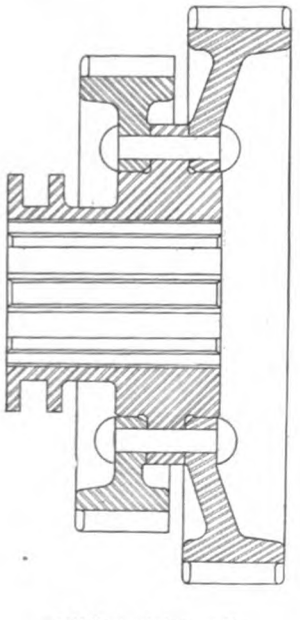
Gear and Tooth Sizes

The gears are 5-7 pitch, 6 in. from center to center of main shaft and countershaft. The width of gears increases from 1¼ to 1½ in. from the constant mesh gears to the low, according to the tooth pressure developed and the work it is expected each speed will be called upon to do.

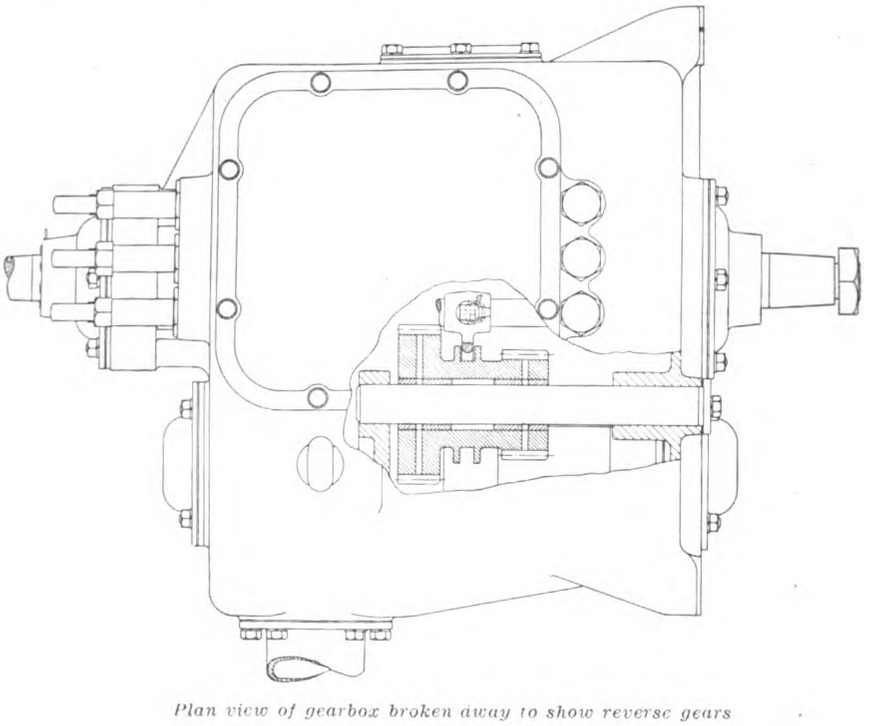
The speed ratios are 5.93 to 1 on first and reverse speeds, 3.23 to 1 on second, 1.76 to 1 on third, and direct on fourth speed. As the rear axle reduction is 9.5 to 1 this gives a total reduction of 56.335 on first and reverse.

It is common practice in transmission design to have the reduction considerably greater on reverse than on first. The ordinary four-speed transmission arrangement with a ratio of 5.93 on first would have one of 6.78 on reverse. A total reduction of 56.335 was considered ample to secure the tractive factor desired in the Class B truck under almost any road conditions, so it was decided to make the ratio on reverse speed in the transmission the same as on low, all working parts to the rear of the transmission can thus be made lighter than would have been required if the usual practice had been carried out, of having the reduction reverse greater than on low speed. The countershaft first-speed gear is forged integral with the countershaft. The other countershaft gears are held with a single key.

The reverse idler gears are made from an integral forging. The shifter slot is between the gears. All gears are made from forgings. The main shaft is 2¼-in. S. A. E. six-spline, ground all over except where threaded. A clearance is provided over the splines in the keyways of gears, the working fit being in the ground bore of the gear.

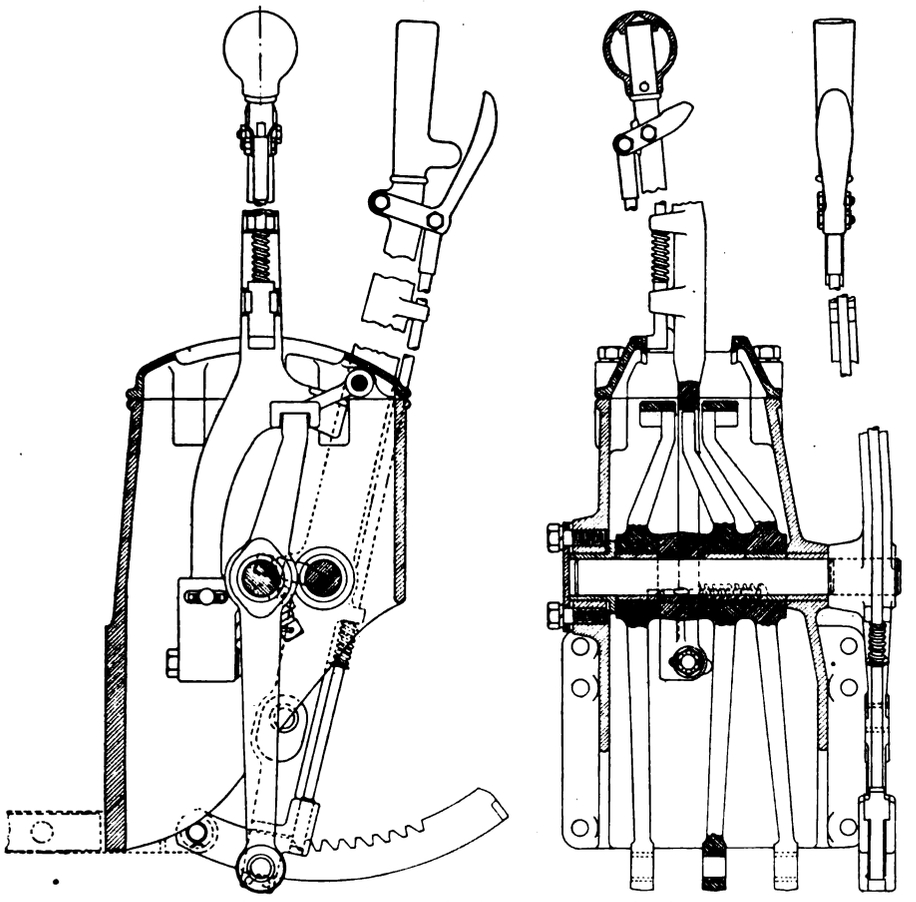


Sliding pinion unit



Plan view of gearbox broken away to show reverse gears

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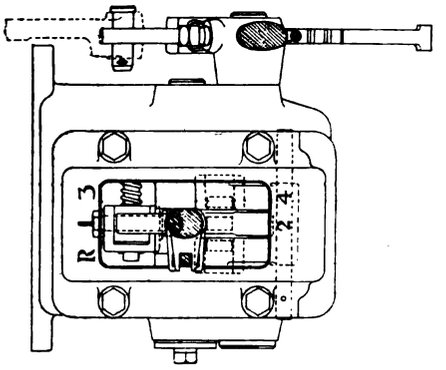


Three views of the selective control mechanism

All shafts are specified alloy steel equal to 3½ per cent nickel in physical properties, properly case hardened. Gears may be made of alloy steel equal in physical properties to 3½ per cent nickel. The steel may be high carbon properly heat-treated or low carbon properly case-hardened. All the gears are now being made of 3½ per cent nickel steel, low carbon case-hardened.

The lower part of the mesh lock-plungers are wedge shape. Instead of leaving a thin straight end, the end is machined concave and rounded off. This design gives greater wearing surface than the cone-pointed plunger and the concave end prevents the plunger from turning around. There is no inter-lock in the transmission, but a positive inter-lock is provided in the control set. The control set is a rocking-lever type.

Annular ball bearings are used for drive-gear shank, main-shaft case bearing and countershaft. The main-shaft spigot-bearing is of the solid roller type running directly on the pilot on the end of the main shaft and in the end of the drive gear. Plain phosphorus bronze



bearings are used for the idler gears. The drive-gear shank terminates in a 1½-in. S. A. E. taper and the main shaft in a 1¾-in. S. A. E. taper.

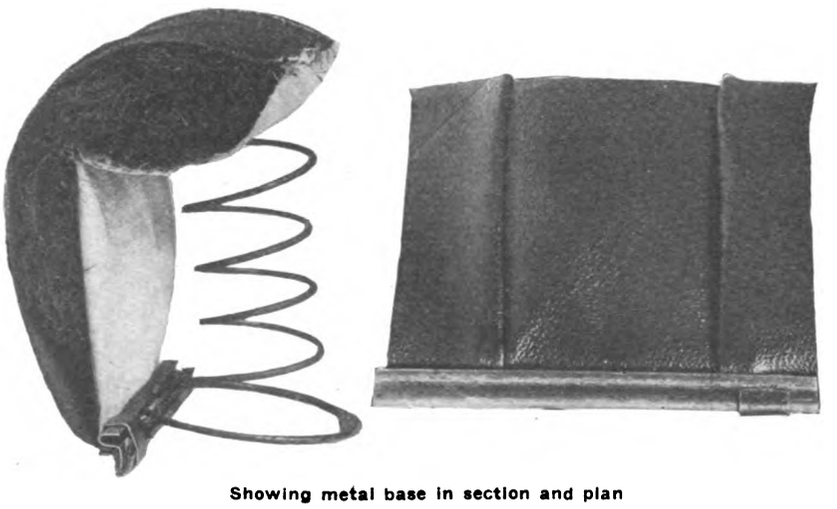
Although the several units of the Class B truck were designed by separate groups, the different groups kept in close touch with each other and the result is a truck of balanced design. The Class B transmission is in no sense a compromise design. Each part of the design had practically the unanimous approval of the transmission engineers on the job, and in most cases represents successful current practice. It is confidently expected to give a good account of itself under the most trying conditions on the battle front. Throughout the whole design S. A. E. Standards were used just as fully as they were available.

The speed-change H-plate is the S. A. E. recommended practice. No rocker arms are used in the transmission. The shifter forks are fixed to the shifter rods by hardened screws having special taper ends. The shifter forks are as short as the diameter of gears will allow. The arrangement is such that the shifter rod nearest to the idler gear is the one used for reverse. Grooves of 90-deg. V-shape are used.

Hayes Metal Base for Automobile Seats

THE Hayes Mfg. Co., Racine, Wis., has developed a new metal base for automobile seats, on which a patent has been obtained. A photograph of the construction is reproduced herewith. The base is very simple but is exceptionally strong and inexpensive to manufacture. Its use is claimed to result in a saving of both material and labor, and it should therefore appeal to car makers.

In trimming a seat with this base, the raw edge of the leather is brought over the extending flange. The locking or clamping strip is then applied and the seat is finished. The operation of trimming is said to require 2 min. per seat and there is no necessity for tacking, stitching of the leather, or sewing on of the welt for binding. Any style of trimming can be used, viz., plain, pleated, piped, etc. The Hayes Company is now ready to place the base on the market and expects a wide demand for it.



Showing metal base in section and plan

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The AUTOMOBILE

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The Military Motorcycle

OWING to the somewhat different organization of the motorcycle industry as compared with the truck industry, a different procedure has to be followed in the design of a motorcycle for general army use from that followed in the development of the army trucks. The great majority of motor trucks just previous to this country's entrance into the war were assembled from parts purchased in the open market, and the manufacture of truck parts was well organized. Therefore, when the problem of designing motor trucks for the army arose, groups or committees of engineers experienced in the manufacture of the different units were formed, and each group was entrusted with the task of designing a part for the Liberty truck.

There is practically no parts industry associated with motorcycle manufacture. Every motorcycle factory produces its own engines, transmissions, frames and other major parts. Therefore, there are no motorcycle parts specialists and it was not possible to evolve the standard motorcycle or Liberty motorcycle on the parts committee plan. Also, once the design is completed it will not be possible to let contracts for the manufacture of the different parts to factories experienced in that particular work unless the contracts are made with the established motorcycle manufacturers.

The plan worked out by the men in charge of the motorcycle branch of the department of motor transport was to select a number of motorcycle factories producing a type of machine similar to the one required, and with the aid of the engineers of these factories evolve a composite design using the engine of one factory, the transmission of another and the frame of the third. The advantage of this plan is that as soon as the design is completed one factory is already tooled up for each of the major parts of the machine. It may be readily imagined, however, that many difficulties will crop up in fitting together—in the course of evolving the composite machine—parts that were not primarily designed to go together. This may necessitate changes in the design of some of the parts of such nature that the tools used for its production become unsuitable or require extensive alteration. Also, there is a chance for differences to arise as to the selection of the parts, though the commendable spirit in which the motorcycle makers have co-operated in the past gives assurance that all difficulties will be smoothed out and the motorcycle program will be carried through with the same dispatch and efficiency as the motor truck program.

Aircraft Engine Types

IN motor truck work the four-cylinder vertical engine is in almost universal use, and in the tractor field the same type of engine is rapidly forging to the front and bids fair to attain a commanding position before many years have gone by. That there is no such uniformity of practice in the passenger-car field is due to the peculiar conditions affecting sales in this field. One might say that the passenger-car problem is not a straight engineering proposition. So many different requirements are made and the limitations of purchasers in respect to the prices they can afford to pay vary so widely that it is probable that we will not be able to settle on one or two engine types as most suitable for all passenger vehicles for a great many years to come.

In aircraft engineering almost every conceivable type of engine has had its try-out, from the two-cylinder opposed up to the eighteen-cylinder W type.

Owing to the fact that the power required has jumped by leaps and bounds and that any engine under 150 hp. is of little use to-day except for purposes of instruction, no engines of less than six cylinders are now used in actual warfare. The six-cylinder vertical engine is supreme in Germany, Austria and Italy. It is the simplest engine, having a perfect balance of reciprocating parts and it has been built in units up to 400 hp.

When the power required is more than this the plane can be fitted with two or more engines, and the Germans seem to prefer this plan to increasing the cylinder number.

In this country we have been featuring the Vee engine for the last four or five years, first for auto-

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mobile and now for aircraft work. It is undoubtedly possible to build a Vee engine lighter than a vertical engine of the same horsepower within the power ranges required for military aircraft nowadays, chiefly because of the great saving in weight in the crankcase of the Vee, but there is a compensating disadvantage in the Vee in the greater resistance it offers to motion through the air. It is this factor of high head resistance which has entirely eliminated the radial stationary cylinder engine from the aircraft field and has greatly hampered the rotating radial engine. To minimize the head-on resistance, builders of Vee engines sometimes make the angle of Vee as small as constructional limitations permit and smaller than necessary to insure uniform spacing of explosions. In the twelve-cylinder engine the balance is not dependent upon the angle between the two-cylinder blocks, and angles of 50 deg. and even less have been used. In the eight-cylinder engine, if the angle is made less than 90 deg., not only is the sequence of explosions disturbed but the balance is rendered worse. Hence eight-cylinder engines heretofore have always been made with a 90-deg. angle, though we understand that experimental work is now going on with engines of a smaller angle of Vee.

An increased head resistance is equivalent to reduced power and the endeavor to overcome it at some cost in respect to other desirable features is therefore understandable.

There have been many attempts to go beyond twelve cylinders in aircraft engines, but whether any advantage can be secured seems problematical. Higher speeds would be possible with the multi-cylinder engines, but as the propeller does not operate efficiently at high speeds this feature cannot be taken advantage of except by the use of reduction gearing, which is objectionable. Crankshafts of enormous size have to be used in any case to transmit the power and these will also withstand the explosive and inertia pressures consequent upon the use of fewer and larger cylinders. The eighteen-cylinder would seem to be the most logical step after the twelve-cylinder, but we understand that experiments with sixteen-cylinder constructions are under way.

Private Aircraft Engine Development

WHEN the standardized aircraft engine program was first disclosed it was of an all-inclusive nature. The U. S. A. engine, as it was then referred to, was to be made in four, six, eight and twelve-cylinder models, all with the same size and design of cylinder. After production was once well started these engines were to be used for all requirements of our aerial forces. The announcement had the effect of subduing private enterprise in developing new types and more efficient forms of engine. If it had not been for this, the $640,000,000 appropriation would have mightily stirred designing talent throughout the country.

It seems now that plans have been somewhat modified. While the Liberty engine program is being proceeded with as fast as possible, manufacturers of other efficient engines will be given a chance. New foreign engines are being put in production here and there is considerable activity in American drafting rooms on new designs. The aircraft authorities of the allied nations do not favor the policy of putting all eggs in one basket, though they fully realize the advantages inherent in one-design engines from the standpoint of both production and replacements. The feeling here seems to be that the demand for engines will be so great that the Government cannot afford to refuse the purchase of any good engines offered to it.

Your Responsibility

TO win the war we need to do things—to do them quickly, with less man power and less waste. This means increased activity. It means more efficient use of every piece of equipment with which the work is to be done. It means more efficiency of all the equipment that we employ. We are not getting the maximum of activity. We are not getting the maximum of activity because the great arteries of transportation, which speed our material to us and distribute our goods for us, are overloaded. Our railroad facilities are too small. Eight years ago James J. Hill said that unless we put a billion dollars a year for five years into railroad facilities, they would break down under the growing load. We did not provide the money and, consequently, the railroad facilities are not large enough. Neither the efficient control of the Government nor the wisdom of the railroad men can solve the present freight difficulty. The transportation problem is your problem. It is our problem. If we are to maintain our business as members of the third largest industry in the country, an industry intimately connected with a flexible unit transportation, which can be used where railroads cannot go, which can be used to relieve the railroads, it is up to us to solve the transportation difficulties of our own business by the efficient use of the transportation equipment which we are manufacturing and to apply our industrial knowledge and organization to the work of constructive suggestion for the improvement of the general transportation situation. By practical application of this flexible unit transportation equipment, the railroads can be relieved of a burden too great for their equipment and facilities to take care of.

A time of emergency such as this is no time for sitting back and letting matters take their own course. It is a time to do things. In each manufacturing center in the automotive field there is a sufficient number of far-sighted business men acquainted with the practicable possibilities of these transportation facilities to work out methods by which, in a creditably short time, a large measure of relief can be applied to the situation. The automotive industry can undertake for itself and suggest to others relief measures which will aid the Government and obviate the necessity of Governmental action, which must be slow—and unsuited to local conditions.

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Latest News of the

Stettinius May Head War Board

Need for Centralized Authority Would Give Board Greatly Enlarged Powers

WASHINGTON, Feb. 6—It is probable that Edward R. Stettinius will be placed at the head of the War Industries Board and that this board will be given greatly enlarged powers similar to those mentioned in the Chamberlain Bill. It is said that President Wilson recognizes the need for centralized control but desires that such control be lodged in the War Industries Board, which is an experienced, established body, rather than in any new board which might be created. If Stettinius is so appointed, and in view of the new priority rulings which are outlined in another column, H. L. Horning, chairman, Automotive Products Section of the War Industries Board, will have considerably enlarged powers and it will be necessary to install various departments in order to control priorities and the approval of orders. Under the new priority ruling each division of the Government will pass on priorities affecting its particular work. For example, the Automotive Products Section will pass on priorities regarding trucks.

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Quartermaster Trailers Shipped

CLEVELAND, Feb. 7—The first of the new 1½-ton Class A four-wheeled Quartermaster trailers have been shipped from this city and Detroit. Another concern has some parts for Ordnance Department trailers.

—

No Airplane Mechanics Shortage

WASHINGTON, Feb. 7—There will be no shortage of airplane mechanics. Statistics gathered by the National Advisory Committee for Airplanes from records of the Signal Corps show that this branch of the service is well organized and able to supply the requisite number of repairmen to keep our fleet in action after it gets well started. Thousands of enlisted men are now in training in various schools and manufacturing establishments, and the work is being enlarged constantly. Engine mechanics for the four motor mechanic regiments now being organized at Camp Hancock, Augusta, Ga., have been and are being obtained by a system of selection from the national army. Men of required qualifications have enlisted in the aviation service already. The balloon service is able to get practically all the men it requires by selection from the aviation recruits. The necessary training to make the men work as a team is given to them at the various balloon schools.

—

Republic Men from Tractor Company

ALMA, MICH., Feb 6—Interests closely affiliated with the Republic Motor Truck Co. have formed the R. & P. Tractor Co., which will start with $5,000 capital and manufacture a tractor embodying the ideas of F. W. Ruggles, president of the Republic company, and Channing Parsons, formerly general manager of the same company. The company will commence manufacture in a wing of one of the Republic buildings. Ruggles is president of the tractor company, other officers being: Vice-president and general manager, Channing Parsons; secretary, Harry Green; treasurer, T. A. Burt; directors include the officers and F. L. Smith.

—

Reo to Make Worm Drive Truck

LANSING, Feb. 7—The Reo Motor Car Co., which has been making only a 2-ton chain-drive truck, is now experimenting with a worm-drive truck of the same size and similar design. This will be ready by spring, but no details of it are available yet.

—

Durant to Confer on Fuel

WASHINGTON, D. C., Feb. 7—W. C. Durant, who is chairman of the committee which was appointed to confer with Dr. Garfield, was to have called a meeting last week but did not do so. It is understood now that he will either call an informal gathering to-morrow or for the early part of next week. Henry Ford was in Washington yesterday and conferred with Dr. Garfield about fuel.

—

Stewart Warner Earnings $2,200,774

CHICAGO, Feb. 7—Net earnings of the Stewart Warner Speedometer Corp. for 1917 were $2,200,774, which is approximately 19 per cent on the capital stock. This is figured before the deduction of income and excess profits taxes, for which a reserve of $340,000 was set aside. During the year $600,000 was paid out in dividends, and a total unappropriated surplus of $5,456,215.38 still remained on Dec. 31. The net earnings for 1916 amounted to $2,215,042.

—

New Grant 3½-Ton Truck

FINDLAY, OHIO, Feb. 7—The Grant Motor Car Corp. is designing a new 3½-ton, internal gear truck, and expects to have a model completed in 2 or 3 months. No details are available yet, except that the truck will have Torbensen rear axle and a Continental engine.

Chicago Show Draws 150,000

More Than 8,000 Dealers — Great Interest of Farmers Deemed Significant

CHICAGO, Feb. 2—The Chicago motor car show as the intrinsic business criterion of the industry has vindicated itself. The total attendance is put down as 150,000. The show resulted in heavy retail sales and drew a large number of dealers, estimated at eight thousand, this being more than double the number that ever attended before. These men represented the Mississippi Valley and the vast area to the north, west and south of it to our boundaries.

The large dealer attendance is significant and indicates that the agricultural districts of the country are anticipating a large business with the coming of spring, at which time the farmer will be able to move his heretofore transportation-bound product to market and thus stimulate business. This is an event toward which dealers must look forward with foresight and optimism. It must be met with American business methods.

—

Fifth Foreign Trade Convention Meets

CINCINNATI, Feb. 7—The Fifth National Foreign Trade Convention, called together by James A. Farrell, chairman of the National Foreign Trade Council, will meet to-day at the Gibson Hotel and will continue to-morrow and Saturday. The following subjects will be discussed: Foreign trade achievements in the past; after-war conditions of foreign trade; exports and imports control; foreign credits; education for foreign trade, and the merchant marine.

The convention will hold its banquet Friday evening, Feb. 8, at 7 p. m. The Government is co-operating with the council to make trade information and advice concerning foreign trade markets available.

—

Chalmers Corp. Reduces Common Stock

NEW YORK, Feb. 7—Stockholders of the Chalmers Motor Corp. at the annual meeting held here yesterday voted to reduce the authorized common stock from 532,000 shares, no par value, to 400,000. The 132,000 shares involved are unissued but authorized stock, held in the treasury. The following board of directors was elected: Jules S. Bache, J. Horace Harding, Hugh Chalmers, Henry E. Butler, George C. Van Tuyl, Jr., Joseph H. Clark and W. P. Kiser.

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Automotive Industries

Duesenberg Buys Fiat Plant

Use Equipment to Enlarge Elizabeth Plant Now Devoted Exclusively to Airplane Engine Work

NEW YORK, Feb. 5—The Duesenberg Motors Corp., Elizabeth, N. J., has purchased the buildings and equipment of the Fiat Co., Poughkeepsie, N. Y., and will commence immediately to remove the bulk of the equipment to its Elizabeth plant. The Fiat company will continue to occupy a part of the buildings and the production and assembly of Fiat cars will go on much as usual.

The Duesenberg company purchased this property and equipment in order to obtain immediately a large amount of machinery with which to carry on the production of airplane engines for the government. At the present time, Duesenberg is concentrating its entire manufacturing facilities on the production of Bugatti airplane engines for which it has a large contract. The production of Duesenberg engines has been entirely stopped, though at some future time arrangements may be made with some Western engine builder to manufacture the small Duesenberg four.

Present plans of the Duesenberg company are to move a large part of the machine tool equipment from the Poughkeepsie plant to Elizabeth as soon as facilities for its reception can be completed. This will double the capacity of the plant. Eventually, it is planned to have new machinery, which is due to be delivered early in the summer, installed in the Poughkeepsie plant, where some of the minor machine operations will be carried on. The purchase includes all the Fiat buildings and about 30 acres of land.

The Fiat company states that it has no intention of stopping the manufacture of cars and that this work will be carried on indefinitely with but little interruption.

—

Urge Water-Power Development

WASHINGTON, Feb. 6—The United States Chamber of Commerce is conducting an investigation with a view to ascertaining the sentiment for legislation to encourage the development and conservation of the water power resources of the United States. A questionnaire is being sent out to more than half a million American business men to obtain a referendum vote which it is expected will be of influence on Congress in indicating how the business men of the country look on the water power question. The committee on Water Power Development recommends Federal legislation encouraging the development of water power with permits for a period of at least 50 years. It is estimated that the undeveloped water power of the country exceeds the total steam power now in service.

—

Two More 4-Day Shut-Down Periods Considered

WASHINGTON, Feb. 6—Instead of eliminating future heatless, workless Mondays in the industries, it is understood now that Fuel Administrator Harry A. Garfield is seriously considering two more four-day shut-down periods. One of these would include Lincoln's Birthday and the other would include Washington's Birthday. It is understood to be the plan of the Fuel Administration to make two such periods of industrial suspension take the place of the remaining heatless Mondays.

—

Build Airplanes in Middle West

WASHINGTON, Feb. 6—Howard E. Coffin, chairman of the Aircraft Production Board, is authority for the statement that "fully fifty per cent of the airplanes constructed for the United States Government will be produced in factories in the middle West." It is the plan, as the program for construction expands, to use many of the plants in the middle West sections where woodworkers are now employed on furniture, pianos and other goods less essential to the winning of the war.

—

G. V. Interests for Aeronautical Engine Company

NEW YORK, Feb. 5—Interests allied with those of the General Vehicle Co., Long Island City, whose plant was taken over by the Government recently for the production of airplane engines, have formed the Aeronautical Engine Co. This company will take over the aircraft work of the General Vehicle Co.

—

Franklin to Make Rolls-Royce Airplane Parts

NEW YORK, Feb. 5—Contracts for parts for airplane engines for the allied governments continue to be let to automobile manufacturers. Among the latest reported to receive such contracts is the H. H. Franklin Mfg. Co., Syracuse, N. Y., which, it is understood, will make 1500 crankshafts for the Rolls-Royce aviation engines. Others working on similar contracts are the F. B. Stearns Co., Cleveland, and the Taft-Pierce Mfg. Co., Woonsocket, R. I.

Probe Airplane Plans in Senate

Investigation Reveals Spruce Shortage—Continue Monday Closings—Other Washington News

WASHINGTON, D. C., Feb. 4—The chief event of the past week here was the investigation of airplane activities by the Senate Military Affairs Committee. For military reasons the majority of the sessions were in secret, but the few open meetings served to show both progress and procrastination.

The greater part of time of the open sessions was consumed by Major Charles Sligh, who used the time of the committee to dwell at considerable length upon his personal troubles with Howard E. Coffin, chairman of the Aircraft Production Board, and Col. E. A. Deeds, of the Signal Corps. He charged them with neglecting certain recommendations he made, but in several instances was induced by skillful questioning on the part of Senator Chamberlain to admit that the blame was to be placed with the head of the War Department, instead of with either Coffin or Col. Deeds.

The most important testimony in open session related to a considerable shortage of spruce for planes. This was attributed rather to the procrastination of big Western lumber interests than to the Aircraft Board.

Coffin, always demanding secret hearings, dwelt chiefly upon airplane design, changes of type, training of aviators, airplane production and aviation tactics in war. According to Senators who questioned him in the final hearing last Saturday, Coffin made a detailed statement which was regarded by the Senators of the committee as favoring definite affirmative action in support of the bills for a War Cabinet and Munitions Director.

In one sense it was unfortunate that Coffin called for a secret hearing Saturday. The testimony of Thursday and Friday tended to show inefficiency in our aviation activities, which was the reason that Mr. Coffin was recalled for explanation. Had this last hearing been an open one it would probably have served to dispel the doubts in the public mind as to our actual progress.

Late last week a joint statement by Dr. Garfield, Fuel Administrator, and William G. McAdoo, Railroad Administrator, was to the effect that they are considering suspension of the Monday closing order. They will hold a conference again to-morrow on this matter, at

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which time a decision will be reached.

The conference of last week, and the partial decision to countermand the Monday closing order, was induced in great part by a speech by Congressman Smith of Michigan, in which he showed that the closing of industry in Grand Rapids last Monday produced an actual saving of 6 tons of coal, at a cost of over $22,000.

He showed that it required almost as much coal for the furniture factories to start again as was saved.

In addition, he discussed the situation in Detroit, taking for example Dodge Brothers, who, he stated, had their force dissipated 70 per cent by the order, despite the fact that they are working on munitions for the Government and have a full supply of coal on hand.

He testified that Dodge Brothers are making cannon for our army and purchased 100,000 tons of coal last February, which has been delivered. From their coal pile they supplied 3000 families in Detroit who were permitted to come and take and use the coal. Mr. Smith went on further to show that the Monday closing order "did not save an ounce of coal or relieve congestion anywhere."

Normal Labor Conditions

Labor conditions, according to placement figures of the Department of Labor, are normal. These figures, issued monthly, show the numbers of men seeking work, and the numbers of employers seeking labor. There has been little change in the figures for any time in the last twelve months.

The department, through its new employment reserve service, is enrolling thousands of workers throughout the country for work in the shipyards, in anticipation of the demand for such workers in the next 6 months.

An important result of the first week of this enrollment is that great numbers of those enrolling are men now out of work, and seeking immediate employment—definite proof that there is no such labor shortage existing as some agitators would have us believe.

The department is still insisting upon a sane course for the handling of wartime labor conditions, and has established several new bureaus to maintain a broad national labor policy. A Publicity Division has been appointed, which aims to tell the public that labor is merely a matter of adjustment, during the present emergency, and not a question of labor shortage. It will point out through its publicity channels that while there are shortages of labor in some localities, there are surpluses equally great in others.

The word non-essential, as applied to industries, has again been heard in Washington in the past week, when a conference of state directors of the Public Service Reserve endorsed the "conversion of non-essential industries rather than the establishment of new factories." These directors no doubt are unaware that official Washington has learned that

(*Continued on page* 339)

Federal Licenses for Fuel Oil Men

Transportation Difficulties, Not Shortage, Necessitate Government Action

WASHINGTON, Feb. 5 — Manufacturers and distributers of fuel oil with gross sales of more than 100,000 barrels a year after Feb. 11 must have Federal licenses to do business. Although there is an abundant supply of oil, transportation difficulties have made such action necessary and President Wilson has taken this step. The distribution of fuel oil is to be under the direction of the oil division of the Fuel Administration, headed by Mark L. Requa. There is no intention to extend this emergency measure to cover gasoline and kerosene which are not included under the term fuel oil.

Coincident with the President's proclamation Fuel Administrator Garfield has made public the following list which will govern priority of deliveries:

1—Railroads and bunker fuel.
2—Export deliveries or shipments for the U. S. army or navy.
3—Export shipments for allied navies and other war purposes.
4—Hospitals where oil is used for fuel.
5—Public utilities and domestic consumers now using oil (including gas oil).
6—Shipyards engaged in government work.
7—Navy yards.
8—Arsenals.
9—Plants engaged in manufacture, production and storage of food products.
10—Army and navy cantonments where oil is now used as fuel.
11—Industrial consumers engaged in munition manufacture and other articles under government orders.
12—All other classes.

The new order has been necessitated entirely by the inadequacy of transportation facilities. According to a statement issued to-day: "The oil supply is abundant."

At present Dr. Garfield and his advisers feel that there is no reason for the extension of the order to cover control of gasoline and kerosene.

—

Five Truck Trains Near Destination

WASHINGTON, Feb. 4 — The five motor truck convoys en route to the Eastern seaboard from Detroit are nearing their destination. The convoys have had to contend with the most severe winter storms, and in a number of instances were snowbound for two and three days at a time. The convoys are traveling one day apart.

—

50 Cars Sold at Chicago Salon

CHICAGO, Feb. 5—Chicago's salon in the Elizabethan room of the Congress Hotel reflects the same spirit of optimism that is noticeable at the Coliseum, and between 50 and 60 cars have been sold. The attendance this year was better than in 1917. The salon exceeded all expectations in the number of visitors as well as the amount of business done. The Elizabethan room permitted the exhibition of only 20 cars as against 80 in New York. Unless war conditions make it impossible, space next year will be doubled or tripled.

—

Scientists to Test Garabed

WASHINGTON, Feb. 4—Garabed, the new free energy which has been discussed in Congress and is supposed to have been invented by G. T. K. Giragossian, will be tested in Boston shortly by eminent scientists to be selected from the faculties of Harvard, Yale, Massachusetts Institute of Technology and the Worcester Polytechnic Institute. It was learned here to-day that just before the resolution was passed authorizing the tests the British Embassy promised the inventor that if the United States Government did not accept the invention Great Britain wanted the opportunity to do so.

—

Armitage President of Whitman & Barnes

AKRON, OHIO, Feb. 1—A. D. Armitage was elected president of the Whitman & Barnes Mfg. Co. at the annual meeting of the stockholders held here yesterday. Frank A. Seiberling was appointed a director to succeed A. B. Rinehart, former president of the company. At the meeting the regular quarterly dividend of 1½ per cent and an extra dividend of 1 per cent, payable Feb. 15, were declared.

—

Globe Truck Elects Officers

EAST ST. LOUIS, Feb. 5—The Globe Motor Truck Co., at its first annual stockholders' meeting, elected the following officers: David A. Marks, president; Christopher Beckemeier, vice-president; Nansen J. Marks, secretary. David A. Marks, Louis Hughes, George Baeker, John Soy, George Chapline, Christopher Beckemeier and William G. Meiher are the directors. The company was formed in January, 1917.

—

New Bell 1½-Ton Truck

YORK, PA., Feb. 5—The Bell Motor Car Co., Inc., will manufacture a new 1½-ton truck with internal gear drive and wheelbase of 112-124-136 in., in the factory it recently purchased from the Pullman Motor Car Co., York. It will also bring out a new model Bell passenger car.

—

Miller Top Elects New Officers

CARO, MICH., Feb. 2—The following officers of the reorganized Miller Top Co. have been elected: President, Max Zemke; vice-president, Peter Miller; secretary and treasurer, M. G. Atwood. These three, with N. B. Atwood and D. L. Lazelle, constitute the board of directors.

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Slight Decrease in 1917 Exports

Few Trucks Shipped in December—Month's Total Largest for Entire Year

Mos.	Cars	Value	Trucks	Value	Parts
Dec..	6442	$5,375,706	825	$1,585,481	$4 952,465
Nov.	5006	4,820,738	1435	3,430,162	2,535,230
		1916			
Dec..	4911	3,658,660	1331	3,689,314	1,755,333

WASHINGTON, Feb. 5—In spite of the fact that the truck exports during December were less than half of the November amount, the total exports show an increase of $1,127,522 over the previous month, and an increase of $2,810,445 over December, 1916.

The total amount of exports for 1917 is slightly lower than that for 1916, the difference being less than $1,000,000. There was a great increase in the number of passenger cars shipped last year, but truck exports have fallen off considerably.

Canada was by far the largest purchaser of passenger cars during the year, and the United Kingdom bought three times as many trucks as any other country. Argentina follows Canada in the number of passenger cars bought, with only one-fourth of the number. Chile is third in the number of cars bought, but second if value is considered.

Great progress was made during the year in the number of trucks shipped to Russia. Strangely enough, Russia in Asia received twice as many as Russia in Europe.

Although South America is a good market for passenger cars and parts, not one truck was shipped there.

—

To Make Unit for Ford Cars

YOUNGSTOWN, OHIO, Feb. 6—The Lau Iron Works, manufacturer of the Elton truck unit for Cadillac cars, will also manufacture a truck unit for Ford cars.

December Gasoline Exports Drop

NEW YORK, Feb. 5—Gasoline exports in December amounted to 35,335,977 gallons valued at $8,674,987. This is a drop of 40 per cent from the amount exported in November, which was the largest month of the year, but show a 50 per cent gain over the exports in December, 1916.

The total amount of gasoline exported during 1917 was 416,249,063 gallons, at a cost of $93,166,692. This is an increase of 16 per cent in quantity and 30 per cent in value over 1916 exports.

The average price in December, 1917, was approximately 24 cents a gallon, about 5 cents more than in December, 1916. The Allies are the largest importers of gasoline, buying it chiefly for war purposes, since civilians in neither France nor England may use it under ordinary circumstances.

—

Franklin Sales Increase 135 Per Cent

BOSTON, Feb. 5—Sales of Franklin cars during 1917 increased 135 per cent over 1916, according to figures given out by the Franklin Mfg. Co. The greatest production was in October, when 294 cars were turned out in a single week. The company's business during the year amounted to $16,000,000. The last buildings needed to bring the company's capacity up to 15,000 cars a year are now completed and in use.

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$37,898 for Pullman Creditors

YORK, PA., Feb. 2—Receivers for the Pullman Motor Car Co. have filed a report with Judge Charles B. Witmer, of the United States District Court at Scranton. Unless exceptions are taken to the accounts of the receivers within 30 days the report will be finally confirmed at the March session of the district court. The receivers' report shows a balance of $37,898.36 for distribution among creditors.

Goodrich Net Profits $12,675,000

Preliminary 1917 Report Shows 33 Per Cent Gain Over Previous Year

AKRON, OHIO, Feb. 5—The B. F. Goodrich Co. made a preliminary report for 1917 yesterday, showing net profits of $12,675,000, before the Federal income and excess profits taxes are deducted. This is 33 per cent more than the net profits of 1916. The figures given out by the company follow:

	1917	Difference between 1916 and 1917	
Net profits after provision for maintenance, depreciation, and doubtful debts.....	$12,675,000	Inc.	$3,106,325
Provision for income and excess profits taxes.....	2,250,000	Inc.	$2,250,000
Net earnings for dividends	$10,425,000	Inc.	$856,235
Preferred dividends.	1,848,000	Dec.	52,000
Balance for common	$8,577,000	Inc.	$919,235
Common dividends..	2,400,000		
Surplus	$6,177,000	Inc.	$919,235

The surplus on Dec. 31, 1916, was $14,920,000, which added to the above made the total surplus on Dec. 31, 1917, $21,097,000. From this amount $900,000 was deducted and set aside for redemption of preferred stock, and $39,187 representing the reduction of preferred stock purchased from cost to par, making a total adjustment of $939,187. When this is deducted from the total surplus, there still remains $20,157,813.

The directors, subject to the approval of the stockholders at their annual meeting on March 13, have voted to retire 9,000 shares of preferred stock prior to July 1, 1918. This will make a total retirement of 45,000 shares.

Exports of Automobiles, Trucks and Parts for December and 11 Previous Months

	December				Twelve Months Ending December			
	1916		1917		1916		1917	
	No.	Value	No.	Value	No.	Value	No.	Value
Passenger cars	4,911	$3,658,660	6,442	$5,376,706	61,947	$43,725,087	65,792	$51,982,966
Commercial cars	1,331	3,689,314	825	1,585,481	18,903	52,870,774	14,347	36,364,773
Parts, not including engines and tires.	.....	1,755,333	.....	4,952,465	.....	24,001,060	.....	31,523,754
	6,242	$9,113,307	7,267	$11,914,652	80,850	$120,696,921	80,139	$119,871.493

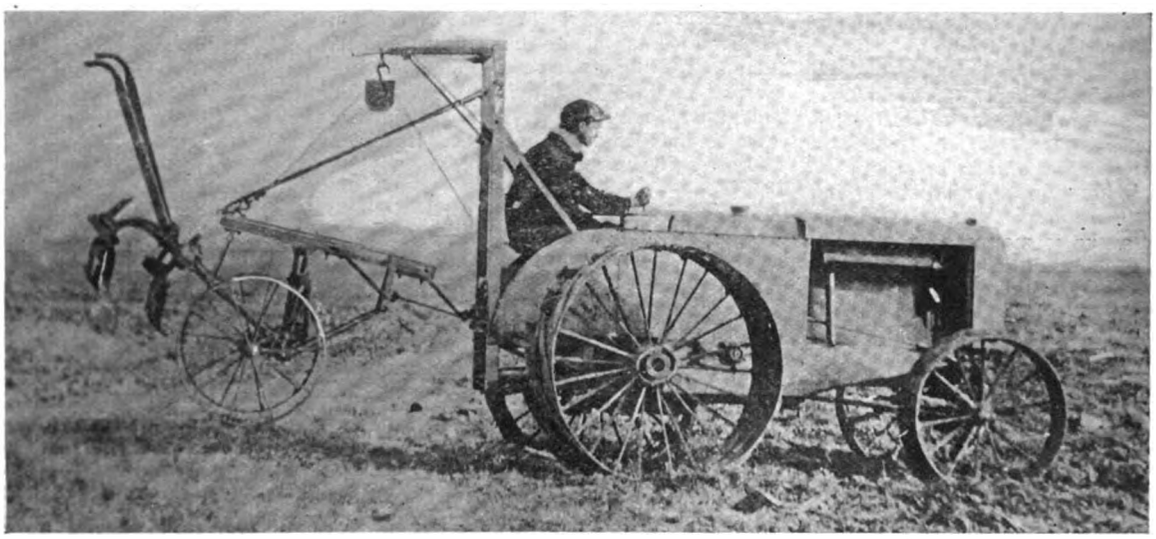
BY COUNTRIES 1917

	Passenger Cars		Trucks		Passenger Cars		Trucks	
Denmark	.....	.....	.....	.....	247	$ 223,616	.....	.....
France	285	$ 312,568	141	$ 634,420	1,634	1,217,583	2,683	$8,466,271
Norway	.....	.....	.....	.....	676	715,585	.....	.....
Russia in Europe	.....	.....	.....	.....	634	1,341,925	86	2,294,174
United Kingdom	39	118,096	219	411,165	1,349	1,978,948	7,574	20,111,759
Canada	1,852	1,318,786	92	118,038	16,438	12,401,705	822	1,075,750
Cuba	402	363,776	.....	.....	3,037	2,678,362	.....	.....
Argentina	270	225,309	.....	.....	4,171	2,808,869	.....	.....
Chile	536	601,118	.....	.....	3,937	3,481,061	.....	.....
British India	.....	.....	.....	.....	1,509	1,165,158	.....	.....
Dutch East Indies	129	131,741	.....	.....	2,273	2,215,040	.....	.....
Russia in Asia	.....	.....	.....	.....	260	419,463	193	622,883
Australia	426	358,534	.....	.....	4,561	3,557,852	.....	.....
New Zealand	71	51,779	.....	.....	2,753	2,080,919	.....	.....
Philippine Islands	254	216,895	.....	.....	1,243	959,683	.....	.....
British South Africa	207	170,944	.....	.....	3,396	2,492,399	.....	.....
Other Countries	1,971	1,507,160	373	421,858	17,674	12,244,798	2,389	3,793,936
	6,442	$5,396,706	825	$1,585,481	65,729	$51,982,966	14,347	$36,324,733

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Maxwell Develops 3-Plow, Inclosed Transmission Farm Tractor

Has Detachable Head 4 x 6 Engine, Three-Speed Gearset and Final Drive by Bevel Gears Through a Differential—Can Be Used for All Farm Work and Also on Roads



The new Maxwell farm tractor is a versatile machine and can be used for practically every kind of farm work as well as for towing farm products to market over the roads

THE Maxwell tractor, which was held under cover until the Chicago show and then sprung as a surprise at the annual dealers' banquet of the Maxwell-Chalmers distributers, is of a type which would naturally be expected from an automobile manufacturer. This tractor has been under development for about 5 years. It was concealed under the name of the "Chief" and received its real try-outs on the sugar plantations of Louisiana.

The tractor is a three-plow machine giving a plowing draw bar up to 3000 ft. lb., with a normal output of approximately 2600. It is a four-wheel type, weighing 3600 lbs. with tanks empty, and drives through two 48 by 10 in. rear wheels by means of an enclosed transmission. The tractor is, throughout, what may be called an automobile type, for, although nothing about it follows automobile practice, yet the layout is such as closely parallels automobile design. The wheelbase is 6 ft., and the minimum tread is 44 in. This, however, is adjustable, as will be explained later. The tractor can turn in a circle of 21 ft.

A frame construction is used, consisting of two deep angles with the flanges turned in so that the entire frame structure is virtually a U section. In this U rest the engine and transmission and all the working parts. The frame is 7 in. deep and is of semi-flexible nature, with a flexible front support at the center of a transverse spring mounted on the front axle.

This construction gives a tractor which is not affected by the distortions due to inequalities of the ground. The construction of the tractor is of two main units, the powerplant and the transmission.

The backbone of the powerplant is made up of the cylinder casting, which includes the crankcase, and a bell housing. The second part is a casting, which includes all the transmission gears and extends from the bell housing back to the rear axle.

These two component castings bolt together at the bell housing, giving a rigid central construction for the working parts and form the two distinct structures which go to make up the principal part of the machine.

The powerplant is a three-casting unit composed of the cylinder block above described, a casting for the head, which is detachable, and a casting forming the oil pan.

The engine proper is a detachable L-head unit of very simple design. The cylinder dimensions are 4 by 6, although this may later be changed to 4¾ by 6 to fit into a proposed production schedule involving a truck unit of heavy capacity. Nothing definite, however, can be stated on this at the present time.

The L-head engine is conventional in every respect with the exception that the water jackets are of much greater capacity than usual. The jackets extend to the bottom of the cylinder, so that there is a straight wall on the outside of the cylinder directly down to the crankcase, giving a completely cooled unit of large water capacity.

The water area round the cylinder-head, which is a separate casting, is also particularly large with the water brought well around the spark plug aperture to eliminate any chance of hot points developing in their proximity.

The crankshaft is carried on three bearings and is a 2½-in. unit with all bearings 2½ in. in diameter. The connecting-rod bearings are 3½ in. in length and the main bearings are exceptionally large for the normal engine speed, which is 900 r.p.m. These bearings from front to rear are 3¾, 3½, and 4¼ in. in length.

An interesting oiling system has been worked out. It is one of the few truly combined pressure feed and splash systems, as both the pressure feed and the splash are relatively complete within themselves.

In conjunction with the oil pressure feed, which operates through a drilled crankshaft, there are three pumps, one pump being located at the forward end of the crankcase, one at the rear end, and the third taking the oil from the sump and delivering it to the three main bearings, from where it is led by the hollow shaft to the connecting-rod bearings.

With these three pumps, if the tractor has to climb a stiff grade, and the oil should run to the back of the case, the pump at the rear will carry the oil back to the sump, where it will distribute to the main bearings. Should the tractor

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be inclined to the front the front oil pump will act in the same way. Thus, in spite of the difference in purpose, a hint has been taken from aircraft practice.

The water system holds 10 gal. Water is pump-circulated through a vertical tube radiator with cast tanks. Ignition is by magneto, the make of which has not as yet been fixed, the magneto being equipped with an impulse coupling for starting. The magneto is driven from the water pump shaft through a flexible coupling. Gravity gasoline feed is employed, with a 26-gal. tank mounted behind and above the engine. The fuel employed is gasoline, and the hot-spot manifold design is employed to provide for evaporation.

With this engine of the 4½ in. diameter type, 29 hp. is delivered at 900 r.p.m., which is the governed speed. The governor is a gear-driven unit on the same shaft as the fan.

A cone clutch faced with asbestos fabric is enclosed in the bell housing, and the service brake is mounted on the reverse side of the clutch. Thus when the clutch pedal is depressed, the cone, which has a diameter of 16 in. and a face width of 3 in., is first pulled out of the driving member and a further depression of the pedal results in bringing the brake into effect.

The transmission gearing provides three speeds, the ratios being such that on high gear the tractor travels 6 m.p.h. at 900 r.p.m.; on intermediate, or plowing speed, 2¼ m.p.h. at 900 r.p.m.; and on low, 1½ m.p.h. at 900 r.p.m. The transmission gearing is all mounted on anti-friction bearings, and none of the center to center distances of these bearings exceeds 14 in.

The final pinion has a 7 in. face and the rear axle gear a 6 in. face. All of these are chrome-nickel gears running in oil.

The drive passes from the clutch shaft through bevel gears to a transverse shaft. This engages in turn with a second transverse shaft, carrying the reduction gear, and from this second transverse shaft it passes back through the final pinion to the rear axle.

The first transverse shaft has a pulley on the right end and a winch or cable hoist on the opposite end.

By means of these two devices any work desired by farmer, contractor, or any other type of engineering farming or construction work requiring animal power or mechanical power can be performed. The tractor can lift itself off the ground if that is desired, or it can lift wagons to points where they can be dumped in their entirety if the tractor is used by contractors who need that sort of assistance.

The pulley makes it possible for the farmer to use the tractor as a stationary powerplant, and a snubbing block can be fitted over the pulley if desired for work in which a device of this kind gives more practical assistance.

The rear axle carries the differential mounted on the outside and the axle itself is hollow, and after it passes through the differential housing, it drives through tubular units which can be added to by inserting additional members which really form part of the rear axle, thus giving an adjustable tread.



This shows the appearance of the Maxwell tractor equipped for use on hard roads. The design is compact and follows the usual practice with the engine under a hood at front

The combination of the adjustable tread and adjustable draw bar and the provision of both cable hoist and pulley, or snubber block, together with shieve combinations, allow practically any work to be accomplished with this tractor that is desired. The load can be attached to the draw bar at any point, and if desired this can be used as a frame to which a small crane can be attached. The tractor has been designed throughout with an eye to maintenance, and all parts are readily accessible, the oil tubes, for instance, all being exterior so that they can be taken out and cleaned. There are two oil wells, one for the engine and the crankcase, and the other in the gearbox supplying all the transmission gearing. The oil is circulated in the gearbox by means of a gear wheel which picks it up and allows it to flow over to the surfaces.

The tractor is not in production as yet, but will be as soon as it is possible to co-ordinate the Maxwell-Chalmers plant which at the present time is doing considerable Government work. The manufacture of the tractor will not interfere with this, however, and production will not be long delayed. The price of the tractor is not fixed and cannot be until production is started and costs accurately estimated. It will naturally depend largely on the number scheduled. It can be predicted, however, that this tractor will take its place among low-priced machines.

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Hot-spot Manifolds Criticised

MINNEAPOLIS, Feb. 6 — Hot-spot manifolds for farm tractors burning kerosene came in for much criticism at the monthly meeting of the Minneapolis Section of the S. A. E. to-night, when Professor Mowry of Minnesota State University read a paper on "Tractor Fuels" before one hundred and twenty-five members of the section and their guests.

Professor Mowry gave reports of laboratory tests with different kinds of manifolds and showed the quantity of kerosene that entered the crankcase. With the Clapper manifold after a one-hour test with the engine running at 750 r.p.m. under full load 0.1 lb. was added to the crankcase oil. With a Holley vaporizer the engine speed had to be increased to 850 r.p.m. to give the same horsepower and 0.7 lb. was added to the crankcase oil. With a Duplex manifold the speed was 820 r.p.m. to give the same horsepower and 0.3 lb. was added to the crankcase oil.

W. G. Clark, engineer of the Bennett Carbureter Co., differed with Professor Mowry, contending that hot-spot manifolds cut down volumetric efficiency as much as 33 per cent and that it is necessary to use engines that are too heavy and that to-day engine weight must be reduced. The farmer objects to having a 40 hp. engine to give only 30 hp. just because a hot-spot manifold is used to permit burning kerosene.

With the use of a double manifold, the entire charge is heated but not to the same degree in all cylinders so that preignition is difficult to overcome. The volumetric efficiency is reduced too much, there is smoky exhaust and kerosene in the crankcase. Too many tractor makers declare they can run on kerosene but this statement is misleading. It is true they can run on it but they do not burn it as it should be burned.

Clark argued in favor of furnishing a dry gas from kerosene which is possible at a temperature of 110 deg. providing the manifold is of small diameter and the gas velocity maintained high. If the gas velocity is not high enough a higher temperature must be maintained, a temperature of 450 deg. being needed at atmospheric pressure to maintain a dry gas from kerosene.

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80,000 Aviators Available for Air Fleet

Senate Investigating Committee Reveals Delay of 2 Months in Program by Changes in Design and Drafting of Skilled Workers Into National Army

Eighty thousand aviators, trained or nearly trained, are available now for the American aviation fleet.

America's airplane program, which will cost $1,000,000 in addition to the $640,000,000 already expended, has been delayed two months because of necessary changes in the type of combat machines, due to the altering of plans to meet the ever changing German tactics.

Delay has also been caused by the drafting of thousands of skilled toolmakers into the National army.

Inability to secure adequate supplies of spruce for the manufacture of planes has been caused by unwillingness on the part of the great lumber concerns to cut sufficient timber to produce the kind of spruce needed, and also by failure to place an official in the lumber districts with full authority.

These were the more important developments of the open sessions of the hearing of airplane activity by the Senate Military Affairs Committee this week. The first hearings Monday, Tuesday and Wednesday were in executive session, and no details were made public. On Thursday and Friday sessions were open to the press, and discussions by Col. E. A. Deeds, Col. Montgomery, Major Charles R. Sligh and ex-Governor Oswald West of Oregon were heard.

Following the opening sessions Howard E. Coffin, chairman of the Aircraft Production Board, was again recalled by the committee which, at his request, placed to-day's hearing in executive session, maintaining secrecy about the developments.

Baker's Brother Lost Contracts

At the hearing on Thursday it developed that H. D. Baker, a brother of the Secretary of War, had been interested in an airplane factory at Niles, Ohio, which had, but lost, contracts with the Government.

Before this matter had been gone into deeply it was learned that as soon as the Secretary of War knew of the contract he ordered it cancelled. Col. Deeds, assistant to Gen. Squier, Chief Signal Officer, testified that H. D. Baker had conferred with him last June about securing a contract, but had been turned down because the plant was not ready to produce.

Later, when the plant was equipped, and known as the Engel Aircraft Co., it was given contracts which Secretary Baker cancelled soon after. With regard to this matter Secretary Baker issued a statement explaining that although the men interested in the company were of the highest standing, he directed that the contract be cancelled to avoid possibility of embarrassment. H. D. Baker also withdrew from the company.

Col. E. A. Deeds, in his testimony, said that it had been necessary to change the entire program at least twice because of developments in Europe, where the second battle of Verdun showed that a change of type was necessary.

The life of a battle plane used at the front seems, from the Verdun experiences, to be about two months, after which it is worn out and must be replaced with a new machine.

He said that the proposal to appropriate a billion dollars for the new airplane program is not an over-estimate of the needs of the service, and that this amount will be necessary for the program recommended by Gen. Pershing, and adopted by the War Department.

Col. Deeds stated that it has frequently been found difficult to secure materials even when priority orders are granted, and in reply to inquiry he said that when all branches of the Government are seeking priority orders confusion results.

He believes the time is coming when it will be necessary to seek priority over priorities in order to get the immediate necessities.

Probe Spruce Shortage

Major Charles R. Sligh, who was removed from the Aircraft Production Board, where he had charge of wood production, was one of the chief witnesses at the open sessions. Col. R. L. Montgomery, Chief of the Equipment Division of the Signal Corps, stated that Major Sligh was removed because heads of the service believed spruce production was delayed. Major Sligh stated that he was too accurate to satisfy the members of the Lumber Committee of the Council of National Defense, and he went into great detail to explain political angles and jealousies and also to make statements about the unwillingness of the larger lumber companies to co-operate with him.

He stated that the Weyerhauser lumber interests had a representative on the Lumber Board with whom he did not agree, and that the Weyerhauser company, although it had the requisite amount of spruce needed by the Government, refused to cut the timber because it would create a surplus of lumber and thereby cheapen the price.

He spoke disparagingly of Col. E. R. Disque, head of the new Spruce Production Committee, and stated that since Col. Disque was in charge spruce production had fallen from 4,000,000 feet per month to 2,000,000 feet per month.

He said that there was no system to the present spruce purchasing of the Aircraft Board, and recommended centralized buying and standardized grades. He stated that by the use of standardized grades, and particularly by using what he termed "Specification No. 1 Spruce," it would be possible to get 30 per cent instead of the present 15 per cent out of the logs.

He claimed that the Curtiss Aeroplane Co. was using about 465 feet of spruce to a plane now, following his recommendation for the use of "Specification No. 1 Spruce," as compared with 1000 feet to a machine prior to that time.

According to Major Sligh, England and France are using 2440 feet of spruce to the machine, and Italy is using only slightly less. Major Sligh stated that before he inaugurated the present purchasing system the Government was paying $200 per 1000 feet for inferior spruce, and that at this time, through his plan, it secures a superior grade for $105 per 1000 feet.

Cost of Airplane Spruce

He eliminated the brokers and dealt directly with the mills. He showed that only a short time ago airplane companies were paying a minimum of $140 per plane for spruce, and using an average of 1000 feet per plane, which is now reduced to an average of 600 feet. Major Sligh stated that the production of spruce was 2,000,000 feet in September, which he increased to 4,000,000 feet in November. Col. Disque, he said, took charge in October, and production decreased to 2,500,000 feet in December and 2,000,000 in January. He admitted that part of this decrease was due to the rainy season, but thought that the three thousand workers recently sent to the lumber districts by the Government should have offset the effects of the rain.

Major Sligh stated that 80,000,000 feet of spruce would be required to meet the plane-building plans for 1918.

Ex-Governor West told the committee that only 20 per cent of the required spruce was being obtained. He said that someone with authority and with experienced lumbermen as advisers was necessary as head of the Government lumber interests in the West. The aviation program, according to Mr. West, called for 11,000,000 feet of spruce a month, while in the past six months ended Dec. 31 only 13,500,000 feet had been produced.

Details regarding the engineering progress of the Liberty engine, and the changes of type and various tests, were all told in executive sessions, and none of this information was made public.

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Airplane Spruce Supply Within 50 Per Cent of Requirement

WASHINGTON, Feb. 5—Howard E. Coffin, in conference to-day, stated that while the spruce supply for airplanes was not up to schedule, it was not as far behind as was stated last week in the Senate Committee hearings. He believes the supply is now within 50 per cent of the requirements, and will soon be increased to meet the demand.

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Hardy & Co. Assign French Rights

COVENTRY, ENG., Jan. 25—Ed. J. Hardy & Co., makers of the Hardy flexible joint, have assigned the French rights to this joint to Messrs. Brampton Bros., Calais, France, makers of Brampton chains.

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Chevrolet Car Sales Double in 1917

125,004 Sold for $62,638,303—General Motors Profits Greatly Increased

DETROIT, Feb. 2—Sales of the Chevrolet Motor Co. in 1917 amounted to $62,638,303 for 125,004 cars as against $32,306,295 for 62,522 cars sold the year before. This represents an increase of 99.8 per cent in the number of cars sold, and 93.9 per cent in the cash value.

These figures were given out in the preliminary report of the General Motors Co. The same report shows undivided profits for that company for the 5 months ended Dec. 31 of $15,000,000 compared with $11,238,984 in the corresponding period of 1916. This is figured before the deduction of war taxes. Results for the 5 months of 1917 and 1916 follow:

	1917	1916	Increase
Cars and trucks sold	89,901	65,893	21,008
Net sales	$94,500,000	$60,731,130	$33,768,870
Undivided profits	15,000,000	11,238,904	3,761,016

Ford Building for Drafting and Designing

WASHINGTON, Feb. 4—The Ford Building here will not be occupied by the Quartermaster Corps, as was first planned, but will instead be taken over by the drafting and designing branch of the Ordnance Department.

Will Map Truck Routes

WASHINGTON, Feb. 5—The pathfinder car of the Highways Transport Committee of the Council of National Defense starts this week mapping out army truck routes for the Government. The committee has already laid out an official route from Detroit to the seaboard and another from Buffalo to the seaboard; it is now proposed to tap every truck manufacturing point in the central west and pick out feeder lines to two great main highways running eastward.

The pathfinder will go as far west as the Mississippi river and will map routes from cities in Wisconsin, Illinois, Michigan, Indiana and Ohio. The car will be in charge of Raymond Beck, field engineer of the Highways Transport Committee; with the car will be Major W. D. Uhler, formerly State Highway Engineer of Pennsylvania and now connected with the Motor Transport Service of the Quartermaster's Department, and Captain E. B. Butchers, Brigade Engineer of the U. S. Engineers' Corps.

As each state line is reached a representative of the State Highway Department will join the car and proceed over the roads of his own state. When this trip is completed the Government will have four main highways forming connecting links between the great manufacturing centers of the country and the Atlantic seaboard.

Motor transports on their way to France will follow these routes and will carry cargoes to relieve freight congestion. The drivers will secure their training under service conditions and be better fitted for their tasks of driving when they reach the war zone.

Minneapolis Show Biggest of Year

MINNEAPOLIS, Feb. 4—The Twin City show, which opened to-day, is a real automotive show, and is bigger than the New York and Chicago exhibitions put together. On the opening day the crowds were so enormous that the box office facilities broke down, and the association officers had to take admission fees at the gate, and pass the people in without tickets.

The show is held in the Overland Building and there are nearly three miles of aisles. The exhibits are varied, and include not only passenger cars, but trucks, tractors and accessories for all three. Farm lighting and farm power machinery, as well as household appliances are shown. There is also one airplane on exhibit, and a big industrial section, including Red Cross and food administration booths. It is nearly a quarter of a mile around the building and the crowds make traveling slow.

One Sub-Chaser a Day from Ford

Highly Standardized Boats to Be 200 Feet Long—500 Tons Displacement

WASHINGTON, Feb. 5—The Ford Motor Co. is to manufacture submarine chasers at the rate of a completed boat a day. Word to this effect and additional information that the first vessel has already been started has been made public.

As is to be the case with the 150-foot vessels to be manufactured by the Elco Works, Bayonne, the brief description of which was given in AUTOMOTIVE INDUSTRIES last week, these sub-chasers which Ford will build are to be highly standardized products. They are to be 200 feet long and of 500-ton displacement. The boats will be fabricated largely of structural steel shapes by the progressive assembly method in Detroit and taken to the sea by way of canals and inland waterways. Power will be furnished by geared steam turbines. There will be nothing freakish about the boats or their equipment. The number of boats ordered has not been revealed.

Probe Airplane Plans in Senate

(*Continued from page* 334)

there is no industry which can be definitely called non-essential.

Interesting news dispatches of the last few days told that the Ford Motor Co. will construct U-boat chasers for the United States. The Ford method of building automobiles on the progressive assembly plan will be followed in the construction of the new boats, which Mr. Ford is said to have designed himself for the Navy. The fabricated parts of the boats will be assembled in sections.

It is planned to have the hull, corresponding to the frame of the motor car, move on a conveyor from department to department, gradually being completed and made ready for launching. The Ford U-boat destroyers will be launched on the Great Lakes and brought to the coast under their own power.

A misunderstanding at the Navy Department last week cost Mr. Ford some good publicity. Seeing the story of his new contract with the Navy in the morning papers he wired to the department for permission to give out in Detroit a complete story of his plans. In the absence of Secretary Daniels, Assistant Secretary Roosevelt, unaware that Secretary Daniels himself had given out the short news item, denied the permission.

The War Industries Board of the Council of National Defense, which controls the important divisions known as the Steel Products Section, Autcmotive Products Section, etc., faces either abolition or readjustment and modification, as a result of a reorganization in the War Department.

The work of the board is already curtailed by the appointment of Col. Palmer Pierce, as Director of Purchases, and E. R. Stettinius as Surveyor General of Supplies in the War Department. These appointments effect principally the purchasing, but leave the work of stimulating and directing production still to the War Industries Board.

Standardized Equipment Important

An interesting point in the standardization of trucks developed at the hearing of Secretary Newton D. Baker at the Senate Committee meeting last week, when Senator Weeks questioned Secretary Baker as to our motor transportation progress, and the secretary answered the accusation of procrastination by stating that "motor transportation is short in the American camps in Europe now for the reason that the production of standardized and interchangeable equipment is of the very greatest importance."

He also added that our standardized trucks are in quantity production now. And in reply to inquiry as to why many divisions were not temporarily with any standard make of trucks, he said, "Now the requirement is that every division should have standard equipment in operation. Instead of buying promiscuous and indiscriminate truck and motor equipment which would have to be discarded when the division actually went into operation, the plan is to supply them with standardized equipment when they need it."

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Shortage of Gas Ties Up Detroit

Between 8000 and 10,000 Men Laid Off—Some Plants Are Entirely Closed

DETROIT, Feb. 3—Between 8000 and 10,000 men had to be laid off temporarily Saturday by a score of manufacturing concerns engaged in war work, owing to a shortage of gas. Conditions are so acute that unless the gas company receives the needed coal within the next 36 hours 100,000 or more workers will be compelled to remain idle, as nearly all the local plants will be short of gas by Monday night. Gas company officials, the fuel administration and the railroads are co-operating to bring relief as quickly as possible, but the situation is considered very serious by all.

This is best shown by the action some of the biggest plants here found it necessary to take, notwithstanding that they are doing war work and thus are entitled to preferential service in getting the supplies of coal, oil, etc.

At the Ford Motor Co. about 4000 men were laid off Saturday and 4000 more may be turned home again Monday unless sufficient gas is available.

Several hundred men were laid off by the Michigan Stamping Co. owing to the shortage of gas, and the amount of coal on hand will only last 4 days at the most.

At the Northway plant more than 100 men were laid off, and the information was given that the plant might have to be closed Monday.

The enameling and block test departments of the Hudson Motor Car Co. are said to have been closed and other departments may have to be shut down within the next 48 hours unless gas is obtained.

The Detroit Forging Co., the Detroit Vapor Stove Co., the McCord Mfg. Co., the Detroit Automobile Supply Co., and several others engaged in war work have closed all departments using gas.

These are merely a few of the most important concerns partly or entirely closed, but it is likely that there will be scores unable to continue operations next week unless gas and coal are available.

The coal situation is practically as acute as it was a week ago. The continual inclement weather has nullified efforts made to get coal to the city. Coal dealers and railroad men say that the men are willing to do their utmost to relieve the situation, but the severe weather is rendering outdoor work almost impossible.

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Detroit Used Car Show a Success

DETROIT, Feb. 4—The used passenger car and truck show, promoted by the Detroit Automobile Dealers' Assn., and held in the Overland Building, is reported by the exhibitors to be a success. The show opened Feb. 2 and will continue all week. According to the management, there were more than 2000 visitors the first day, and many cars were disposed of. Practically every dealer in Detroit has space, and there are about 300 cars and trucks on exhibition. Admission to the show is free, and tickets are obtainable at all dealers and accessory stores, hotels and newspaper stands.

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Renfro Edmunds & Jones Distributer

NEW YORK, Feb. 7—John F. Renfro, 1834 Broadway, New York, has been made eastern distributer for the Edmunds & Jones Corp., Detroit. The company makes equipment for Ford and Dodge Brothers cars, and Renfro will have charge of repairs and parts sales in connection with this work.

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No Plain Lenses for Missouri Cars

ST. LOUIS, Feb. 4—The new state law which prohibits plain lenses on motor car lights became effective Feb. 1 and accessory stores had the most rushing week of their existence. There was a wild skirmish among car owners to find a market for the discarded plain lens but no outlet appeared and thousands of them went into the scrap heaps.

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Oetting to Address Cleveland S. A. E.

CLEVELAND, Feb. 4—At the coming meeting of the Cleveland Section of the Society of Automotive Engineers to be held Feb. 15, O. W. A. Oetting, special engineer of the Willard Storage Battery Co., will give a paper entitled, "The Effects of Low Temperatures on Starting." The place of the meeting will be announced later.

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Lane Heads Parker Rust-Proof

DETROIT, Feb. 6—C. W. Parker, president and founder of the Parker Rust-Proof Co. of America, has resigned as president but retains his seat on the board of directors. George F. Lane, formerly general manager, has been elected president, and a new board of directors consisting of eleven men instead of seven has been chosen. The new officers are: President, George F. Lane; vice-president, Joseph G. Johnson; secretary-treasurer, W. M. Cornelius. Directors include the officers and George D. Mason, William H. Beamer, Thomas Bronley, Jr., Harry Spere, C. W. Parker, E. J. Corbett, F. M. Beal and Fred M. Aldrich. An engineering office will be opened in Detroit.

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Fire Visits Belle City Iron

RACINE, WIS., Feb. 4—Fire of unknown origin almost totally destroyed the main shop of the Belle City Malleable Iron Co., Racine, Wis., causing a loss of at least $100,000. The foundry proper was saved. The burned building was two stories high, 80 by 120 ft. in size, and contained the pattern shop and storage vaults, core room, machine shop and stock room. Reconstruction work will begin immediately.

Priority Regulations Broadened

New Class, for War Emergency Work, Added—List of Products Lengthened

WASHINGTON, Feb. 6 — Priority Order No. 3, which was issued Sept. 21 by Judge Robert S. Lovett of the Priority Board, has been slightly modified by Priority Circular No. 3 which has just been issued.

The circular defines the regulations of the previous order and makes it apply to all individual firms, associations and corporations engaged in the production of copper, iron and steel and in the manufacture of their products: of chemicals, cotton duck and woolen cloth, and all such other raw materials and manufactured products as the committee may deem necessary from time to time.

The original priority order applied only to the production of iron and steel and in the manufacture of their products.

Under the new regulations all orders and work are divided into four general classes, instead of three as heretofore. These four are:

Class for Emergency Work

Class AA, which is the new classification and which covers "only emergency war work of a special or urgent nature"; Class A, which covers other war work necessary to carry on the war, such as arms, ammunition, destroyers, submarines, airplanes, locomotives, etc.; Class B, which covers orders and work which, while primarily designed for the prosecution of the war, yet are of public interest and essential to the national welfare or otherwise of special importance; Class C covers all orders and work not covered in the other three classifications.

The new regulations do not change any priority orders previously issued. The rule of procedure from now on is that orders and work in Class AA shall take precedence over those in all other classes; orders and work in Class A precede those in Class B, and these in turn precede those in Class C. The circular states:

Priority Rules Explained

"The classification of an order simply means that it shall be given precedence over orders of a lower classification as may be necessary (and only such as may be necessary) to insure delivery on the date specified in the order. It does not mean that work should cease on orders of a lower specification or that the order should be completed and delivery made in advance of orders taking a lower specification if this is not necessary to effect delivery within the date specified. The one to whom a priority certificate is directed should make his own production plans so as to get the maximum of efficiency out of his operations, making all deliveries at the times contracted for, if possible, and where this is not possible, giving precedence to the orders taking the highest classification."

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Fuel Situation Near Crisis

Detroit Plants Closing — Gas Company Has 2 Weeks Supply—Shutdown Feared

DETROIT, Feb. 5—The fuel situation is becoming more critical every day. The Maxwell, Paige, Chalmers and Studebaker factories will have to close to-day unless a supply of coal arrives. The Lincoln Motor Co., which is making Liberty engines, has enough coal to last 7 days; the Ford Motor Co. enough for 13 days, and the Packard Motor Car Co. has a 10 days' supply. Many homes in Detroit are without fuel and the weather is below zero.

The gas company has coal for only a few weeks. If no relief comes before that time every engine testing department, enameling oven and all other work depending on gas will have to be stopped.

The confiscation by the local fuel administration yesterday of 20 cars of gas oil and several cars of coal, consigned to industrial plants here and the diversion of them to the gas company's plant, has only slightly relieved the situation. According to H. P. Hood, in charge of the industrial department of the Detroit City Gas Co., the general situation is still very acute and it is more than likely that most of the gas-using departments of the local plants will remain closed for the next few days. The railroad companies are making a special effort to get a supply of gas tanks and coal to the city, and all the local oil companies are co-operating in this respect.

At the General Aluminum & Brass Co., if the gas supply should be cut off for 3 hours, the entire plant will probably have to be closed down.

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DETROIT, Feb. 6—The fuel situation throughout Michigan is daily assuming more serious proportions. Many of the larger companies, including Packard, Paige, Studebaker, and a number of others engaged in important war work and employing thousands of men are living from day to day and borrowing fuel to keep from shutting down. None of these plants has more than 10 days' supply. The situation is so serious that schools are closing to-day for a two-week period. A contributory reason for the coal shortage is that the miners at Albion are on strike, tying up mines which supply 2,000,000 tons annually. Small towns throughout Michigan are appealing for help. In this city the supply of coal at the local gas company remains low, 1000 cars of coal consigned to Michigan being tied up in Toledo. It is expected that 600 of these cars will remain here.

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22,000 Trucks for Ordnance

WASHINGTON, Feb. 5—The Ordnance Department is figuring on purchasing 22,000 Four-Wheel Drive and Nash trucks. It is likely the contracts will be let within the next three weeks.

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Stimulate After-War Exports

WASHINGTON, Feb. 6—By way of facilitating and stimulating after-the-war export business, the War Trade Board has issued instructions explaining to exporters the method of using form X which supersedes all others and which must be filed for all shipments abroad.

Scope of War Board Outlined

Motorcycles, Cars, Trucks, Tractors, Gas Engines and Accessories Controlled

WASHINGTON, Feb. 7—By way of eliminating any confusion which may have existed concerning the activities of the Automotive Products Section of the War Industries Board, this section has made public a chart which reveals its many activities and responsibilities. The chart follows:

H. L. Horning (formerly Waukesha Motor Co.).
Coker F. Clarkson (formerly general manager S. A. E.).
A. B. Brown (Rochester, N. Y.).
George Adams (formerly Garford Motor Truck Co.).

MOTORCYCLES.
Motorcycles.
Motorcycle sidecars.

MOTOR CARS.
Motor cars.

MOTOR TRUCKS.
Motor ambulances.
Motor trucks.
Motor truck bodies.
Motor truck tractors.
Motor truck trailers.
Armored cars.

TRACTORS.
Military tractors.
Military tanks.

GAS ENGINES.
Aeroplane engines.
Marine gas engines.
Stationary gas engines.

ACCESSORIES.
Automotive accessories.

Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co.	46	55	+3
*J. I. Case T. M. Co. pfd.	77	81	+1
Chalmers Motor Co. com.	3	5	—1
Chalmers Motor Co. pfd.	25	40	—10
*Chandler Motor Co.	82	83	+9½
Chevrolet Motor Co.	119	121	+9
*Fisher Body Corp. com.	26	35	+1
*Fisher Body Corp. pfd.	80	87	— ½
Fisk Rubber Co. com.	49	51	..
Fisk Rubber Co. 1st pfd.	98	103	..
Fisk Rubber Co. 2nd pfd.	60	70	..
Firestone Tire & Rubber Co. com.	95	98	+ ½
Firestone Tire & Rubber Co. pfd.	95	97	..
*General Motors Co. com.	134½	136½	+18½
*General Motors Co. pfd.	85	89	—9
*B. F. Goodrich Co. com.	47	49	+5
*B. F. Goodrich Co. pfd.	97	100	+2
Goodyear Tire & Rubber Co. com.	132	136	—1
Goodyear Tire & Rubber Co. pfd.	97	100	+2
Grant Motor Car Corp.	2	3	..
Hupp Motor Car Corp. com.	2¾	3	..
Hupp Motor Car Corp. pfd.	75	80	..
International Motor Co. com.	14	17	..
International Motor Co. 1st pfd.	40	45	..
International Motor Co. 2nd pfd.	14	17	—6
*Kelly-Springfield Tire Co. com.	46	47	+3½
*Kelly-Springfield Tire Co. 1st pfd.	75	80½	+1½
*Lee Rubber & Tire Corp.	14	15	+1
*Maxwell Motor Co., Inc., com.	28	29	+2
*Maxwell Motor Co., Inc., 1st pfd.	60	61	+2½
*Maxwell Motor Co., Inc., 2nd pfd.	22	23	+1
Miller Rubber Co. com.	129	134	..
Miller Rubber Co. pfd.	95	96	..
Packard Motor Car Co. com.	85	90	—2
Packard Motor Car Co. pfd.	91	94	..
Paige-Detroit Motor Car Co.	16	18	+1
Peerless Truck & Motor Corp.	16	17	..
Portage Rubber Co. com.	108	112	—2
Regal Motor Car Co. pfd.	..	23	..
†Reo Motor Car Co.	16	18	..
*Saxon Motor Car Corp.	9½	11	+2
Springfield Body Corp. com.	..	..	..
Springfield Body Corp. pfd.	..	..	..
Standard Motor Construction Co.	9	11	+1½
Standard Parts Co.	72	80	+5
*Stewart-Warner Speed. Corp.	51	52	+1
*Studebaker Corp. com.	53	54	+3
*Studebaker Corp. pfd.	91½	97	+2
Swinehart Tire & Rubber Co.	35	40	..
United Motors Corp.	25	25¼	+ ¾
*U. S. Rubber Co. com.	57	58	+1
*U. S. Rubber Co. pfd.	98	101	+4
*White Motor Co.	41	42	+3
*Willys-Overland Co. com.	18¼	19	+1½
*Willys-Overland Co. pfd.	78	79½	+2½

*At close Feb. 2, 1918. Listed New York Stock Exchange.
†Par $10.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	Bid	Asked	Net Ch'ge
Auto Body Co.	..	8¼	..
Bower Roller Bearing Co.	17	..	—2½
Chevrolet Motor Co.	117	122	+12
Commerce Motor Car Co.	6	..	+2
Continental Motor Co. com.	5⅝	5¾	+ ⅛
Continental Motor Co. (new)	85	..	..
Edmunds & Jones com.	..	..	..
Edmunds & Jones pfd.	..	..	..
Ford Motor Co. of Canada	187	191	+17
Hall Lamp Co.	13¾	14¾	..
Michigan Stamping Co. com.	12½	13	— ⅛
Motor Products	..	..	..
Packard Motor Car Co. com.	82¼	..	—3¾
Packard Motor Car Co. pfd.	91½	92½	+ ½
Paige-Detroit Motor Car Co.	18¼	18¾	+3
Prudden Wheel Co.	15	16¼	+ ¼
Reo Motor Car Co.	17	17⅜	+ ⅜

INACTIVE STOCKS

Atlas Drop Forge	..	32	..
Kelsey Wheel Co.	81	88½	..
Regal Motor Car Co.	..	26½	..

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Chart for Specification Tests on Class B Military Trucks

INSPECTION REPORT
— OF —
STANDARDIZED MILITARY TRUCK

Class _____ *Serial No.* _____

MANUFACTURED BY..... AT.....
INSPECTED BY..... Q. M.....
ACCEPTED BY..... Q. M.....

REC'D O. Q. M. G. MOTOR TRANSPORT..... 19....
APPROVED BY..... Q. M.....

FOR SHIPMENT BY RAIL.

Before shipment the radiator and gasoline tank were drained and a conspicuous tag was hung on the steering wheel stating the necessary steps to be taken before starting the engine.

Important parts liable to injury by tampering were sealed.

List of seals as follows:.....
.....
.....

Loose parts liable to theft were secured by boxing.

All parts subject to corrosion were properly protected.

Chassis was shipped.....
.....
Signed.....Q. M.....

FOR OVERLAND DELIVERY.

Chassis complete with all spare parts and accessories delivered
to .....
at .....
Signed.....Q. M.....

REMARKS: .....
.....
.....

WASHINGTON, Feb. 4.—Shown herewith is the standardized test chart which has been prepared by the United States Government for use in checking the specifications and assembly of the Class B military trucks. Some idea of the thoroughness of the checking may be gained by the minute scrutiny which must be given every part before the truck is finally turned over to the Government as being O. K.

In the production of these trucks the Government deals directly with the makers of the various parts, supplying the parts to the assemblers. In the case of the Class A and Class AA trucks, the Government will deal with the assemblers, who in turn will deal with the parts makers.

....., 19.....

TO THE QUARTERMASTER GENERAL, U. S. ARMY,
WASHINGTON, D. C.

1. I have carefully inspected the above numbered truck chassis and have found it to be in accordance with specifications.

2. I have passed same as efficient for service.

Motor No.....	Frame No.....
Generator No.....	Front Axle No.....
Magneto No.....	Rear Axle No.....
Distributor No.....	Radiator No.....
Carburetor No.....	Wheel Nos. { Wood F...R... / Steel F...R...
Steering Gear No.....	Tires .....
Clutch No.....	Springs .....
Transmission No.....	
Univ. Joints, Front.....	
Univ. Joints, Rear.....	

Motor Operation	Muffler .....
Compression	Gas Tank .....
Tappet Clearances	Gas Lines .....
Ignition	Reach Rod .....
Carburetion	Bumpers .....
Water Leaks	Starting Crank .....
Oil Leaks	Sprag .....
Governor Action	Hood .....
Governor Setting	Rear Axle .....
Timing	Oil Supply Motor .....
Acceleration	Oil Supply Transmission.....
Oil Pressure	Oil Supply Rear Axle.....
Fan	All Lubricated Parts.....
Hand Control	Upholstery .....
Steering Gear	Cotter Pins .....
Clutch Adjustment	Lock Washers .....
Transmission	Rattles .....
Lighting System	Painting .....
Foot Brakes	Standard Tools .....
Emergency Brakes	Special Tools .....
Wheels	

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N. Y. Exports Drop 28 Per Cent

Truck Shipments for December Fall Off 50 Per Cent—Allies Buy Most

NEW YORK, Jan. 31—Exports of passenger cars, trucks and parts from this port during December amounted to $6,955,818, which is only 72 per cent of November exports. Most of the decrease, however, was due to the falling-off in the number of trucks shipped to the allies. In November, England alone received 971 trucks, whereas the total number shipped to all countries during December was 427. The total value of 2907 passenger cars shipped was $3,624,118, that of the 427 trucks was $1,046,687, and exports of parts amounted to $2,285,013.

Australia was the largest purchaser of passenger cars, with a bill of $296,718 for 297 cars, and Argentina came second with receipts of 265 cars valued at $212,815. In November, Russia bought the largest number of cars, but not a single one was shipped to her during December.

France bought 118 trucks, costing $540,520. England came next, with 101 valued at $287,300. Chile's purchases of trucks exceeded England's in number, but were of a cheaper grade, and the bill amounted to only $86,606.

Shipments to the allies amounted to 1/3 of the total, those to South America amounted to ¼ and those to England's colonies amounted to about 1/5.

—

May Prohibit Chrome Imports

WASHINGTON, Feb. 5—Chrome ore may soon be prohibited as a product to be imported in this country, or its importation may be largely reduced. The import trade in manganese and nitrates requires a large tonnage, which the Government needs for exportation of supplies to Europe, and in consequence the United States aims to reduce this tonnage and use the American bottoms engaged chiefly in imported chrome ore in the war zone service. This will probably seriously affect some of our large steel plants which are depending on Cuba and other points outside of the United States for ore, and in turn display its effect upon the industry's steel allowance.

—

KENT, OHIO, Feb. 2—Sales of the Mason Tire & Rubber Co. for the three months ending Jan. 31, 1918, show an increase of 700 per cent over the corresponding period a year ago. January sales were the largest in the history of the company for any one month.

Automobile, Truck and Parts Exports from New York for November

Country	Cars (No.)	Value	Trucks (No.)	Value	Parts
Argentine	265	$212,815	4	$6,939	430,336
Australia	297	296,718	...	....	288,978
Barbados	13	6,541	...	....	2,113
Bolivia	2	6,959	...	....	5,725
Brazil	197	132,531	5	2,125	24,961
British East Africa	....	....	...	....	2,182
British Guiana	10	8,321	...	....	3,993
British Indies	....	....	...	....	49,544
British South Africa	97	170,944	3	12,399	119,447
British West Africa	34	23,052	1	1,357	11,605
British West Indies	6	2,593	9	6,810	7,375
Canary Islands	....	....	...	....	340
Chile	199	593,364	112	86,606	....
Colombia	6	6,285	...	....	2,557
Costa Rica	32	13,600	2	5,500	19,146
Cuba	246	186,750	22	50,318	77,365
Danish West Indies	1	800	...	....	214
Dutch East Indies	43	32,038	...	....	11,1[illegible]
Dutch Guiana	1	841	...	....	9
Dutch West Indies	2	1,841	...	....	758
Ecuador	10	7,939	...	....	2,703
England	3	7,500	101	287,300	662,972
France	199	249,868	118	540,520	530,401
French Africa	51	17,789	16	8,363	3,878
French West Indies	29	24,499	...	....	4,611
French Guiana	....	....	...	....	2,358
Greece	4	5,265	...	....	4,903
Guatemala	....	....	...	....	3,105
Haiti	8	4,378	2	1,179	5,037
Honduras	5	3,052	...	....	2,236
Italy	....	....	...	....	8,926
Jamaica	29	20,544	...	....	3,781
Liberia	8	2,745	...	....	....
Mexico	82	73,137	6	10,544	2,953
Morocco	16	6,570	...	....	....
Newfoundland	1	711	...	....	140
New Zealand	9	8,986	3	3,300	13,257
Nicaragua	4	3,061	...	....	258
Norway	....	....	2	4,308	....
Paraguay	12	4,380	...	....	....
Panama	5	3,226	...	....	9,068
Peru	144	195,975	3	7,129	11,078
P. I.	....	....	14	18,000	921
Port Af.	....	....	...	....	503
Salvador	....	....	...	....	352
Santo Domingo	23	14,029	1	1,400	6,233
Scotland	25	87,000	...	....	375
Siam	....	....	...	....	405
Spain	115	131,564	3	3,662	18,623
Switzerland	3	1,553	...	....	....
Trinidad	66	10,201	2	2,350	5,928
Uruguay	65	102,663	3	4,297	21,362
Venezuela	7	4,263	2	4,950	4,196
Total	2,907	$3,624,118	427	$1,046,687	2,285,013

N. A. C. C. Appoints Truck Committee

Will Help in Solving Freight Problems—Result of Truck Makers' Convention

WASHINGTON, Feb. 5—With a view to aiding the Government in breaking the present nation-wide freight congestion, the National Automobile Chamber of Commerce has just appointed a Motor Truck Committee for constant service in Washington. This committee was appointed as a result of the recent convention of motor truck manufacturers held in New York, Jan. 8, 1918.

At this gathering, which voiced the unanimous desire of the nation's motor truck manufacturers to co-operate with entire unselfishness in any Government measures, three men very closely allied with war activities pointed out the need for a motor truck committee.

These men were Christian Girl, Director of Production, Military Truck Division, Quartermaster Corps., U. S. A.; Hugh Chalmers, Automobile Industries Committee, and Roy D. Chapin, Chairman, Highways Transport Committee.

It was explained that the importance of the motor truck was constantly increasing, not only as a war factor, but as an immediately available medium dealing with the freight congestion.

The committee as organized recently includes George M. Graham, Pierce-Arrow Motor Car Co., chairman; Windsor T. White, president, White Co.; M. L. Pulcher, general manager, Federal Motor Truck Co.; David Ludlum, president, Autocar Co.; D. C. Fenner, Mack Motor Truck Co.

This committee will work largely with the Highways Transport Committee. This latter committee, of which Roy D. Chapin is chairman, has charge of the task of diverting traffic from railroads to the highways in order to restore normal distribution.

Through its direct touch with the motor truck industry and with shippers all over the United States, the Motor Truck Committee should be in a position to lend signal aid.

The committee will also be available to all other departments of the Council of National Defense or of the War Department for any service it may be able to render. It will also render to the manufacturers of motor trucks all over the United States such assistance as they may call for.

Temporary headquarters have been taken in the Ouray Building, Eighth and G Streets, N. W., Washington, D. C.

—

Grossman Not Affected by Bush Terminal Change

BROOKLYN, Feb. 6—The Emil Grossman Mfg. Co., located in the Bush Terminal Building, which was taken over by the Government, will not be affected, since the Government will use only the docks and warehouse part of the building.

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Industrial Review of the Week

A Summary of Major Developments in Other Fields

Steel Industry Operating at Only 50% Efficiency

The steel industry of the country, according to the best data obtainable, is operating on a 50 per cent basis, and some plants at no more than 25 per cent. No decided improvement is to be expected for several weeks, so serious is the derangement of every part of the machinery of transportation both in raw and finished materials. Producers will be many days working out of the glut of their own output which now prevents any measurable increase in rolling mill operations. At some plants the situation is simply chaotic.

The pig-iron statistics for January give a measure of what the steel industry has suffered from the unparalleled weather and transportation conditions of the past month. Output fell to 2,411,768 tons, or 77,799 tons a day, against 2,882,918 tons in December, or 92,997 tons a day. January production was thus the smallest since May, 1915.

On Feb. 1 the number of active furnaces was 310, while on Jan. 1 it was 321 and on Dec. 1, 345. How repeated bankings have crippled operations appears from the fact that in May, 1915, only 200 furnaces were at work to produce 73,015 tons a day, whereas last month it took an average of 315 furnaces to produce 77,799 tons a day.

To-day's situation is much more discouraging than the January figures show. Severe cold suddenly swept down this week on the Middle West, the heart of the iron and steel producing section of the country, and for the first six days of February pig iron production has probably been at less than 50 per cent of capacity. In January it was at the yearly rate of 28,700,000 tons, while the total for 1917 was about 38,600,000 tons. To-day the rate is probably under 22,000,000 tons a year.

Costs have advanced prodigiously under the cumulative handicaps in every part of the industry, and the showing in this respect when iron and steel prices are officially considered in March will argue even more strongly against downward revision than the cost figures canvassed at Washington in December. Predictions of smaller pig iron and steel production in 1918 than in 1917 have already appeared.

A development affecting the business of export houses is causing them some concern. Foreign purchases not for Government account have been unrestricted as to price, but they have been hard to place owing to scarcity of vessel space. Now, apparently at the suggestion of Washington, considerable general French and possibly British buying may be put through as defense material by the foreign commissions at the capital.

A New Service

¶ Herewith AUTOMOTIVE INDUSTRIES *supplies for the benefit of its readers a general summary of important developments in other fields of business. This is rendered possible by the editorial co-operation of leading industrial publications which are recognized authorities.*

By compressing the general industrial situation into this form we hope to give our readers a clear and comprehensive idea of up-to-the-minute developments which they could otherwise secure only with considerable expenditure of time and effort.

While bottoms may thus be insured, the so-called Government prices will undoubtedly obtain. Steel and equipment for a French railroad may be placed in this way.—*Iron Age.*

—

Mercer Bucks Snow In Overland Drive

CHICAGO, Feb. 1—Possibilities of delivering cars by road from factories on the Atlantic coast to points in the middle west, even in midwinter, were demonstrated last week by E. W. Schillo, Chicago Mercer dealer, when he completed a trip from the factory at Trenton, N. J., with the first of his 1918 allotment. His purpose was the dual one of saving a freight car for shipping Government supplies and also to give the car a thorough chassis test on the road. Almost the entire trip was made in deep snow and on portions of the road his car was the first vehicle which had traveled it for days. Schillo plans to drive the most of his allotment from Trenton to Chicago this season. The trip was started from the Mercer factories Jan. 15 in one of the standard roadsters and was finished Jan. 23.

—

Car Dealer to Sell Airplanes

CHICAGO, Feb. 4—Harry Newman, Maxwell and Chalmers distributer, has arranged to supply his customers with aircraft as well as roadcraft, and is the first motor car dealer to handle aircraft on a commercial basis. He is showing a plane of tractor type, but he cannot promise delivery until after the war.

—

Mutual Motors Plant to Be Auctioned

DETROIT, Feb. 6—The plant of the Mutual Motors Co., which formerly manufactured the Marion-Handley car, will be sold at public auction to-morrow in Jackson, Mich. The assets of the bankrupt concern are inventoried at $1,300,000. It is expected that the Jackson Munitions Corp. will be one of the bidders for the plant.

Coal Situation Acute Despite Shut-Down Orders

The cold wave which descended upon the country the first part of the week greatly interfered with railroad transportation and undid in large measure the good work which had been accomplished up to that time.

Throughout New England the fuel situation is acute, both as regards manufacturing and domestic consumption. A short temporary priority order secured at Hampton Roads in favor of this territory helped to a certain extent.

Railroads in many instances have but a scant supply of fuel, and in a few cases are enabled to operate only through the co-operation of connecting lines.

In New York City and vicinity, due largely to adverse weather conditions, coal is extremely difficult to obtain, and practically no stocks are on hand, particularly in the yards of retail dealers.

Efforts to secure river coal at Pittsburgh were temporarily successful, and it was thought that a large part of the city's difficulties had been surmounted, when a new cold wave struck that region and undid the work which had been accomplished in the shape of opening the lower pools of the Monongahela. The warm weather which had preceded the cold wave had, however, loosened up the car situation to a considerable extent and car supplies the first day or two of this week were better than formerly.

The coal trade in the Middle West is still operating under great difficulties imposed by the excessive snow-fall in the past few weeks. Traffic conditions are extremely bad, and mine operation is likewise.

From all over the country come reports of industries cleaning their bins of fuel, and in many cases being down to bare boards. Certain plants have been forced to shut down, while others are only able to keep running on a hand-to-mouth basis through special orders of the local fuel administrators. The domestic situation is scarcely less serious, and the suffering in homes is intense.

It is not believed that these conditions will permanently and entirely right themselves until warmer weather has relieved the adverse conditions under which the transportation of the country is now laboring.—*Coal Age.*

—

Blood Officers Re-elected

KALAMAZOO, Feb. 6—All of the officers and directors of Blood Bros. Co. have been re-elected. They are: President, L. H. Mattingly; vice-president, O. S. Cross; secretary-treasurer, R. G. Urch; directors, the officers and F. S. Chichester, L. L. Thompson and C. E. Parson.

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Olds Chairman of Kardell Truck

ST. LOUIS, Feb. 4—R. E. Olds of the Reo Motor Car Co., has been appointed chairman of the board of directors of the Kardell Tractor & Truck Co. The principal factory of this company will be in St. Louis, and the engines will be manufactured in Lansing. Some tractors for southern use will be made at Oldsmar, Fla. The tractor will be styled "Four-In-One."

—

Harry Krause, formerly with the Wire Wheel Corp. of America, has been made assistant general manager in charge of production of the Splitdorf Electrical Co., Newark, N. J.

—

G. F. Knowles, sales engineer of the Federal Motor Truck Co., Detroit, is leaving for Washington, D. C., where he will handle sales engineering and all business of the Federal company with the government for the duration of the war.

—

Thomas S. Watson, president of the Thomas S. Watson Co., has received the commission of major in the Ordnance Officers' Reserve Corps. He left for Washington last week.

—

Major Frank R. Bacon, president of the Cutler-Hammer Mfg. Co., Milwaukee, formerly in charge of the New Haven (Conn.) District of the Ordnance Officers' Reserve Corps, has been transferred to Washington.

—

H. F. Harris has resigned his position as assistant branch manager of Willys-Overland Inc., New York., and on Feb. 15 will become industrial engineer of the Republic Motor Truck Co., Alma, Mich.

—

George K. Parsons has been appointed manager of the new Detroit branch factory of L. V. Flechter & Co. and will have charge of all factory sales. He was formerly national distributer of the Disco Self Starter Corp. and connected with the sales organization of the Ford Motor Co.

—

Kenneth Moller has resigned from the William Whitman Co., Inc., Boston, to enter Government service.

—

C. E. MacConnell has been added to the staff of sales engineers of the Hyatt Roller Bearing Co., Detroit. He was formerly advertising manager of the Detroit branch of the Goodrich Rubber Co.

—

M. D. Davidson has been appointed sales manager of the truck division of the Lau Iron Works Co., Youngstown, Ohio.

—

William H. Alexander, assistant general manager of the Marvel Carbureter Co., Flint, Mich., who was in charge of experimental work in the engineering department, has been called to serve in the aviation section of the Signal Corps.

—

William D. Paine, York, Pa., who has been Eastern district sales manager for the Saxon Motor Car Co. for the last 10 months, has been commissioned a captain in the Ordnance Officers' Reserve Corps and is awaiting his call to active service.

Men of the Industry

Changes in Personnel and Position

Botterill N. A. D. A. Vice-President

DENVER, Feb. 4—Tom Botterill, veteran motor car dealer, has been chosen Colorado vice-president of the National Automobile Dealers' Association to serve the unexpired term of Walter J. Haughey, who has resigned. Botterill is Pierce and Hudson distributer for Colorado and adjacent territory and Dodge dealer for Denver and vicinity, and Haughey is sales manager of the MacFarland Auto Co., Buick distributer for Colorado and Wyoming.

—

Ralph C. Smith has resigned as Eastern sales manager of the Reo Motor Car Co. to become sales manager of the Anderson Tire Mfg. Co., Washington, D. C.

—

William M. Crotty, for 7 years manager of the Chicago branch of the New York Lubricating Oil Co., has been appointed sales manager of the motor oil department of the Continental Oil Products Co., Chicago.

—

A. A. Lightfoot has been promoted from the position of Pennsylvania representative of the Marathon Tire & Rubber Co. to that of division manager at Chicago. He succeeds H. F. Smith, who has resigned.

—

V. K. McBride, former assistant sales manager of the Federal Motor Truck Co., has been appointed a captain in the Ordnance Department at Washington.

—

E. M. Sanders Dies

ST. LOUIS, Feb. 4—Ed. M. Sanders, for several years western representative of the Moon Motor Car Co., died suddenly of heart disease in Los Angeles, Jan. 26. Mr. Sanders formerly was in the motor car business in this city.

First Class AA ¾-Ton Trucks Practically Ready

(*Continued from page* 317)

is to enable the Post Office Department to use a slightly smaller engine, as the 42 hp. of the 4-by-5 cylinders is considered too large for ordinary post-office work. It may be said in this connection that the undefined rumors to the effect that the Post Office Department will not use any of the standardized war trucks certainly does not apply, at least to the Class AA job, since the Post Office officials and engineers were considered in its design and their recommendations incorporated into the construction laid out.

Aside from the large component parts which were shipped to each of the assemblies by the parts concerns, each assembler furnished a large number of small units such as the brake-rod assembly, clutch-pedal assembly, the fabric universal joint spiders, spring bolts and the like. The Willys-Overland company furnished 130 extra parts in all including spring bolts, pads, clutch and brake pedal units, bumper, draw-bar, etc., exclusive of the wiring system. The Maxwell company supplied a large number of forgings and the spring hangers. Each assembler himself provided small brackets, the spark and control assemblies and a thousand and one small parts which go to make up the completed vehicle.

Will Drive Trucks Overland

According to the plans made known at this writing, it is intended to drive each of the trucks overland to Washington. The Reo job has a Q. M. C. body made by the Auto Body Co., Lansing, Mich., and the Federal job a body made by the C. R. Wilson Co., Detroit.

It is expected that as soon as the vehicles reach Washington and undergo satisfactory tests similar to those performed on the Class A and B trucks, they will be ordered in large quantities. It is expected that the Medical Corps and perhaps the Post Office Department will place the initial orders.

The AA truck can be made in great quantities, and as an indication of the production which can be had with these trucks, Walter E. Flanders of the Maxwell company volunteered the information that his company could build 100 of the trucks a day provided a sufficient number of the parts were made available.

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Current News of Factories

Notes of New Plants—Old Ones Enlarged

Saginaw Malleable Co. Doubles Capacity

SAGINAW, MICH., Feb. 5—The Saginaw Malleable Co. will double its capacity to take care of war contracts by the installation of a new smelting furnace. This will add about 100 more workmen to the 250 already employed.

At the annual meeting of the company held this week the following directors were re-elected: E. J. Lobdell, Henry T. Robinson, George H. Hannum, James J. Kerns, Charles T. Kerry, W. J. Wickes, C. F. Drozeski, who will meet within a few days to elect officers. The present officers are: President and general manager, Charles F. Drozeski; vice-president, W. J. Wickes; treasurer, George H. Hannum, and secretary, Julius B. Kirby. It is probable that they will be re-elected.

—

Larger Quarters for Improved Gauge

SYRACUSE, N. Y., Feb. 4—The Improved Gauge Mfg. Co. has moved to a larger factory at Canal and State streets. The company will increase its production also.

—

Reliance Truck Starts New Plant

APPLETON, WIS., Feb. 5—The Reliance Motor Truck Co., formerly styled Racine Motor Truck Co., has started the construction of the first unit of its proposed new plant here. This will be 76 x 300 ft. It is expected that the work will be completed by May 15.

—

Farm Tractor Now Fond du Lac

FOND DU LAC, WIS., Feb. 5—The Farm Tractor Co., manufacturer of farm tractors and power machinery, has changed its corporate style to Fond du Lac Tractor Co. to avoid confusion arising from the former style.

—

Four Wheel Drive Truck Starts Work

WEBBERVILLE, MICH., Feb. 7—The plant of the Four Wheel Drive Truck Co., a company organized about 6 months ago with $50,000 capital, is now completed and the manufacture of the first 2-ton truck is under way. The officers of the company follow: President and assistant treasurer, Ashmon Catlin; secretary and manager, Frank Young of Webberville; vice-president, F. D. Welfare; treasurer, W. W. Thorbun.

—

Reed Mfg. Co. Elects Directors

KALAMAZOO, MICH., Feb. 7—At the annual meeting of the Reed Mfg. Co., maker of the Reed tractor and steel castings, the following board of directors were elected: Joseph E. Brown, H. C. Lutje, E. H. Smith, B. W. Raseman and J. E. Welborn, Kalamazoo, and E. E. Reed, Oakfield, N. Y. The officers are: President, Joseph E. Brown; vice-president, H. C. Lutje; secretary, J. E. Welborn, and treasurer, B. W. Raseman.

—

Service Truck Elects Officers

INDIANAPOLIS, Feb. 5—At the annual meeting of the Service Motor Truck Co., Wabash, Ind., last week a 3 per cent dividend was declared. Reports show a business of $3,500,000 for the year. Fred B. Walter was elected president of the company; Alex Pence, vice-president; Mole Cook, secretary, and Edward Bridges, treasurer.

—

Columbia Motors to Make Government Trailers

DETROIT, Feb. 4—The Columbia Motors Co., maker of the Columbia 6-passenger cars, has received a big Government order for trailers, with instructions to begin shipments to France as quickly as possible.

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Detroit Aero Club Organized

DETROIT, Feb. 4—The National Aero Model Club has been organized here for the purpose of discussing aviation and solving airplane problems. The officers are: V. C. Babcock, president; A. H. Rembowski, L. Lindblom and E. L. Biechell, vice-presidents, and P. Van Ostenburg, secretary.

—

Capital Increases

SYRACUSE, N. Y., Feb. 5—The Smith Wheel Co., Inc., has increased its capital from $1,000,000 to $3,000,000 and will build several additions to its plant.

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STOCKTON, CAL., Feb. 5—The Holt Mfg. Co. will sell 3968 shares of preferred stock for $396,800 and 5000 shares of common stock for $500,000, the proceeds to be used for the extension and improvement of its plant here and the one at East Peoria, Ill.

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DECATUR, ILL., Feb. 7—The Comet Automobile Co. has increased its capital from $1,000,000 to $3,000,000.

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UTICA, N. Y., Feb. 5—The Genesee Motor Car Co. has increased its capital from $5,000 to $100,000.

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SYRACUSE, N. Y., Feb. 5—The Sanford Motor Truck Co. has increased its capital from $50,000 to $250,000.

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CLINTONVILLE, WIS., Feb. 2—The Four Wheel Drive Automobile Co. has increased its capital from $1,000,000 to $2,000,000.

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LA CROSSE, WIS., Feb. 5—The La Crosse Tractor Co. has increased its capital from $1,500,000 to $2,500,000. The company is working at maximum capacity with a force of 400 men. Within the last year it has doubled its output and is now making extensive additions to its plant.

New Companies Formed

Latest additions to ranks of Automotive Industries

Will Make Airless Tires

KITTANNING, PA., Feb. 6—The Triple Airless Tire Co., a new company capitalized at $500,000, will break ground for its factory next month. The plant will be on a 5-acre lot, and when in operation, 250 men will be employed and 500 tires manufactured daily. Officers have been elected as follows: President, M. Martin, who is also president of the First National Bank, Grove City; A. C. Heilman, vice-president; Fred Daugherty, secretary and treasurer. A. M. McManus, Eau Claire, Wis., has been appointed general sales manager, and the board of directors include Eli Diekel, Ed. Aiken and Sam Sherman.

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Suelflohn & Seefeld Add "Co."

MILWAUKEE, Feb. 4—The Suelflohn & Seefeld Co. has been formed with $300,000 capital, to succeed the partnership business of Suelflohn & Seefeld. The company makes motor car supplies, accessories, hardware, etc. The incorporators are Gustave A., Henry F. and Clarence A. Seefeld.

—

Super-Size Cord Tires Coming

INDIANAPOLIS, Feb. 5—A company headed by P. P. Parker is being organized here to manufacture super-sized cord tires exclusively. The company will be styled Parker Tire & Rubber Co. The organization of the company is well under way. The plant will be located in Indianapolis.

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Dividends Declared

The Standard Oil Co. of New York has declared the regular quarterly dividend of $3 a share, payable March 15 to stock of record Feb. 21.

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Four Wheel Drive Automobile Co., Clintonville, Wis., at its annual meeting declared a stock dividend of 50 per cent. The company is filling a contract for Government military trucks involving about $50,000,000. The dividend increases the capital stock of the corporation from $1,000,000 to $2,000,000. A year ago the capital was increased from $500,000 to $1,000,000. At the meeting J. D. Cotton was elected a director to fill the vacancy caused by the death of John Kalmes, treasurer, several months ago.

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The Union Carbide & Carbon Co. has declared a dividend of $1 a share on its 3,000,000 shares of common stock, payable April 2 to stock of record March 9.

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India Now Good Motor Vehicle Market

High Freight Rates and 82 Cent Gasoline No Deterrent—Big Export Field Opening

BOMBAY, INDIA, Nov. 28, 1917—There is a great demand for automobiles of all kinds in India at present, in spite of the high cost of gasoline, which averages 82 cents a gallon. A government act of 1916 prohibits the importation of motor cars, motorcycles and trucks except for use of the government and persons who have special licenses, but this act will be repealed as soon as the war ends.

Consequently, an unprecedented importation of motor vehicles is expected, not only because the present supply is far less than the demand, but also because native merchants are enjoying a period of prosperity. In addition, the population of India, and Bombay in particular, is increasing rapidly, and the present means of transportation are inadequate.

On account of the great demand and high freight rates prices are high. A Ford car sells for the equivalent of $1,100 and the Scripps-Booth 2-passenger, advertised for $935 in the United States, brings $1,600. Freight, which costs $123.28 a ton via New York and the Asiatic or City Lines to Bombay, naturally hurts the cheap car more than the expensive one.

Streamline Bodies Popular

Residents of Bombay who are in the market for passenger cars prefer the streamline, torpedo body. French gray is the most popular color, with dark shades a close second. Many natives like gaudy colors and have their cars painted to suit themselves. As a result, some startling effects of combined blue and scarlet, orange and black, peagreen and lavender and pink and sky-blue may be seen here.

Cars should have a one-man top, covered with good waterproof khaki, as the monsoon rains beat their way through an ordinary top leather upholstery and brass trimmings are best. The native helper loves any work which he can perform while sitting down and will polish bright work by the hour. As little discretion is used in the selection of a polish, a nickel finish will soon disappear.

Most people in India prefer the touring body, and if there are extra seats these should face the rear seat. The latter, to please the native, must be wide and low, with deep upholstery.

Two Brakes Necessary

The motor laws of Bombay require two brakes, hand and foot, on the rear wheels, two head lamps, tail lamp, and side lamps which throw light on the center of the front fenders. Headlights must be dimmed for city driving and no mechanical or electric horns may be used. In spite of the fact that the left-hand drive is customary in England, India prescribes the right-hand drive, although there are a few instances of left-hand drives being permitted by the police.

In regard to engines, the 4-cylinder engine, 15-20 h.p., with detachable head and overhead valves, is most used. Gear boxes should be separate units and installed in the middle of the chassis. High-tension magnetos are demanded and electric starters are coming into vogue, as most dealers have fully-equipped repairshops and can take care of electric equipment.

Small Gear Ratios

Bombay's topography makes small gear ratios, from 3½-1 to 4-1, necessary, and normal tread cars with chucker tires in metric sizes are most desired.

At present 1½, 4 and 6-ton trucks are popular, the two larger sizes being used for the transport of cotton. These have chain drive and the smallest size worm drive. As Bombay is very hot, extra large radiators with fan and pump are necessary. Tail and side lamps are required, the latter used to show as far as possible the width of the car, which is limited to 6 ft. 7 in. Trucks should have demountable, solid tires.

At present there are 12 agencies in Bombay carrying 19 American cars and 4 American trucks, and 11 agencies for 23 foreign cars and 5 trucks. Seven makes of tires are sold, each by a separate agency.

The complete list follows:

American Cars

Name	Agent
Overland and Willys-Knight	A. Hyland
Briscoe	A. H. Wheeler & Co.
Chevrolet and Oakland	Bombay Garage
Ford	Ford Automobiles, Ltd.
Pullman	Omiar Motor Works
Metz	L. Roysampat
Buick and Saxon	Hill, Sawyer & Co.
Studebaker	French Motor Car & Electric Co.
Moline-Knight,	French Motor Car & Electric Co.
Hudson and Regal	Bombay Motor Car Co.
Dodge	Bombay Cycle & Motor Agency
Scripps-Booth, Chalmers and Maxwell,	The Automobile Co., Ltd.
Oldsmobile	Hormusji Sorabji

Trucks

Garford	Hill, Sawyer & Co.
Federal	French Motor Car & Electric Co.
General Motors	Bombay Motor Car Co.

Foreign Cars

Sunbeam, Austin, B. S. A., Morris, Cowley,	A. Hyland
Calthorpe	A. H. Wheeler & Co.
Napier, Metallurgique	Marcks & Co.
Woolesley, Vickers	Woolesley Motors, Ltd.
Alpha	Ford Automobiles, Ltd.
Rolls-Royce	Rolls-Royce, Ltd.
Crossley	F. W. Barlow
Mors, Minerva, Berliet,	French Motor Car & Electric Co.
Panhard, Blanchi,	French Motor Car & Electric Co.
Rover, Daimler, Fiat	Bombay Motor Car Co.
Charron, Swift	The Automobile Co., Ltd.

Foreign Trucks

Halley	Automobile Co., Ltd.
Thorneycroft, Stellute, Woolesley	A. Hyland
Dennis Bros.	Turner, Hoare & Co.

Tires

Goodyear	Goodyear Tire & Rubber Co.
Goodrich	F. & L. Barraclough
Michelin	French Motor Car & Electric Co.
Dunlop	Dunlop Rubber Co.
Avon	L. Rochat & Co.
Wood-Milne	Turner Morrison & Co.
Dayton Airless	P. Muncherji

—

War Trade Board Issues New Rulings

WASHINGTON, Feb. 1—American corporations, established and doing business in neutral or allied countries, have been authorized by the War Trade Board:

1. To receive in payment of indebtedness, and to collect drafts or checks drawn or endorsed by "enemies" or "allies of enemies" where refusal to accept the same may result in failure to collect the debt.
2. To pay drafts or checks drawn in favor of, or endorsed by, "enemies" or "allies of enemies" where refusal to pay the same will result in a violation of law or commercial obligation;
3. To receive for collection drafts or checks drawn by, or accepted, or endorsed by "enemies" or "allies of enemies;" and
4. To become a party to clearing house transactions in the ordinary course of business where an "enemy" or "ally of enemy" may be a member of such clearing house.

Report Each Transaction

A written report of every such transaction of trade with the "enemy" or "enemy allies" shall be mailed to the War Trade Board, Wahington, D. C., on the fifth day of each month, covering the transactions of the preceding calendar month under 1, 2 and 3 above. Such report must state the dates of the respective transactions, the respective names of the drawers, drawees and endorsers, and the respective amounts of the drafts and checks involved. Any United States corporation or other American house joining a clearing house under 4 above shall immediately mail to the War Trade Board, Washington, D. C., a statement of the facts in the case.

Likewise the War Trade Board has authorized branches of American corporations and other American houses established and engaged in business in neutral countries, or in countries associated with the United States in the war, in cases where a lease has been made without knowledge of the "enemy" character of the tenant or landlord, as the case may be:

1. To receive rent from "enemies" or "allies of enemies" where refusal to accept the same will result in failure to collect the debt;
2. To pay rent to "enemies" or "allies of enemies" where refusal to pay the same will result in forfeiture of the lease or damages.

A report of every such lease shall be mailed to the War Trade Board, Washington, D. C., after the discovery of such "enemy" interest. Such report shall state the date when the lease was made, the date when the lease expires, the amount of rental payable, the name or names of the "enemy" tenant or landlord, as the case may be.

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11 More Michigan Plants Exempted

LANSING, MICH., Jan. 31—In addition to those concerns previously exempted from the closing order in Michigan on Monday of every week until further notice, State Fuel Administrator W. K. Prudden has announced further exemptions. These include the Champion Ignition Co., Flint; Hayes Motor Truck Wheel Co., St. Jones; Jackson Motor Shaft Co., Jackson; Mason Motor Co., Flint; Muskegon Motor Specialties Co., Muskegon; Keller Brass Co., Grand Rapids; Lewis Spring & Axle Co., Chelsea; Jackson-Church-Wilcox Co., Saginaw; General Motors Co. and the Weston-Mott Co., Flint, and the Republic Motor Truck Co., Alma.

Hartford Auto Parts Elects Directors

HARTFORD, CONN., Feb. 3—At the annual meeting of the Hartford Auto Parts Co. last week the following directors were elected for one year: J. H. Trumbull, Trumbull Electric Co., Plainville, Conn.; C. C. Chamberlain, Blakeslee Forging Co., Plantsville, Conn.; H. H. Ensworth, L. L. Ensworth & Sons Co., Hartford, Conn.; M. J. Unkelbach, Unkelbach & Perry, architects, New Britain, Conn.; J. M. Carney and H. W. Bigelow, Hartford Auto Parts Co. The old board of directors was re-elected at the meeting and the regular quarterly dividend of 1½ per cent, payable Feb. 15, was declared.

AA Truck Assemblers to Deal with Parts Makers

WASHINGTON, Feb. 2—The Motor Transport Section of the Quartermaster Corps plans to issue contracts for the assembling of Class AA trucks in a manner similar to that used for the assembling of Class A trucks. This means that the assemblers will deal directly with the parts makers.

Airplane Production Offices in Cleveland

WASHINGTON, Feb. 2—Major Harry Shepler, formerly vice-president of the Willys-Overland Co. and now in charge of production for the aviation section of the Signal Corps, is moving his offices to Cleveland and will have charge of government aviation production. In Cleveland he will better be able to supervise airplane work, as a majority of the factories are located in that section.

Unite to Clear Roads

LANSING, MICH., Feb. 5—The Olds Motor Works, the Reo Motor Car Co., and the Auto Body Co. have joined hands, at least temporarily, to form what might be called a snow-shoveling brigade. More than 100 men are now occupied in clearing the roads from Lansing to Detroit, so that cars and bodies may be shipped overland to Detroit and then connect with the military motor truck road from Detroit to Cleveland and Toledo.

Shipping conditions during the last 10 days have become so acute that these concerns had to lease warehouse space, as their plants were being filled with the finished product, which could not be shipped. A few days ago the Reo Motor Car Co. leased part of the Owosso Sugar Co. plant to store 200 trucks and cars. At the Olds Motor Works it was stated that it is not possible to get freight cars and owing to the bad weather passenger cars can hardly be moved by the usual driveway plan. The Auto Body Co., which is furnishing bodies to the Scripps-Booth Co. of Detroit, is also unable to make shipments. It is for these reasons that these companies have combined.

Calendar

ASSOCIATIONS

Feb. 4-7—St. Louis, American Road Builders' Assn. Convention.
April 18-20 — Cincinnati, Fifth National Foreign Trade Convention.
June 5-12—Hot Springs, Va. National Assn. Automobile & Accessory Jobbers.

SHOWS

Feb. 5-9—Greensburg, Pa., Westmoreland Automobile Dealers' Association.
Feb. 5-9 — Twin City Auto., Truck, Tractor and Industrial Exposition, Overland Bldg., Minneapolis Auto Trade Assn. Walter B. Wilmot, Mgr.
Feb. 5-9 — Kalamazoo, Mich., Kalamazoo Automobile Dealers' Assn., Armory.
Feb. 5-9—Binghamton, N. Y. Binghamton Automobile Dealers' Assn., Kalurah Temple. William M. McNulty, Mgr.
February — Peoria, Ill., Peoria Auto and Accessories Dealers' Assn. W. O. Ireland, Mgr.
Feb. 6-9—Lancaster, Pa., Automobile Track Assn., Fidelity Bldg. R. W. Screiner, Mgr.
Feb. 7-13—Portland, Ore., Ninth Annual Dealers' Motor Car Assn., Auditorium. M. O. Wilkins, Mgr.
Feb. 9-16 — Bronx, N. Y., 2d Battery Armory, Bronx Automobile Dealers' Assn. D. J. Barrett, Mgr.
Feb. 11-16—Elmira, N. Y., Elmira Automobile Club. State Armory.
Feb. 11-16 — Kansas City, Mo., Kansas City Motor Car Dealers' Assn., Convention Hall. E. E. Peake, Mgr.
Feb. 11-16—Kansas City, Mo., Third Annual National Tractor Show.
Feb. 11-17 — Toledo, Terminal Auditorium. Toledo Auto Show Co.
Feb. 13-16 — Ft. Wayne, Ind., Automobile Trade Assn., Concordia Gymnasium.
Feb. 16-23—St. Louis, Mo., St. Louis Auto Mfrs. & Dealers' Assn. Robert E. Lee, Mgr.
Feb. 16-23—Albany, N. Y., Albany Auto Dealers' Assn., State Armory.
Feb. 16-24—San Francisco, Cal., San Francisco Dealers' Assn., Exposition Auditorium. G. A. Wahlgreen, Mgr.
Feb. 18-23—Syracuse, N. Y. Syracuse, Automobile Dealers' Assn., State Armory. Harry T. Gardner, Mgr.
Feb. 18-23 — Nashville, Tenn., Nashville Auto Trade Assn., Hippodrome. Henry B. Marks, Mgr.
Feb. 18-23—Grand Rapids, Mich., Automobile Business Assn., Klingman Building. Ernest T. Conlon, Mgr.
Feb. 18-23—Newark, N. J., N. J. Auto Exhibition, Co. G. First Regiment Armory Claude E. Holgate, Mgr.
Feb. 18-23 — Springfield, Ohio, Springfield Auto Trades Assn., Memorial Hall. C. S. Burke, Mgr.
Feb. 18-23 — Waterbury, Conn., United Shows Co.
Feb. 18-23—Duluth, Minn., Duluth Automobile Trade Association. John J. Lane, Mgr.
Feb. 18-23 — Pittsfield, Mass., State Guard, State Armory. James J. Callaghan, Mgr.
Feb. 18-27—So. Bethlehem, Pa., Fourth Annual (cars 18-23; trucks 25-27), Coliseum, J. L. Elliott, Mgr.
Feb. 20-23—Quincy, Ill., First Annual. Armory. L. B. Bartlett, Mgr.
Feb. 23-Mar. 2—Brooklyn, N. Y., Brooklyn Motor Vehicle Dealers' Assn., 23d Regiment Armory. I. C. Kirkham, Mgr. Passenger cars Feb. 23-Mar. 2; Trucks, Mar. 5-9.
Feb. 23-Mar. 2—Omaha, Neb., Omaha Auto. Trade Assn. Auditorium. Clarke G. Powell, Mgr.
Feb. 25 - Mar. 2—Indianapolis, Indianapolis Automobile Trade Assn., Diamond Chain Work Bldg. John B. Orman, Mgr.
Feb. 25-Mar. 2—Muskegon, Mich. Second Annual, Merrill Auditorium. John C. Fowler, Mgr.
Feb. 27-Mar. 2—Columbus, O., Auto Exhibitors' Co. W. W. Freeman, Mgr.
Feb. 27-Mar. 2 — Burlington, Iowa. Cars, Trucks & Accessories.
Feb. 27-Mar. 6—Boston, Mass., Salon, Boston Automobile Dealers' Assn., Copley Plaza Hotel. Chester I. Campbell, Mgr.
Mar. 1-15—Lyons, France, Third Sample Fair.
Mar. 2-9—Boston, Mass., Boston Auto Dealers' Assn., Mechanics' Bldg. Chester I. Campbell, Mgr.
Mar. 2-9—Pittsburgh, Pa., Automobile Dealers' Assn. of Pittsburgh, Motor Square Garden. John J. Bell, Mgr.
Mar. 4-9—Utica, N. Y., Utica Motor Dealers' Association, Inc., State Armory.
Mar. 6-9—Clinton, Ia., Clinton Automobile Dealers' Assn., Coliseum.
Mar. 6-9—Raleigh, N. C., Auditorium. John Kelley, Mgr.
Mar. 6-9—Watertown, N. Y., Automobile Dealers, Inc., State Armory. Arthur E. Sherwood, Mgr.
Mar. 6-9—Mason City, Iowa. Annual Car and Truck. Automobile Dealers' Assn.
Mar. 6-9—St. Joseph, Mo., St. Joseph Automobile Dealers' Assn., Auditorium. John Albus, Mgr.
Mar. 6-9—Sioux Falls, S. D., S. D. Automobile Dealers' Assn.
Mar. 8-11 — Green Bay, Wis., Brown County Automobile Trade Assn.
Mar. 11-16—Cedar Rapids, Ia., Cedar Rapids Auto Trade Assn., Auditorium.
Mar. 12-15—Fargo, N. D., Gate City Auto. Show Co., Auditorium. J. W. Murphy, Mgr.
Mar. 14-16—Fort Fairfield, Me., Reed's Garage. R. F. Reed, Mgr.
Mar. 15-20—Great Falls, Mont., Montana Automobile Distributors' Association, Lexington Garage. A. J. Breitenstein, Mgr.
Mar. 19-23—Vancouver, B. C., Western Canada Automobile Show Assn., Horse Show Bldg. D. A. Hamilton, Mgr.
Mar. 19-24—San Francisco, Cal., Motor Truck Dealers of San Francisco, Auditorium. Ivan R. Gates, Mgr.
Mar. 20-22—Houlton, Me., Second Annual, Houlton, Motor Car Dealers' Assn., Bangor St. Exhibition Hall. J. D. Luth, Mgr.
Mar. 20-23 — Holdredge, Neb., Second Annual of Southwest Nebraska.
Mar. 20-23 — Trenton, N. J., Trenton Auto Trade Assn., Second Regiment Armory. John L. Brock, Mgr.
Mar. 25-30—Bridgeport, Conn., Fourth Regiment Conn. Home Guard State Armory and Casino. B. B. Steiber, Mgr.
Mar. 30-Apr. 6—Hartford, Conn., Eleventh Annual, Hartford Automobile Dealers' Assn., Inc. State Armory. B. F. Smith, Mgr.
Mar. 30-Apr. 6 — Atlantic City, N. J. Second Annual. Garden Pier. S. W. Megill, Mgr.
Apr. 6-13 — Red Bank, N. J., Monmouth County Auto. Dealers' Assn., Armory. E. C. Von Kattengell, Mgr.
Apr. 9-13—Stockton, Cal., Third Annual San Joaquin Auto Trade Assn. Samuel S. Cohn, Mgr.
Apr. 17-20—Calumet, Mich., Upper Peninsular Show, Copper County Automobile Dealers & Garage Owners' Assn., Coliseum.
Sept. 23-28 — Chicago, National Accessory Show for Fords. Coliseum.

ENGINEERING

American Society of Heating and Ventilating Engineers.
Mining and Metallurgical Society of America.

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The Spark Plug
With the One Inch
Firing Surface

A Spark Plug that stands the test of Tractor Service—

will meet superlatively the ignition requirements of any passenger car or truck. Low speed tractor work with kerosene the common fuel—is the supreme spark plug test.

NATIONAL SPARK PLUGS are used exclusively by constantly increasing thousands of tractor owners. Try a set this winter on your passenger car and you will learn the reason.

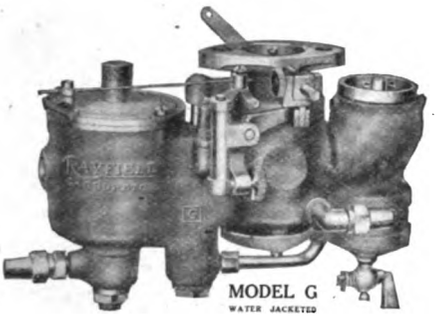
Ideal for easy winter starting, 7 to 10 fat hot sparks insure quicker, surer explosions—a better operating motor under all conditions.

Sold on 30 Days' Trial. Price $1.00 each for all cars. Order of your dealer, or direct if he cannot supply you.

Write for unusually interesting dealers' proposition.

BERGIE NATIONAL SPARK PLUG CO.
ROCKFORD ILL.

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THE Rayfield is acknowledged to be the best carburetor on the market today.

It is best for all makes of cars.

It is best with all grades of fuel.

It is best in all kinds of weather.

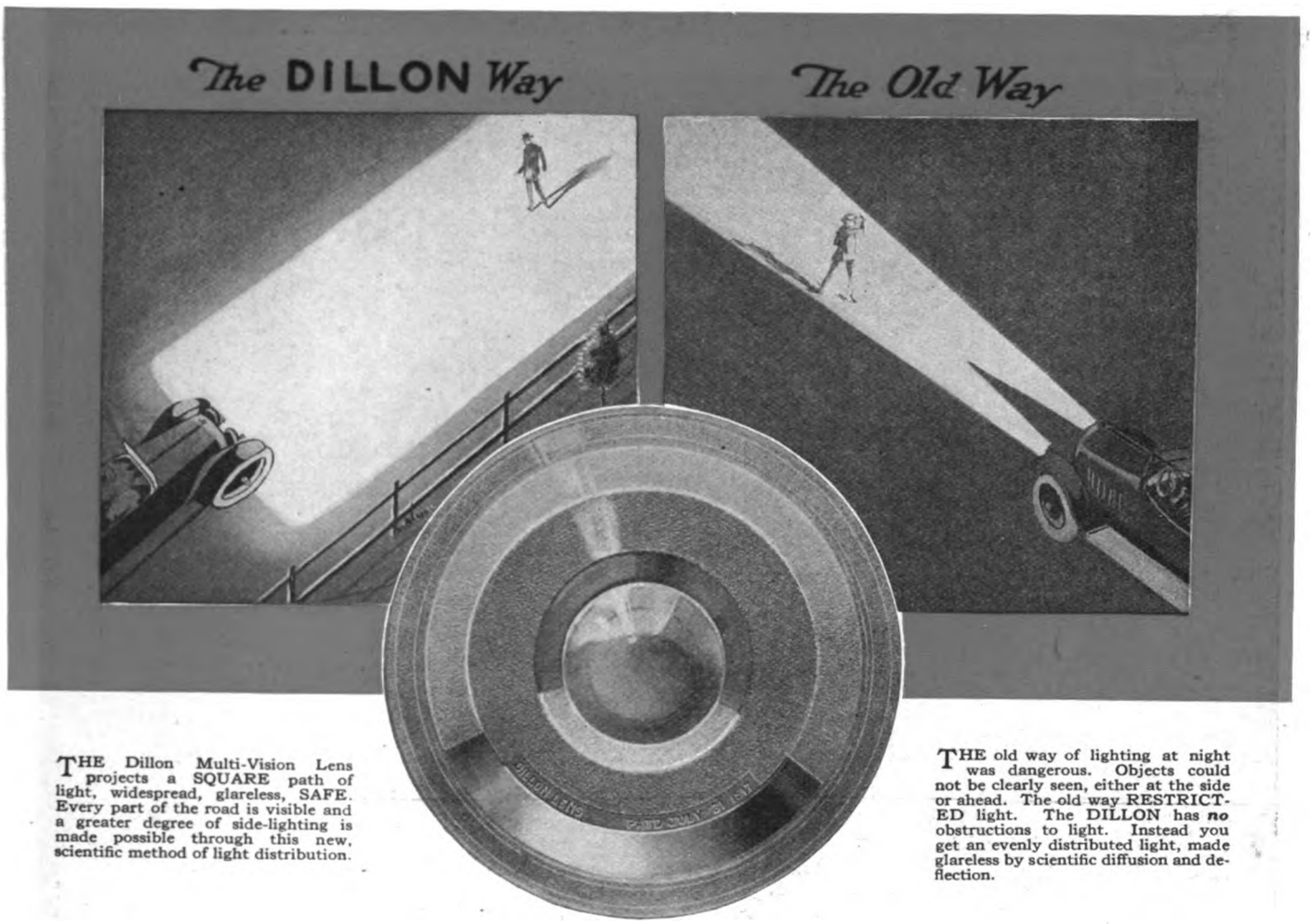
Severe winter driving demonstrates Rayfield superiority. Poor carburetors are at their worst during zero spells.

How has your carburetor been serving you this winter?

Findeisen & Kropf Mfg Co.
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RAYFIELD CARBURETOR

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THE Dillon Multi-Vision Lens projects a SQUARE path of light, widespread, glareless, SAFE. Every part of the road is visible and a greater degree of side-lighting is made possible through this new, scientific method of light distribution.

THE old way of lighting at night was dangerous. Objects could not be clearly seen, either at the side or ahead. The old way RESTRICTED light. The DILLON has *no* obstructions to light. Instead you get an evenly distributed light, made glareless by scientific diffusion and deflection.

Which will you choose?

Why risk your safety, why not ASSURE it? Why drive the old way, why not the DILLON way?

The Dillon Multi-Vision Lens answers the question. Once you have ridden behind it, once you have given it a thorough test under all conditions, then you will be glad you chose the Dillon way of night-motoring.

Only the Dillon can give you a SQUARE path of light, only the Dillon can guarantee you TWICE the lighted area, only the Dillon will give you ALL the light you need without glare.

The Dillon makes driving at night as safe as by day. Legal in city or country. Will not break from contraction or expansion. Sold everywhere for $3.50 a pair, any size. Write if your dealer cannot supply you.

MANUFACTURERS: *Which will YOU choose? Inefficient lenses which bring discredit to you as a manufacturer, or the Dillon Multi-Vision Lens, the SAFEST lens in America, which adds to the prestige of your car. The Dillon is being made known nationally. Have your engineers test a pair. Write.*

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Exclusive Dillon Lens Distributors

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Oliver Bldg., Pittsburgh, Pa. A-2-7

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JUST SIGN AND WE WILL SEND PARTICULARS

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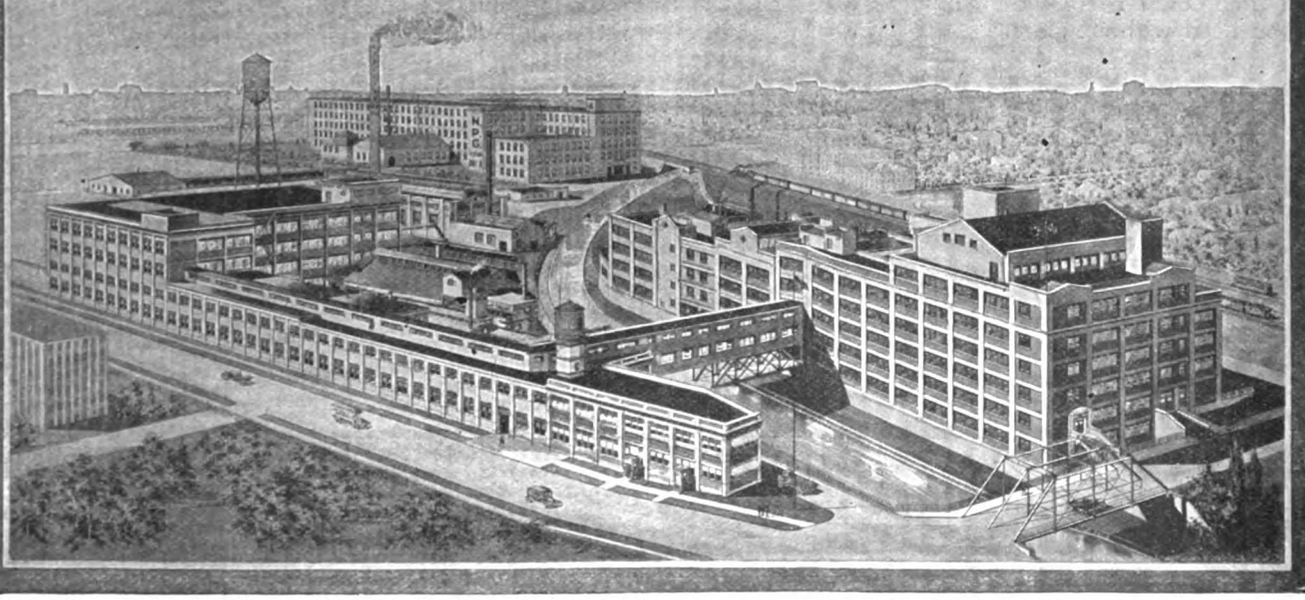
COMPLETE DIFFERENTIALS GEARS FOR TRANSMISSIONS

Gears of any kind made to order in any quantities

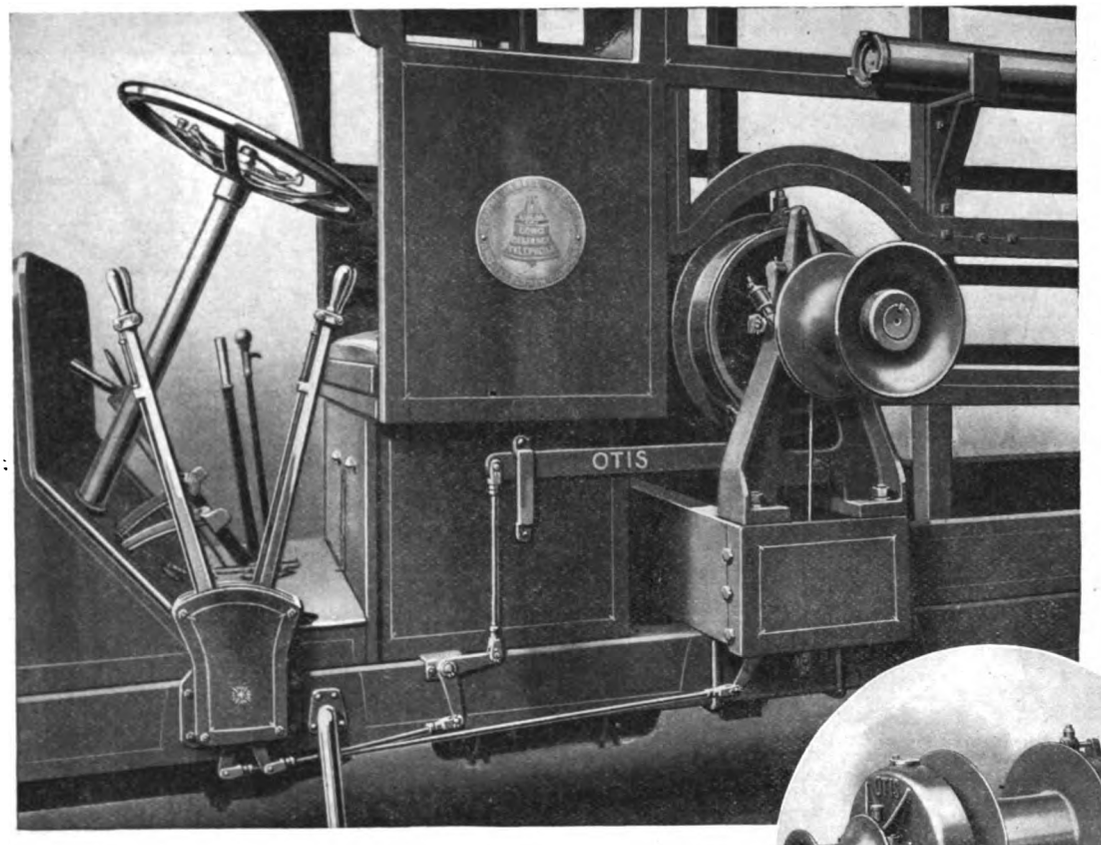
Our enormous plant concentrates entirely on gear work, and the bulk of our output has gone into the automobile field.

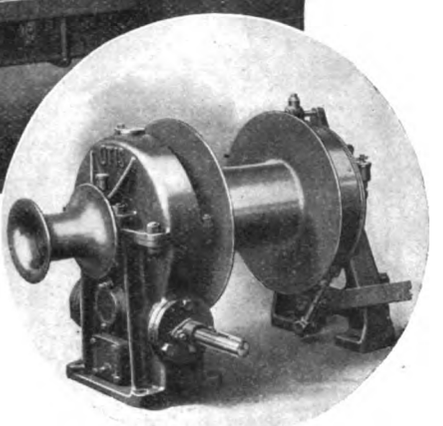
We have the organization, equipment and capacity to meet any automobile truck or tractor manufacturer's requirements with every assurance of prompt delivery as well as quality.

N.P.R.H. NEW PROCESS N.P.R.H.
GEAR CORPORATION
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Increase the Value and Usefulness of Your Trucks by Equipping them with the

OTIS POWER WINCH

What hitherto was accomplished with much labor and the expense of much unnecessary time is now made possible to accomplish swiftly and easily through the use of the Otis Motor Truck Power Winch.

Trucks which hitherto have been used as merely a means of transportation are transformed by the installation of the Otis Power Winch into an elevating, self-loading machine.

The Otis Power Winch can be utilized in numerous practical and effective ways. Good business prompts one to get the utmost efficiency and value from every investment, and your trucks will not be attaining their maximum of utility until they have been equipped with the Otis Power Winch.

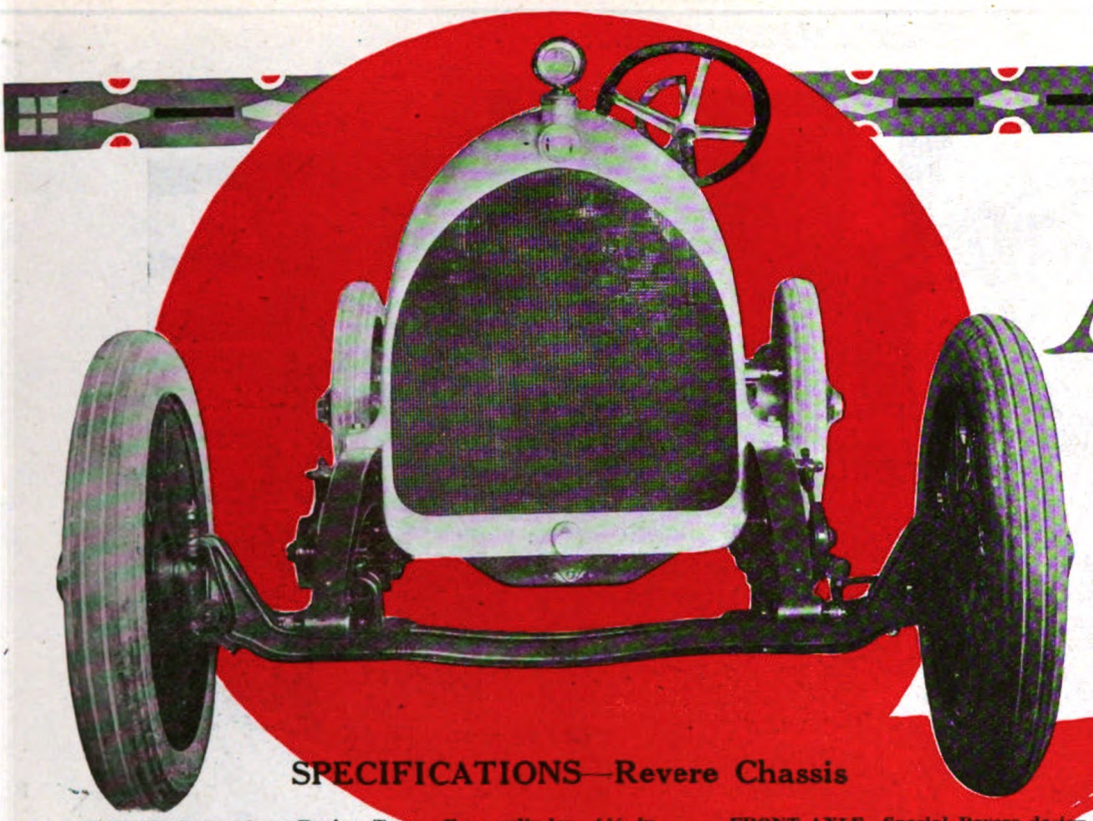
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Industrial Department

OTIS ELEVATOR COMPANY

Eleventh Avenue and Twenty-Sixth Street, New York City

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An

Duesenberg Racing Type Motors. Used in all REVERE CARS. Speed from 4 to 85 miles an hour — 130-inch wheelbase

SPECIFICATIONS—Revere Chassis

ENGINE—Duesenberg Racing Type. Four-cylinder, 4½ in. bore, 6 in. stroke. Develops 103 H. P.

Cylinder—Gray iron and aluminum, cast en bloc.

Crankcase—Aluminum, crankshaft chrome nickel steel, finished all over, counter balanced.

Connecting Rods—Drop forged, heat treated chrome nickel.

Pistons—Special aluminum alloy. All integral moving parts hardened and ground; tungsten steel valves. Oiling system, pressure feed and splash.

Magneto—Bosch high tension.

Clutch—Multiple dry disc; discs faced with non-burn composition.

Starting and Lighting System—Electric Bijur.

TRANSMISSION—Revere design. Four speeds forward and one reverse. Direct drive on fourth. Unit power plant.

Gears—Special alloy steel, hardened and ground on bearing surface; shafts on large ball bearings.

Transmission—Supported on three points, assuring absolute alignment of engine and transmission, drive to rear axle through two universal joints; torque taken up through two rods each side of propeller shaft.

REAR AXLE—Full floating type, spiral bevel gears.

FRONT AXLE—Special Revere design, drop forged.

Knuckles—Extra heavy drop forged chrome nickel steel knuckles and steering connections, all tested to 100,000 pounds, elastic limit, all steering joints ball adjustable type, short turning radius.

FRAME—Special Revere design front and rear kickup.

SPRINGS—Silico manganese special alloy steel, heat treated.

Front Springs—Semi-elliptic.

Rear Springs—Special Revere design, very long, 58 inches long, 2½ inches wide with rebounding springs.

STEERING GEAR—Worm and gear type, all gears and shafts hardened and ground and adjustable for wear, in all directions. Special Revere design spark and gas control.

CARBURETOR—Miller or Stromberg.

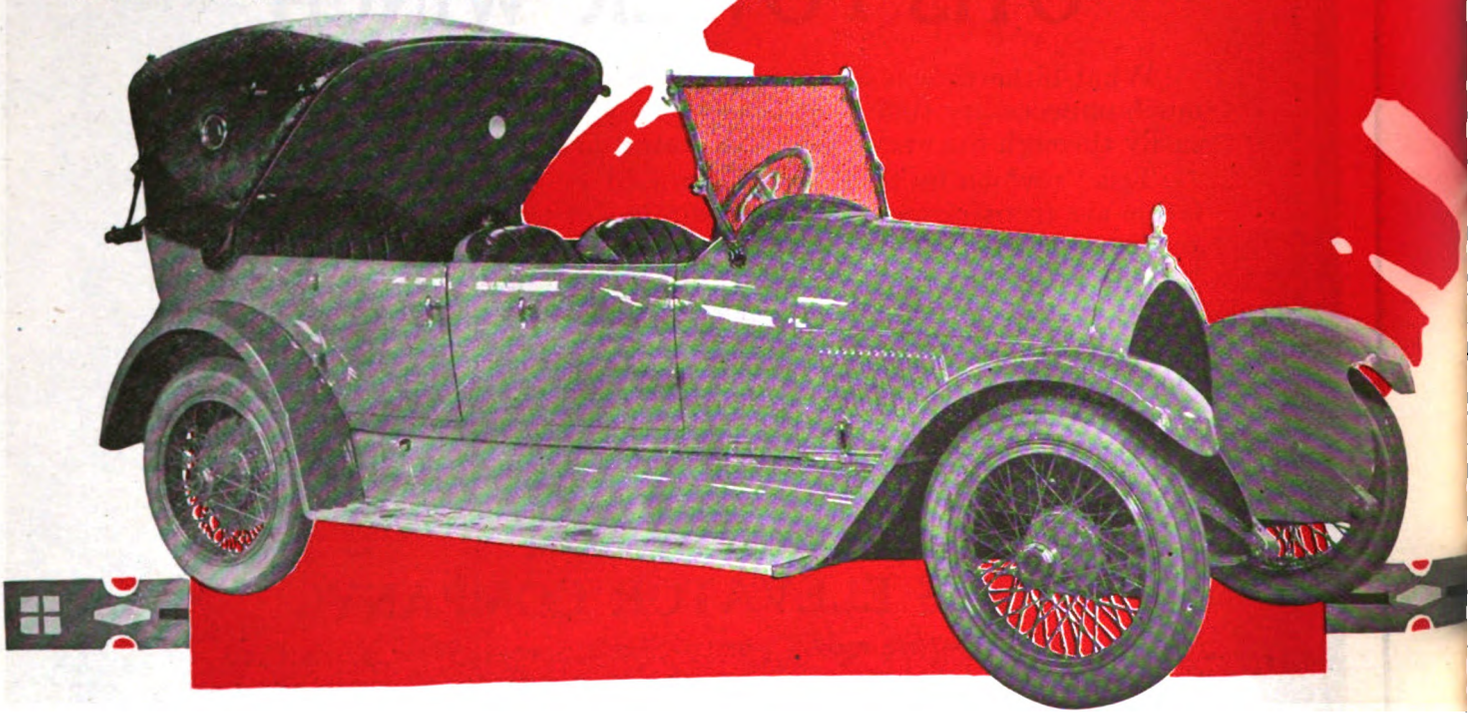
RADIATOR—Exclusive Revere design, honeycomb type, mounted in aluminum shell.

WHEELS—32x4½ wood or wire wheels. Tires 32x4½ Goodyear Cord.

WHEELBASE—130 inches.

BODY—Speedsters, six-passenger Touring Car and four-passenger Sport style.

Car Complete, $3500—$3850 f.o.b. Logansport, Ind.



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nouncing *the* REVERE

With DUESENBERG Motor-All Standard Body Sizes

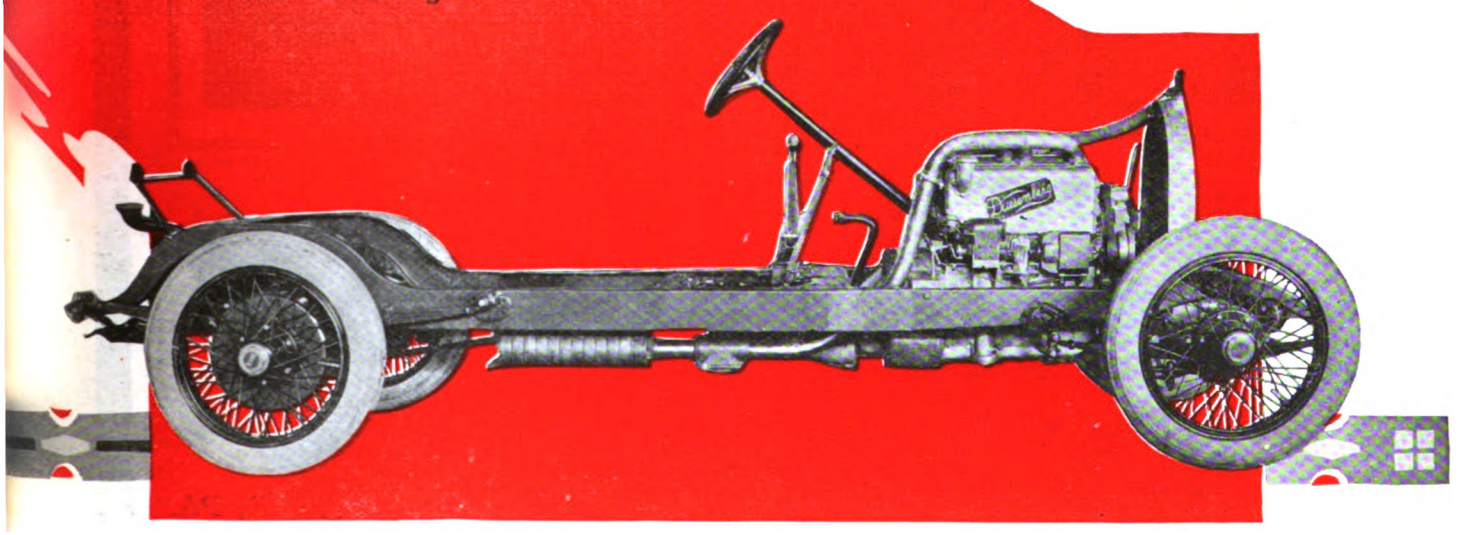
Designed by

GIL ANDERSON, ADOLPH MONSEN and TOM ROONEY

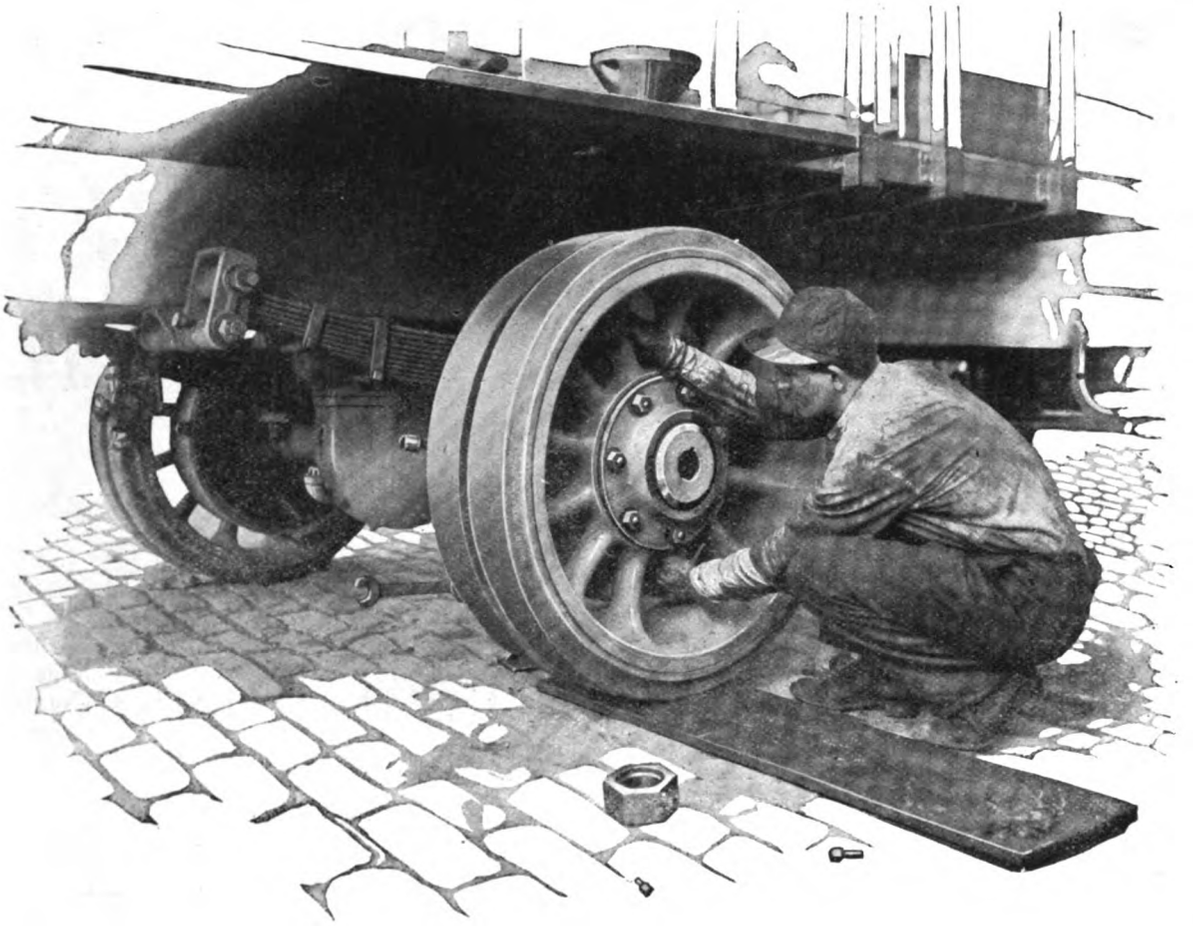
Offering a select number of big calibre dealers in the larger population centers a connection of unusual possibilities. Due to limited output for 1918 we urgently advise getting in touch with us at once. Wire or write for full information.

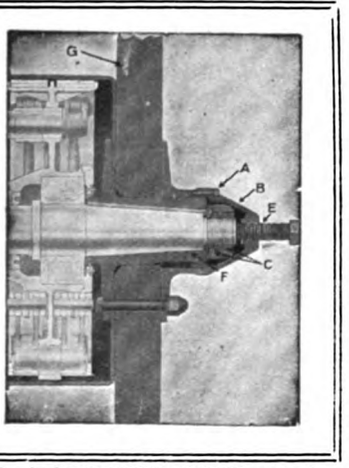
REVERE MOTOR CAR CORPORATION
1638 Monadnock Block CHICAGO
Factory—Logansport, Ind.

CAR OWNERS
Write for Catalog



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Ready demountability of Sheldon wheel hub. Remove parts A, B, and C, replace B (hub cap), insert E (set screw), and screw against shaft. Tap back of wheel G till it comes loose.

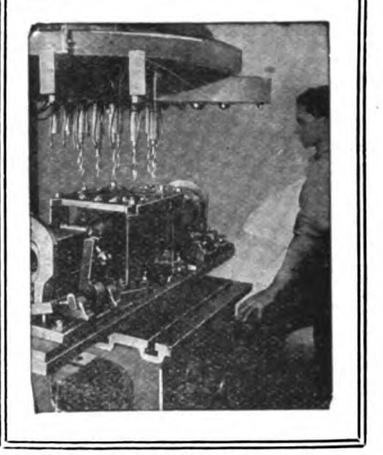
This Giant Wheel Can Be Quickly Removed

from the Sheldon Worm Gear Axle. There are only six simple operations necessary and these can be performed in a few minutes by an ordinary workman.

Most large truck users insist that, as a matter of precaution, the rear wheels be removed frequently for inspection. This is accomplished with the utmost facility on the Sheldon Axle and without exposing the ball bearings to dirt and grit because they are completely enclosed.

Sheldon Worm Gear Semi-floating Rear Axles are the highest possible expression of service and utility.

Write for complete details.



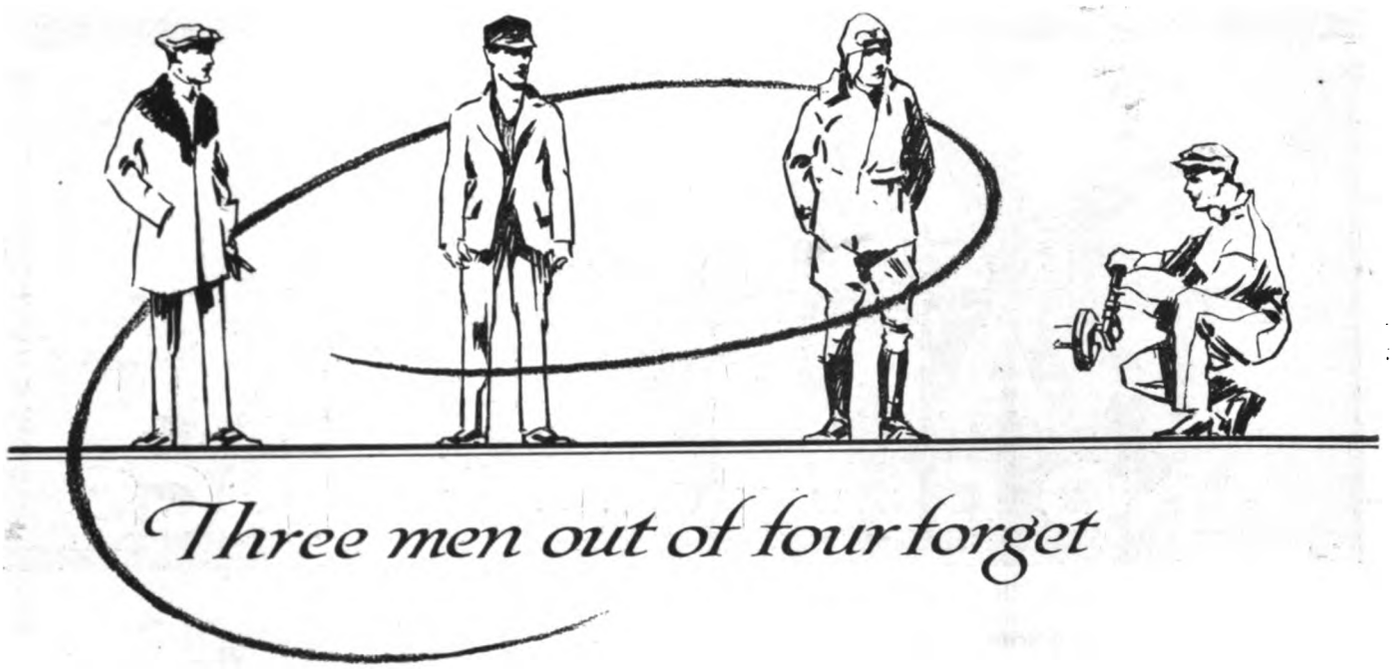
Drilling 12 stud holes at once in a worm-gear axle housing.

SHELDON

WORM GEAR AXLES

SHELDON AXLE & SPRING CO. *Makers of springs and axles for heavy duty service for more than fifty years.* WILKES-BARRE, PA.

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IT is important to remember that the service life of a car, and in fact machinery of all types, is determined by the life of its bushings.

It is likewise important to remember that the service life of a bushing is determined by the amount of proper lubrication is receives.

Experience proves that three out of four drivers of cars, or operators of machinery, forget or neglect to lubricate the most important bushings.

The reason is that many of these bushings are hidden in out-of-the-way places that are difficult or impossible to reach.

For this reason far-sighted manufacturers of trucks, passenger cars, and builders of machinery of all types use Genuine Graphited Oil-less Bushings in these out-of-the-way bearing places most liable to neglect. In this way they safeguard and prolong the service life of their products.

Should you neglect an *oil-less* bushing, no harm will result. Its efficiency or service life will not be affected. It is *self* lubricated. It represents a form of insurance against neglect and quick wear.

We also manufacture Nigrum (Impregnated hardwood) oil-less bushings.

BOUND BROOK OIL-LESS BEARING COMPANY

Specialists in the manufacture of Oil-less Bushings for more than a third of a century.

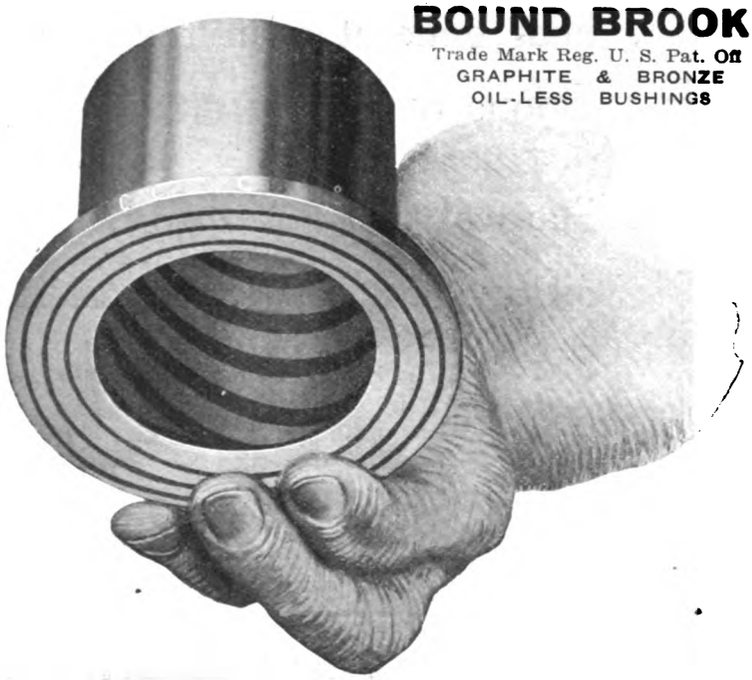
BOUND BROOK, NEW JERSEY

All Genuine Graphited Oil-less Bushings have always been made at Bound Brook, U. S. A.

NIGRUM
Trade Mark Reg. U. S. Pat. Off.
IMPREGNATED WOOD
OIL-LESS BUSHINGS



BOUND BROOK
Trade Mark Reg. U. S. Pat. Off
GRAPHITE & BRONZE
OIL-LESS BUSHINGS



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STANWAL
BRAKE LINING
AND CLUTCH FACINGS

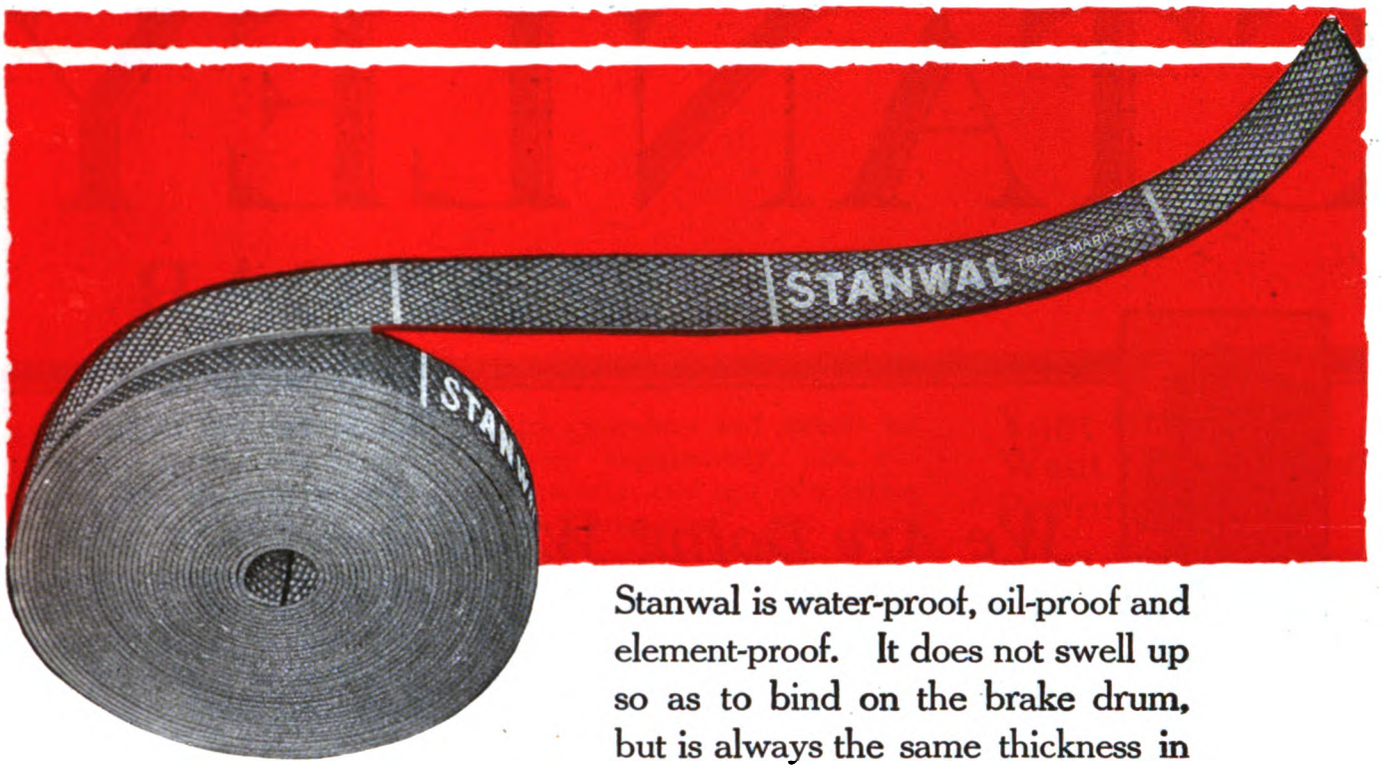
STANWAL marks a distinct advancement in manufacture. It is an engineering achievement — an invention which has revolutionized the quality of brake linings for pleasure cars and trucks.

Tested by impartial experts, Stanwal is pronounced perfect in performance. It withstands the frictional heat generated in the brake drums under any conditions of service.

Stanwal will not absorb moisture. It is unaffected by oil and water. It is noiseless under severe pressure. It averages a plus 25 per cent wearing quality.

Please mention Automotive Industries when writing to Advertisers

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Stanwal is water-proof, oil-proof and element-proof. It does not swell up so as to bind on the brake drum, but is always the same thickness in relation to the brakes.

STANWAL improves with use. This is made possible by the exclusive, scientific treatment which is given to every foot. As a result of this treatment a high frictional quality is given to the fabric, and as the frictional pressure is applied the heat-resisting quality increases.

Write for our descriptive booklet, "Safety at a Saving"

STANDARD WOVEN FABRIC CO.
WALPOLE, MASS.

New York Branch and Export Office, 1834 Broadway
Chicago Branch Office, 1430 Michigan Avenue
Detroit Branch Office, 306 New Telegraph Building
Philadelphia Branch Office, 406 Colonial Trust Co. Building

OTHER STANWAL PRODUCTS

Multibestos Brake Lining and Clutch Facing
Stanwal Friction and Insulating Tapes
Splicing Compounds
Cable and Specification Tapes
Tire Tape
Moulded Rubber Goods
Stanwal Matting
Stanwal Rubber Heels
Stanwal Fiber Soles

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STANLEY

STEAM 22nd year CAR



The Power That Moves the World

We Are Doing What All Other Makers Are Struggling in Vain to Do

We are making a car which runs with a soft, smooth, gliding motion —without any noise or vibration at any speed—without any shifting of gears—and with a driving power which is absolutely uniform and continuous—and whose fuel is kerosene. But far beyond that, we are doing

What No Other Maker Is Even Attempting to Do

We are delivering this absolutely uniform and continuous driving power without any gears to shift, without clutch, flywheel, carburetor, ignition system or self-starter, and without any substitute devices to perform the functions of these. The functions themselves are simply not a part of the Stanley car. And we are doing it with

Only 32 Moving Parts in the Complete Vehicle

—with only two cylinders, with only 894 revolutions a minute at sixty miles an hour, and with no controlling device whatsoever except a finger throttle. There is absolutely nothing for the operator to do to control the speed of his car except to move this finger throttle forward and back on its quadrant, and apply the brakes. This is the ideal performance that you have been longing for.

Other makers have recognized your longing, and have made honest endeavors to achieve the ideal. But the limitations of the internal explosive engine are such that to adapt it to a self-propelled road vehicle means the interposition between the engine and the driving wheels of a clutch, a flywheel, a gearshift and a transmission; and without any possibility of storing power except in the flywheel.

It means trying two, four, six, eight and twelve cylinders; it means trying electric gear shifts, electric final drives, friction drives, two-speed rear axles, over three thou-

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sand engine revolutions and upwards of thirty thousand piston revolutions a minute.

Makers of multiple cylinder cars, recognizing the fundamental superiority of steam for self-propelled road vehicles, have advertised that their cars were "almost as flexible as steam."

The Ideal Performance of the Stanley is based on three fundamental facts. First, the engine is geared directly and permanently to the differential; the engine speed is the same as the car speed; there is no such thing as shifting gears, and therefore no such thing as a clutch or a flywheel and no such thing as disconnecting the power from the load; to "change speeds" you merely admit more steam to the engine.

Second, the steam enters the cylinders and exerts its force expansively, not explosively, and not in a series of "impulses," not even "overlapping impulses," but in a smooth, continuous torque on the crankshaft, which means a constant flow of driving power.

Third,

The Fuel, Which Is Kerosene

is converted, not into mere instantaneously dissipated power, but into steam, which is stored in advance in great abundance, and can be instantly applied to the driving wheels by merely opening the finger throttle, without waiting for the power to be built up into a flywheel, and which delivers its very maximum of power under the most adverse conditions.

Your Customers Want This Wonderful Performance

—they would want it, even if it were achieved by the addition of still more contrivances to their present conventional car. How much more, then, do they want it if it is achieved by eliminating all those hardships and handicaps which have been most fearsome to them?

Ride in a Stanley—drive it yourself. Then and then only can you realize what this Stanley performance means to experienced motorists.

You don't want to miss getting your customers *exactly what* they have been longing for by overlooking the Stanley, do you? We shall be glad to hear from you, and to send our booklet.

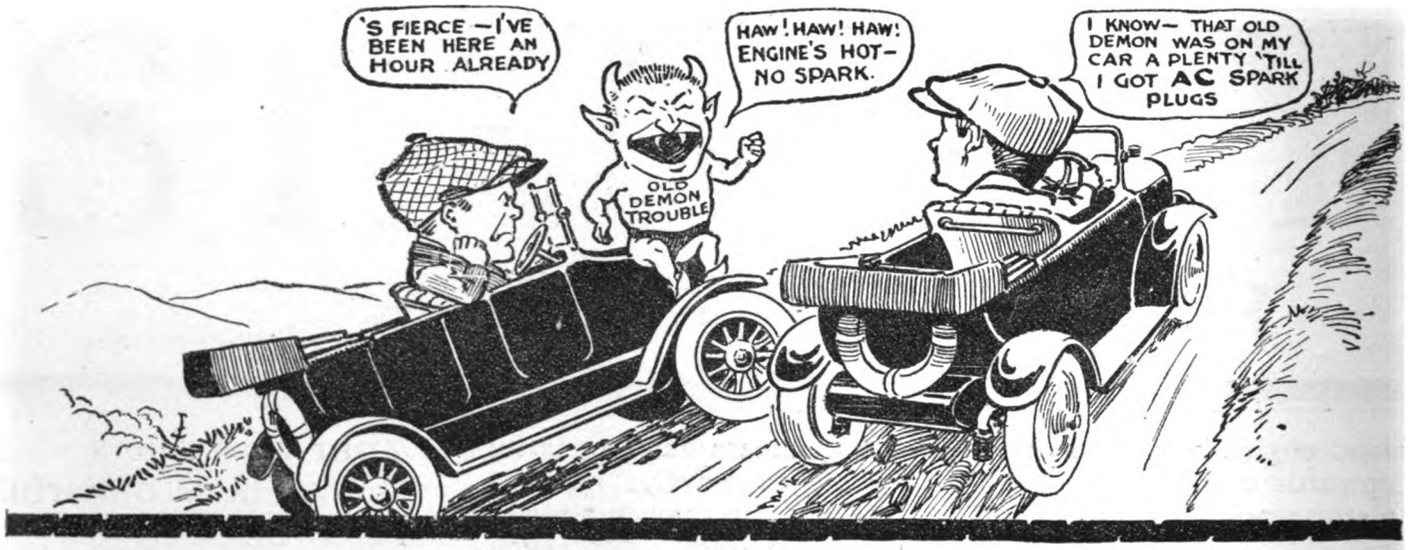
STANLEY MOTOR CARRIAGE COMPANY

NEWTON, MASSACHUSETTS

The Stanley Touring Car is $2600, f.o.b. Newton, Mass. Wire Wheels $100 extra. Wheelbase, 130 inches—Tires, 34 x 4½ Goodyear Cord—Warner Speedometer—Timken Bearings and Front Axle—Klaxon Horn—Warner Steering Gear—Mayo Radiator—Aluminum Body—Valentine Varnish—12 Miles to the Gallon of Kerosene—200 Miles to a Tank of Water.



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These Manufacturers Use AC as Standard Equipment

Cadillac
Pierce-Arrow
Packard
Marmon
Hudson
Chalmers
Hupmobile
Chandler
Haynes
Chevrolet
Locomobile
Disbrow
Dorris
Dort
Cole
Reo
Paige
Peerless
Pilot
McFarlan
Paterson
Monroe
Singer
Hatfield
Case
Delco-Light
Murray
Economy
Jordan
Liberty
Jackson
Apperson
Anderson
Phianna
McLaughlin (Canada)
Gabriel Trucks
Federal Trucks
American-La France
Menominee Trucks
Wisconsin Trucks
Sandow Trucks
Stewart Trucks
Robinson Fire Truck
Advance-Rumely Tractor
Gramm-Bernstein Trucks
Lombard Tractors
Buick
Oakland
Oldsmobile
Nash
Kissel Kar
Premier
Knox
White
Daniels
Westcott
Duesenberg
Lexington-Howard
Scripps-Booth
Crane-Simplex
Stearns-Knight
Saxon
Stutz
National
Velie
Stephens
Dodge Brothers
Henderson Bros
Case Tractors
Signal Trucks
Maxim Trucks
Acme Trucks
Riker Trucks
Wilcox Trux
Republic Trucks
Four Wheel Drive
Netco Trucks
Sterling Trucks
Diamond T Trucks
G.M.C. Trucks
Old Reliable Trucks
Brockway Trucks
Moreland Trucks
Samson Tractors
Titan Trucks
La Crosse Tractor

DO you know that poor insulation leaks electricity when it becomes hot? And the hotter it is the more it leaks. That is why many cars will sputter and die on hills when the same model—AC equipped—will scoot by on high.

AC SPARK PLUGS

As a progressive *dealer* you should not run the risk of injuring your trade by keeping a stock of ordinary Spark Plugs! There's such an easy way to build up a steady, satisfied patronage by simply supplying AC exclusively.

Your judgment will have the backing of all these leading engineers. Read the list and see the *national* endorsement of AC Plugs.



AC Carbon Proof
For Fords
Overlands and
Studebakers

The Standard Spark Plug of America

Champion Ignition Company

Sole Manufacturers, Flint, Mich.

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Please mention Automotive Industries when writing to Advertisers

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"—and yet Mason Tires sell at popular prices."

MASON
MEANS
MORE
MILEAGE





BUILT to ENDURE

MASON TIRES, like the ancient Egyptian temples, are built to endure.

From the inner layers of carefully selected fabric to the outside tread, MASON TIRES are built to endure the shocks and strains of the road.

Their perfectly balanced construction and extreme resiliency make for big mileage records at low cost.

THE MASON TIRE AND RUBBER CO.

Factory and Home Office, Kent, Ohio

Distributing Branches:

Cleveland	Chicago	New York	Kansas City
1806 Euclid Avenue	2120 Michigan Avenue	28 W. 63d Street	1732 Grand Avenue
Buffalo	**Atlanta**		**Akron, O.**
834 Main Street	21 Houston Street		34 W. Market Street

The wide-awake, progressive Mason selling plan is mighty profitable to the dealer. Your request will bring full selling details of this popular-priced quality tire.

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MERITAS LEATHER CLOTH

The Leading Leather Substitute for Automobile Manufacturers

MERITAS Leather Cloth is the accepted quality standard by which other leather substitutes are judged.

Long experience in manufacturing these goods, the largest and most modernly equipped plants (five of them) and a complete knowledge of your automobile top and upholstering requirements enable us to deliver satisfaction with every piece of MERITAS Leather Cloth.

No matter what weight, color, grain or finish you require in a quality leather substitute you will find it in the MERITAS Leather Cloth line.

Always look on the back of the goods for the MERITAS trademark.

Samples on Request

Please state your requirements

The Standard Oil Cloth Company

INCORPORATED

320 Broadway, New York

DEPT K.

MERITAS STANDARD OTC COMPANY LEATHER CLOTH

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PROMPT DELIVERY

We are now in a position to make quick deliveries of the **E. C. & M.** Automatic Compensator. Remember you push the button and the Automatic Compensator starts an alternating current motor without danger to motor or to the machine driven by the motor.

Write for Bulletin



THE ELECTRIC CONTROLLER & MFG. CO. CLEVELAND, OHIO

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Immediate Deliveries

WISCONSIN AXLE

WORM DRIVE

Act NOW to provide against a possible shortage of worm-drive axles in 1918.

Protect yourself against a curtailment in your present source of supply.

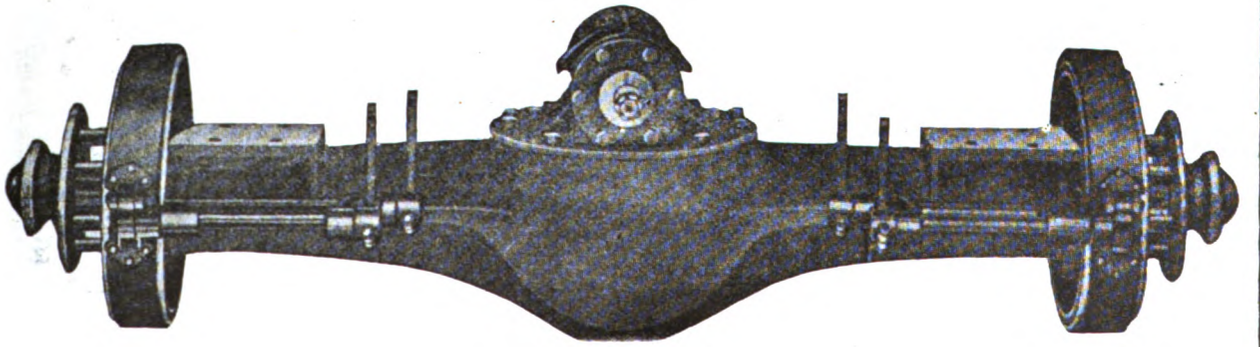
We have increased our facilities to accommodate you—and a few other foresighted truck manufacturers.

Let us show you what the six truck concerns we are now serving think of our product and service. Write us.

Sales Representative of
E. B. Hayes Machinery Corporation
Oshkosh, Wis

Engineering & Sales Corporation
122 South Michigan Avenue, Chicago, Ill.

4 Models — 2½, 2, 1½ and 1 ton Capacity.



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BOYCE MOTO METER

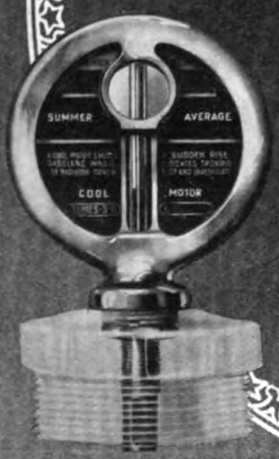


STANDARD MODEL
In beautiful black gloss enamel with heavy beveled glass crystals protecting the instrument. Price $10

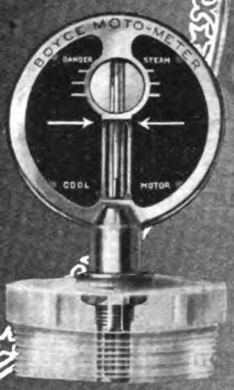


OVERLAND MODEL
Same as Standard Model, but specially constructed to fit the radiator of Overland and Willys Cars. Price $10

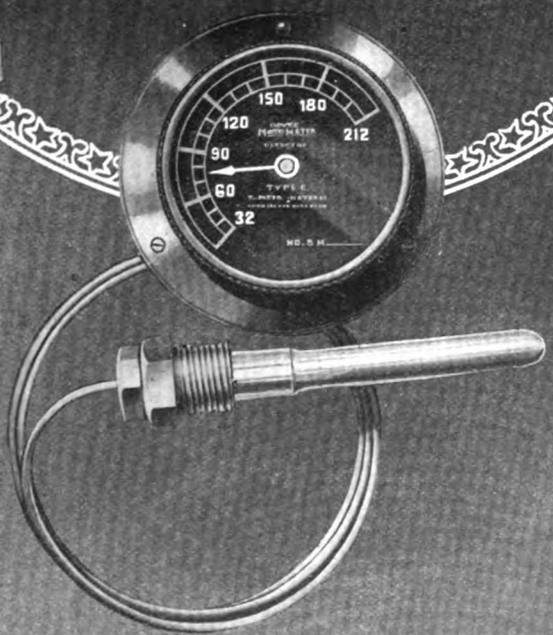
JUNIOR MODEL
With heavily nickel-plated rims adapted for medium priced cars. Price $5



DISTANCE TYPE
For Airplanes, Tractors, Stationary Engines and Motor Boats. Absolutely accurate and reliable weight with 12 ft. of tubing, 12 oz. Price $30



MIDGET MODEL
With heavily nickel-plated rims, suitable for small cars, such as Fords, Maxwells, etc. Price $2.50



THE MOTO-METER CO., Inc. Long Island City, N. Y., U. S. A.

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Many Kinds of Economy With Firestone Tubes

ONE of the strongest factors for extra measure of tire mileage is the protection given the casing by the enduring liveliness of the Firestone Red Inner Tube. It is built, layer on layer, by the laminating process, into one integral unit of endurance against heat and grind. This tube means for the man who sells it, the lasting economy and long-time dividends of good will.

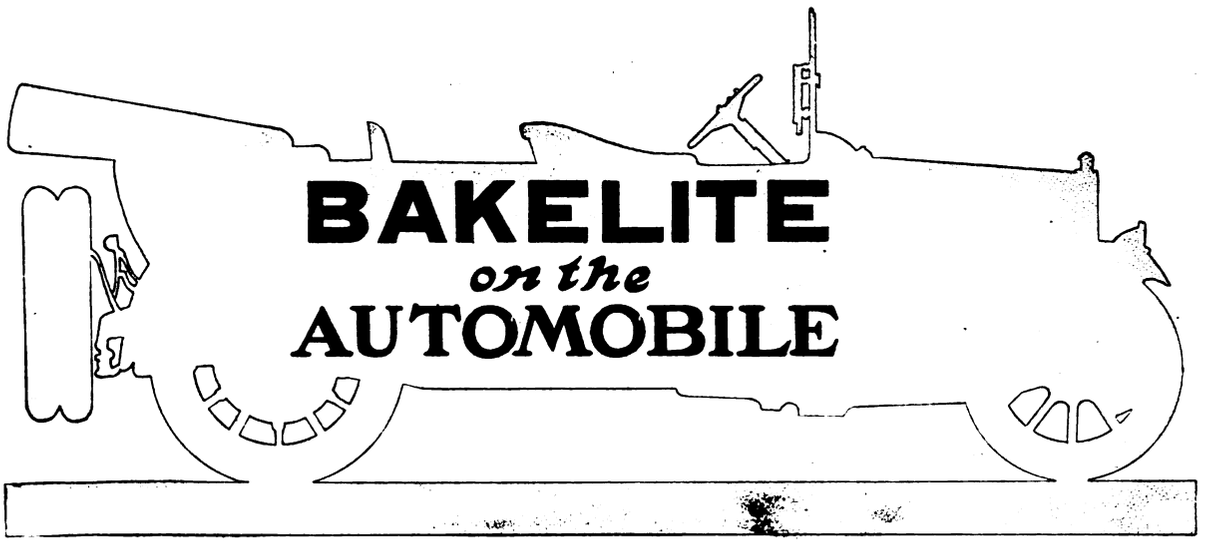
Firestone Red Tubes sell best because they serve best. The prices are eye-openers on all the Firestone values. The facts will be plain to any motorist who buys Tire Accessories. If a Firestone Tube, which anybody can judge on sight, can be so good and yet sold so low, Firestone Tire Economy must be a fact.

Write for the Firestone sales-helps.

FIRESTONE TIRE AND RUBBER COMPANY, AKRON, OHIO
Branches and Dealers Everywhere



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BAKELITE *on the* AUTOMOBILE

Good Places for BAKELITE

Bakelite has proved an unqualified success in the automobile field because of an unusual combination of qualities possessed by no other material.

Bakelite is ideal for Steering Wheels, Dial Plates, Radiator Caps, Distributors, Commutators, and other parts of Electric Starting, Lighting and Ignition Systems.

BAKELITE

Is not affected by heat.

Is mechanically strong and chemically inert.

Is not affected by water, steam, oils, solvents, or ordinary chemicals.

Automatically assumes a polish in the process of moulding.

Can be economically moulded with metal inserts.

All pieces come from the dies in exact duplicate.

Let us have your specifications and we will tell you just how Bakelite can be utilized to meet your requirements.

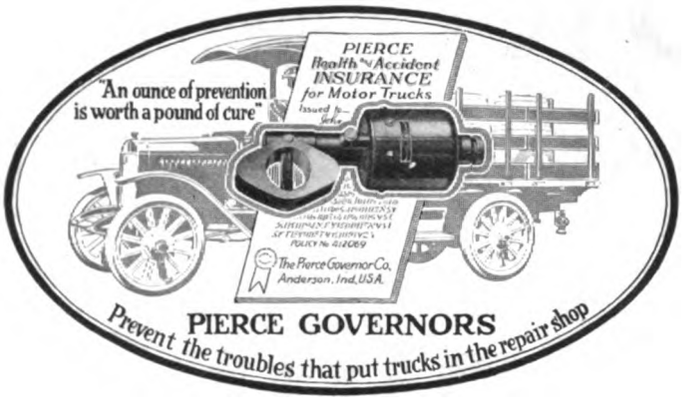
GENERAL BAKELITE COMPANY

2 RECTOR STREET NEW YORK

55-171

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Making Trucks Last Longer



Pierce Governors

The Truck Industry's Chosen Standard

A RELIABLE speed-limiting mechanism is as necessary on a motor truck as rubber tires or steel springs, if maximum durability and economy are to be realized. Excessive motor and tire wear, excessive fuel and oil consumption, high maintenance cost, and 76 per cent. of all accidents and collisions are the results of fast driving.

The best proof of the efficiency of the Pierce Governor is found in the number and standing of the truck manufacturers who use it. According to the recent compilations of specifications by trade journals, Pierce Governors are standard equipment on more truck models than the next two popular makes of governors combined. Pierce Governors limit the speed without limiting the power of the vehicle. Quickest acting governors made. Do not affect carburetor adjustments. Trouble-proof and fool-proof. Adjustments sealed to prevent tampering. Approved by the U. S. Government for use on army trucks.

Dealers who sell Pierce-equipped trucks do not have their customers continually demanding unnecessary and unprofitable service—the governor protects the trucks, makes speeding impossible and reduces upkeep cost to a minimum.

Standard Equipment on Seventy-One Prominent Makes of Motor Trucks

The Pierce Governor Company

World's Largest Governor Builders

Anderson :: Indiana, U. S. A.

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DRIDEK—

With the Leather Finish

TRADE DRIDEK MARK REG.

DrideK with its leather finish, is an entirely new creation, based on many years' experience in furnishing tops and upholstery for the majority of the cars that have been put on the market.

DrideK looks as well as the best of leather. The distinguishing features in the wear of DrideK are: that you cannot scratch the finish; that it retains its color until entirely worn out; and that it is absolutely waterproof.

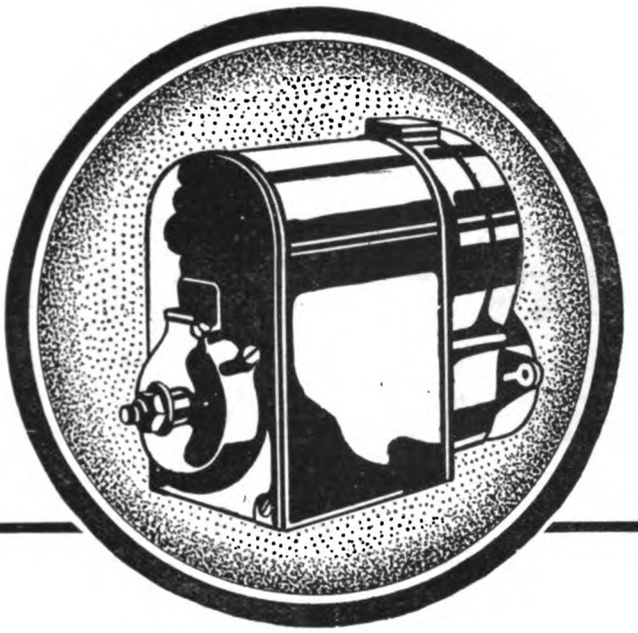
The product is unquestionably superior, and the price is within reach of your specifications. Made in black and many attractive colors.

Send for Samples and Price List

L. J. MUTTY COMPANY

Boston, Mass.

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Consider the Source of Your Spark

Consider it well, for when the spark falters, so does the motor.

Consider the structural excellence of your Magneto from the electrical standpoint and from the mechanical.

Is it so designed as to yield the highest possible spark-efficiency?

Is it so designed and are the materials so selected that you need not fear its failure because of the shocks and jars of hard service?

How thoroughly is it protected from the harmful effects of dust, water and oil?

How accessible are the parts that require occasional adjusting?

The more searchingly you apply these questions to the Eisemann Magneto, the more certain you will be to agree with the leading manufacturers of trucks, tractors and pleasure cars who have adopted Eisemann as standard equipment. In all, there are 117 of them.

THE EISEMANN MAGNETO CO.

Sales and General Offices: 32-33d St., Brooklyn, N. Y.

Chicago, Ill., 910 South Michigan Ave.
Detroit, Mich., 802 Woodward Ave.

THE

EISEMANN

MAGNETO

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DU PONT AMERICAN INDUSTRIES



The Auto Specialty That Sells Itself

Mark × before subject that interests you and Mail This Coupon to
E. I. DU PONT DE NEMOURS & CO.
Advertising Division
WILMINGTON H.A. DELAWARE

___	Pontoklene	___	Motor Fabrikoid
___	Rayntite Top Material	___	Craftsman Fabrikoid
___	Blasting Powder	___	Truck Special Fabrikoid
___	Farm Explosives	___	Marine Special (U. S. Stand.)
___	Hunting	___	Fabrikoid Sheeting
___	Trapshooting	___	Fairfield Rubber Cloth
___	Py-ra-lin Toilet Goods	___	Anesthesia Ether
___	Challenge Collars	___	Leather Solutions
___	Novelty Sheeting	___	Soluble Cotton
___	Transparent Sheeting	___	Metal Lacquers
___	Py-ra-lin Rods and Tubes	___	Mantel Dips
___	Py-ra-lin Pipe Bits	___	Bronzing Liquids
___	Py-ra-lin Specialties	___	Pyroxylin Solvents
___	Sanitary Wall Finish	___	Refined Fusel Oil
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100% efficiency is solving one of the most vexing problems of motoring.

Pontoklene removes tar like magic! Makes tar melt and run like the proverbial snowball in a real hot place. Is also a perfect grease and oil remover—restoring the original polish of a car without rubbing. Much better than gasoline for cleaning engines.

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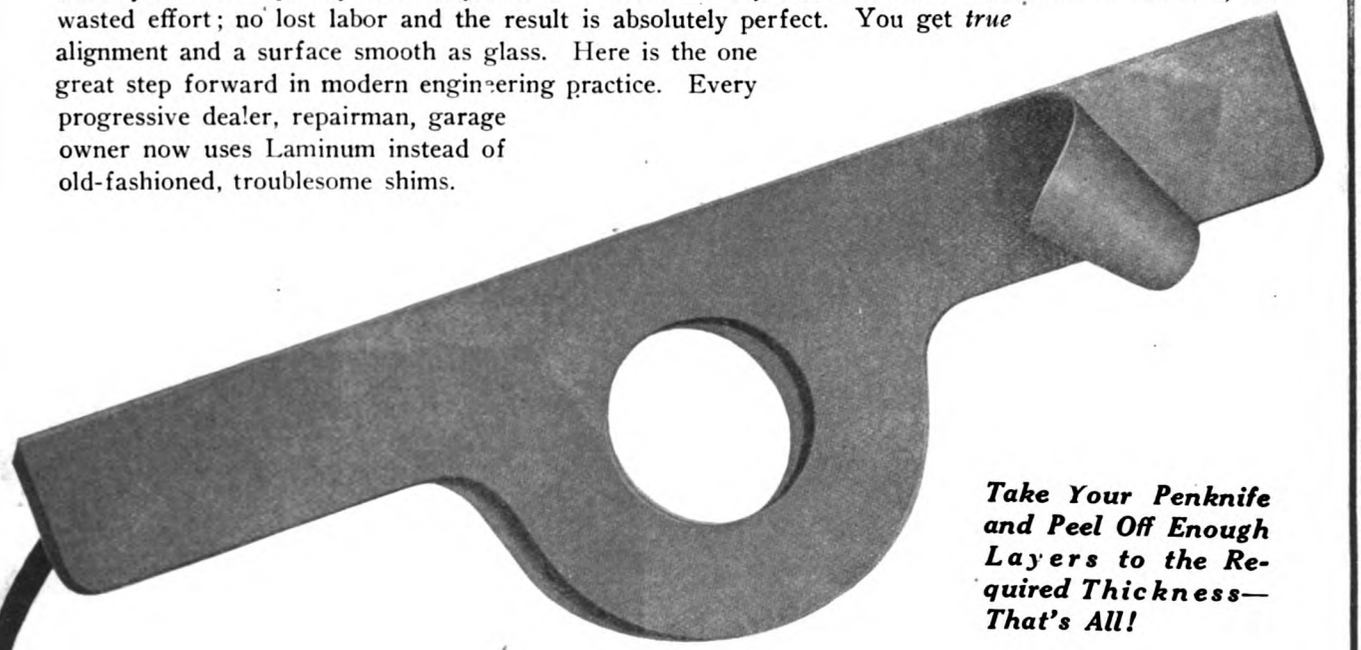
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Why bother to file solid shims?
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Laminated Shims save time, money, labor.

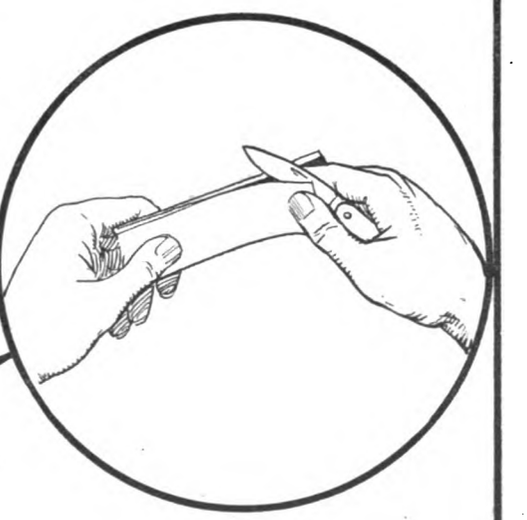
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Take Your Penknife and Peel Off Enough Layers to the Required Thickness—That's All!

Can you imagine a greater convenience? Think how this is going to conserve time and costs. A better job and certainly larger profits. Try Laminated Shims. See for yourself how Laminum makes quick and easy adjustments. We'll be glad to send you a sample shim at our expense. Write for it—to-day.

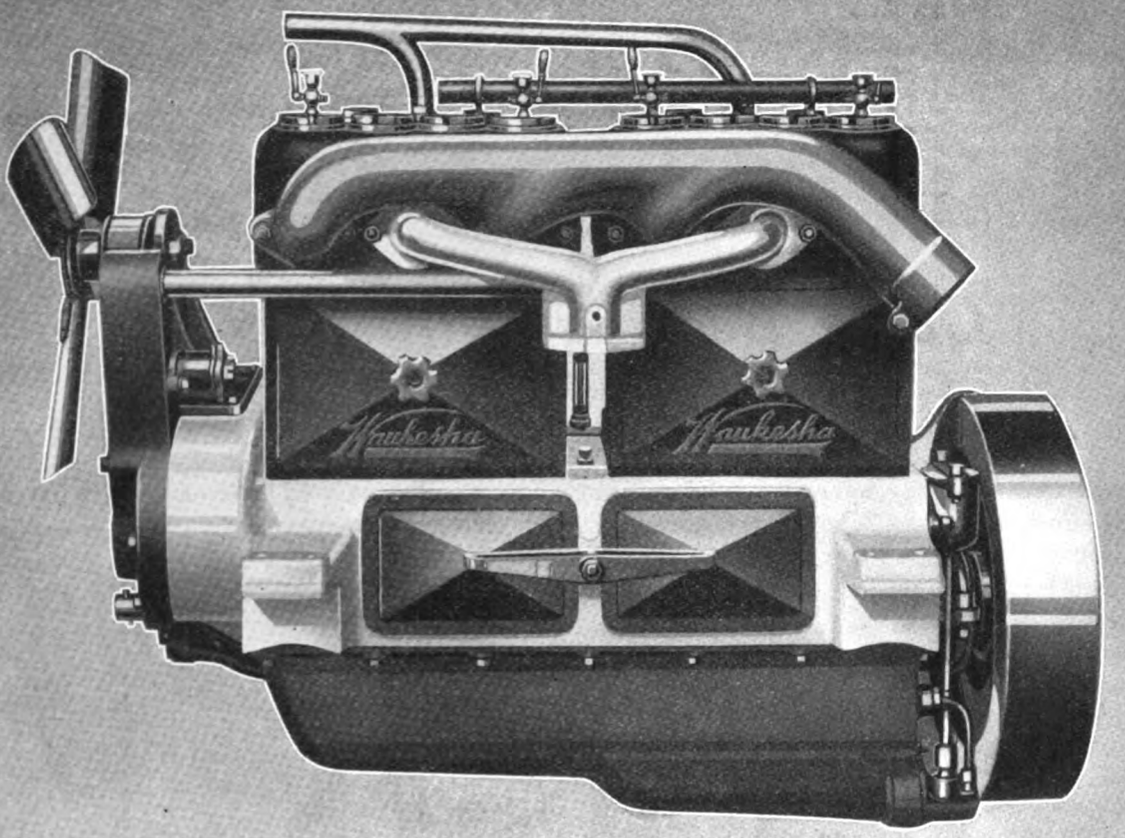
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London: R. A. Rothernel, 6 Great Marlboro' St., London, W.
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Waukesha
TRADE MARK

Four-Cylinder Motors for Trucks and Tractors

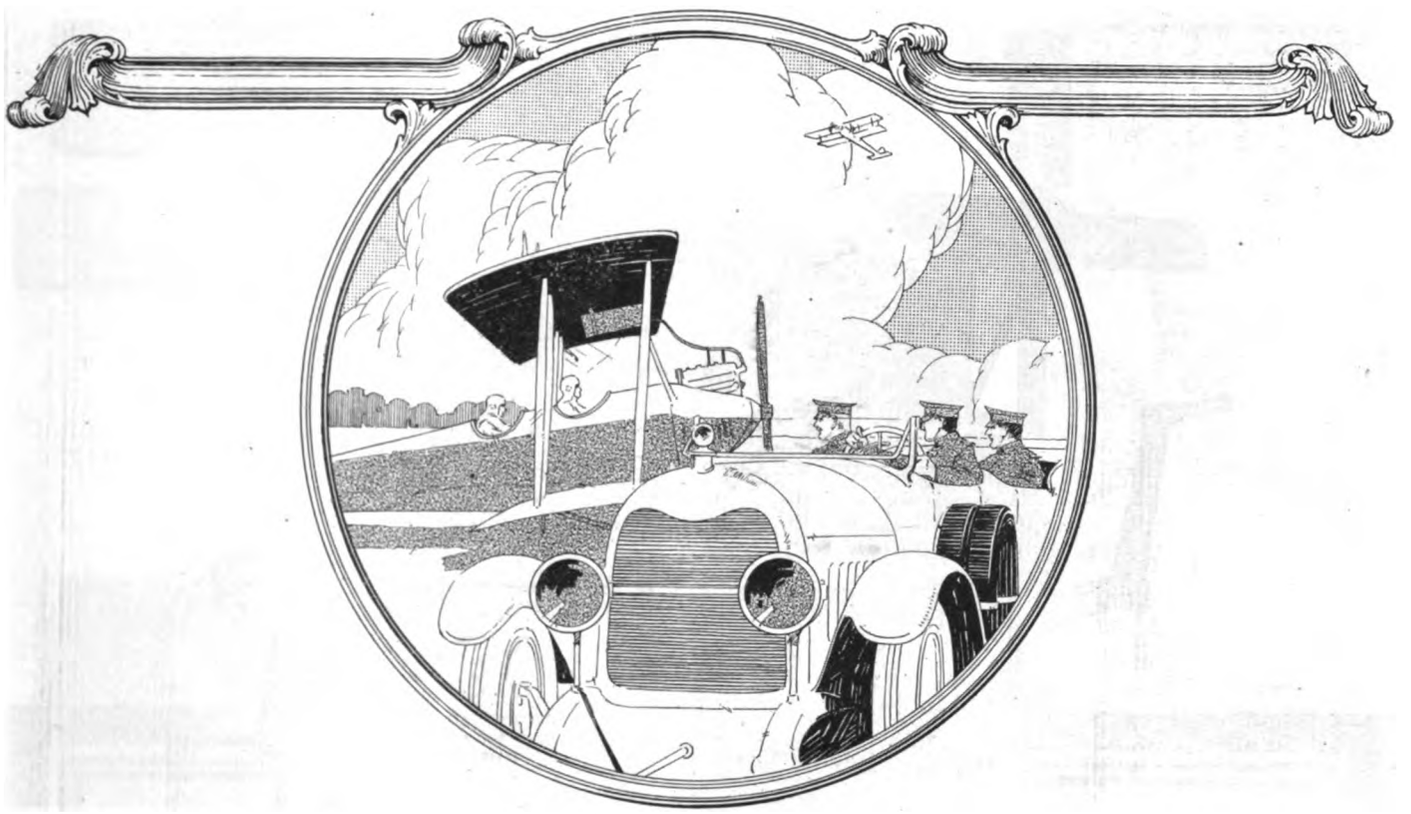
have drawn a new and bigger circle in the field of truck and tractor efficiency because character is an inherent part of their construction. The policies, the aims, the ideal of the organization which produces them are reflected by the performance of the motors.

"Demand a Waukesha Motor in the Truck or Tractor You Buy"

WAUKESHA MOTOR CO., Waukesha, Wis.

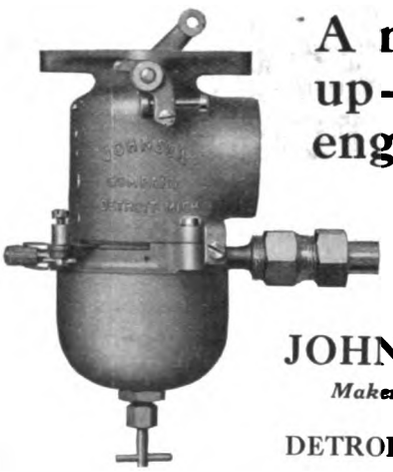
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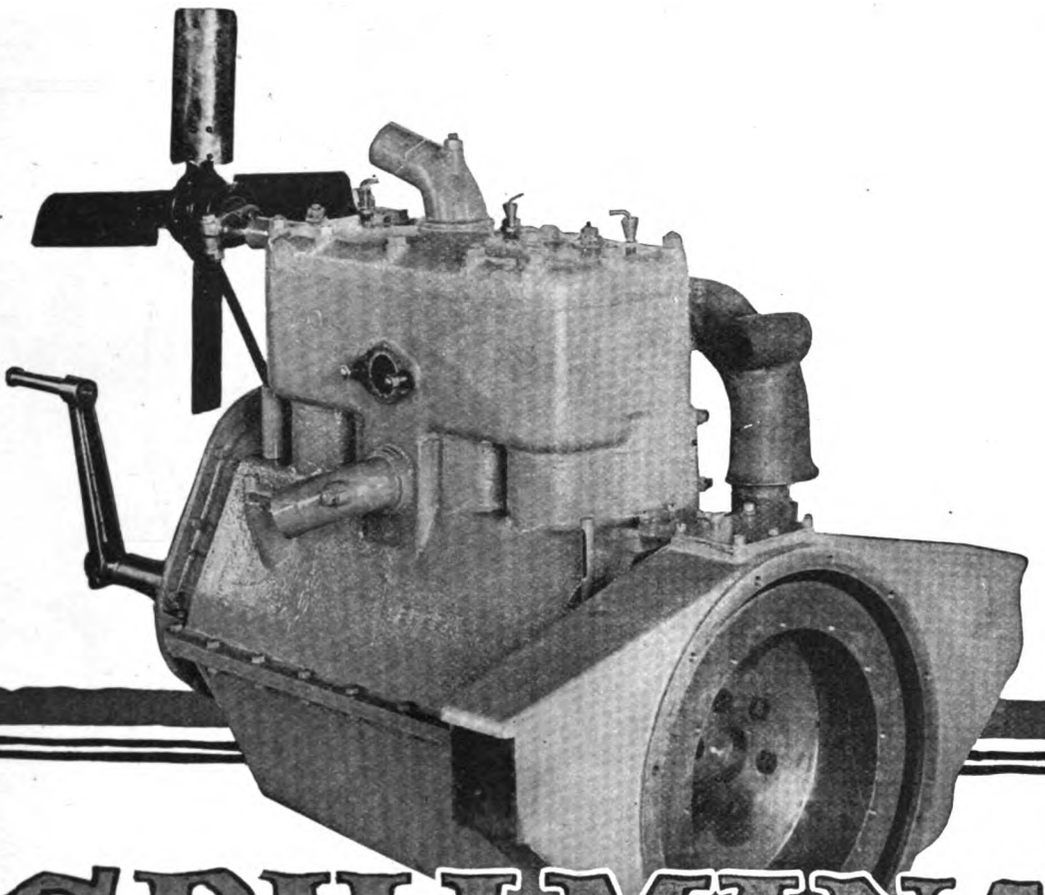
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3¼ × 5 — 4 CYL

SPILLMAN ENGINES have proved their high quality, not only in Motor Cars, but in Truck and Tractor work as well.

And in the Airplane Field almost since its inception.

Spillman Motors have been accepted as leaders.

The SPILLMAN "4" has already made a truly remarkable record.

Simple in construction, accessible in every part, it has established an unusual freedom from "engine trouble" of any kind.

It possesses power, speed and flexibility far beyond other engines of its class.

Much of the refinement and characteristics that make for reliability, so essential in airplane practice, are brightly reflected in the Spillman Automobile Engines of today.

Large additional factory facilities, now being completed, have greatly increased our production capacity, and we are open for a few more contracts for early delivery.

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Builders of Automobile Motors

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For Quality Motor Trucks

The leading manufacturers of quality motor trucks know the importance of bearing dependability. They know that unless a truck is well bearinged it will not stand up under the severe conditions of road service. And they know, too, that SKF Ball Bearings with their self-aligning feature and double row of balls have the increased carrying capacity which commends their use for motor trucks. Because of these exclusive characteristics—their accuracy—and dependability—they are used in trucks of national repute.

The harder the service—the greater the need of SKF.

SKF BALL BEARING CO.

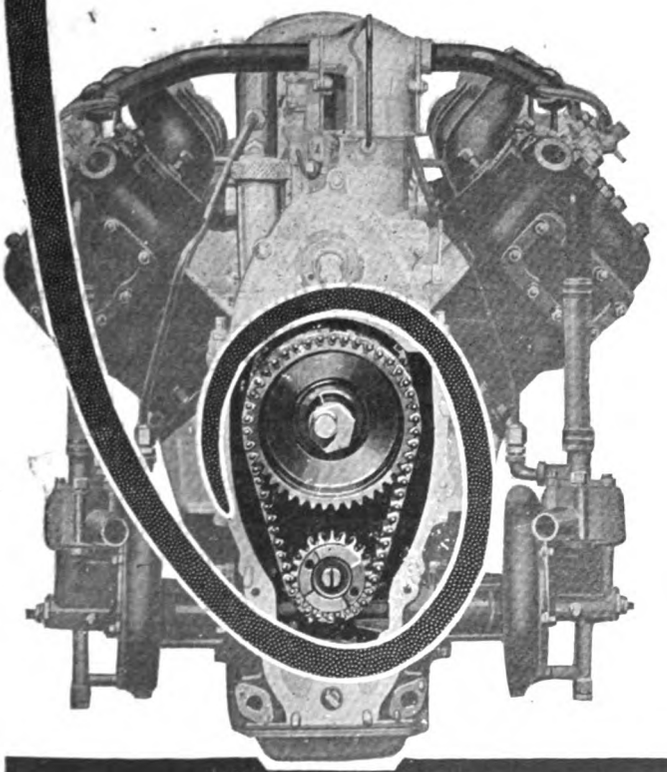
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Showing Morse Silent Chain Drives in Cadillac Motors



It Is Golden to the Car Builder

because his motor soon wins for itself a reputation for quietness in operation which is the one big necessary factor in the success of his enterprise. SILENCE is a modern refinement which is absolutely essential to every motor which can hope to survive in the struggle for existence. MORSE EQUIPPED motors are all among the Fittest.

It Is Golden to the Car Dealer

because modern car buyers are motor wise and know enough to use their ears in judging a car. MORSE SILENCE makes any car easier to sell. It is known to exist on over thirty of the best known of America's quality cars and gives any car possessing it a prestige which counts in landing a prospect.

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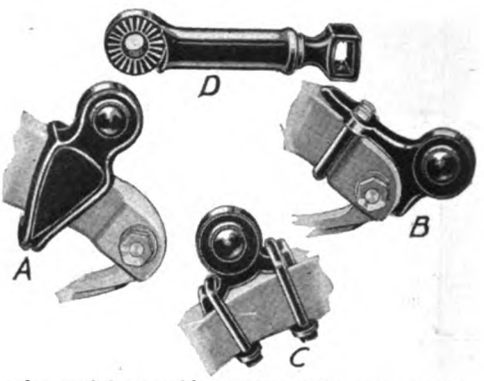
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STANDARDIZED and SIMPLIFIED

The necessity of heavy investments by the dealer eliminated by the

Halladay Standardized Unit



By means of these four parts and a supply of bars, the dealer is enabled to assemble a bumper to fit perfectly 90% of all cars with forward frame extensions and the rear of most cars with either three-quarter elliptic springs or extended frames.

Bear in mind, these assemblies are not "make-shifts," they are as perfectly adapted to the car as are the special bumpers built for the same cars, with the advantage of a wider adjustment for height, etc. With these fittings, all Halladay bars may be used, including the new "MULTIPLE SPRING BAR."

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Every garage and repair shop should be equipped with "LITTLE GIANT" Combination Screw Plates. Furnished both in U.S. and S.A.E. Standards.

Each die is contained in its own collet and adjusted to size. There is also a Bit Brace Die Holder for cleaning up battered threads in out-of-the-way places.



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New York, 28 Warren St. Chicago, 13 S. Clinton St. Canadian Factory: Wells Brothers Co. of Canada, Ltd., Galt, Ontario.

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There may, however, be quite a difference, hich wil show up when work is started on the piece.

Such annoyance is bad enough in ordinary times. It is doubly bad in these times when every hour counts.

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It protects the user

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Patented July 10th 1917

Reduce Vibration and Eliminate Bearing Pressure.

We are serving 14 Aviation Motor Companies making 18 different models of crank shafts... *of which the above cut shows* **one.**

We have shipped 60,403 Counterbalanced Crankshafts up to Feb. 1st, 1918

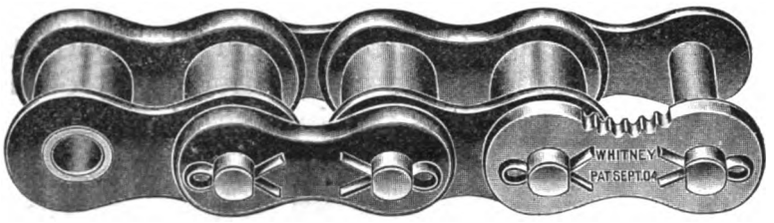
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For the Radiator Manufacturer

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No. 913A Black Enamel used on Radiators is described on page 6, Hilo Bulletin No. 1 on Black Enamels and Japans. Copy for the asking.



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the time-proved "safety first" gasoline carrier for all automobiles and commercial trucks. It is made of the finest selected steel —seamless, tinned and tested. There is a style and size just right for your car. Ask your dealer or write us.

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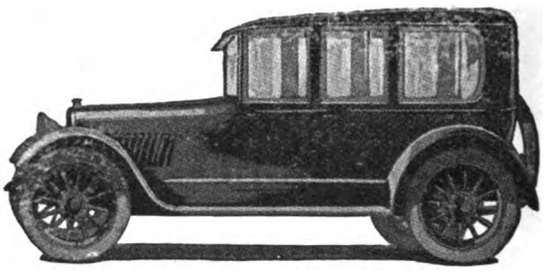
Deposit a heavy, bright, uniform coating of pure zinc on all rims for your cars—the galvanized finish that looks good and is good.

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Superior Meaker Galvanizing will not cost you as much to produce as out-of-date, inferior, dark-colored, thin zinc coatings that do not even protect rims from rusting while they lie in storage.

Forward us a set of rims and felloe bands and we will give you some interesting figures.

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Save Money Without Sacrificing Appearance

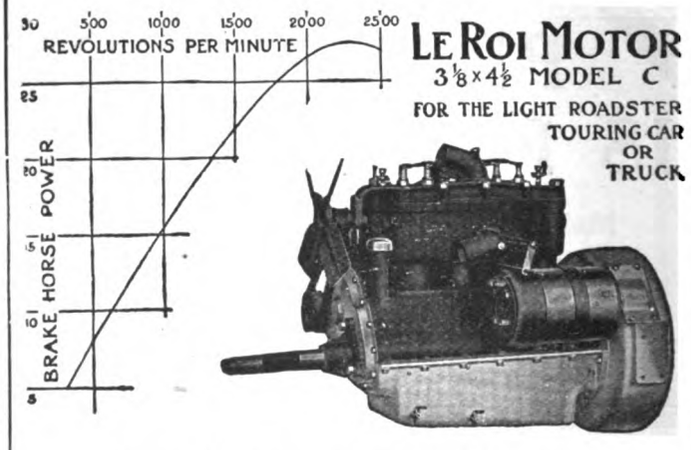
In this time of nation-wide economy, are you finding ways of cutting costs—and still retain quality? One item of saving—and it's no inconsiderable part of motor equipment either—is

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CABLE LE ROI MILWAUKEE

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THAT the *Internationally Standardized Schatz "Universal"* is the safest, longest-lived, smoothest-running and by 300% to 400% the most efficient of all annular ball bearings in carrying end thrust loads is due to the unique *three area contact construction* of the "Universal" ball races.

Engineers of motor cars or of other mechanisms with rotating members—write for catalog and data sheets.

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Write for specifications of different types and sizes.

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every day means lives

The minutes in an airplane factory today are like drops of blood.

Each day saved in balancing a crankshaft may mean an airplane at the front that much sooner.

Five minutes is all that's needed, with the

CARWEN
Dynamic Balancing Machine
(AKIMOFF PATENTS)

to tell the exact plane of unbalance and its amount.

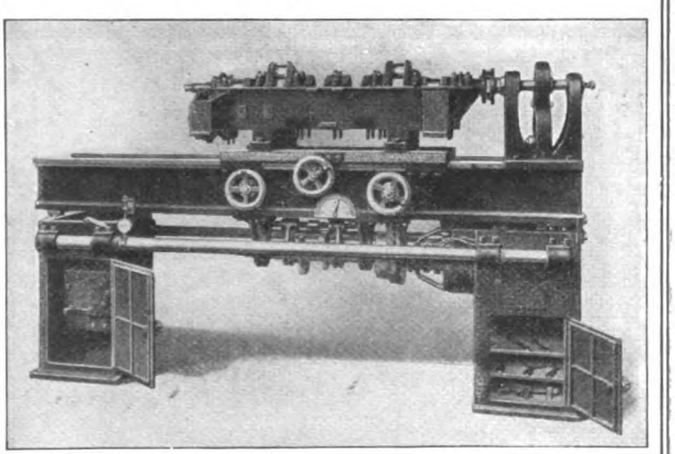
Twenty minutes covers the entire process—static balancing in another fixture, measuring running unbalance in the Carwen machine, and drilling to correct it.

One Carwen machine will handle 100 crankshafts in an 8-hour day.

Think what it would mean if every process in making an airplane motor could be shortened as much!

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Erie Ave. at Richmond St.
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METAL STAMPINGS
IN LARGE QUANTITIES


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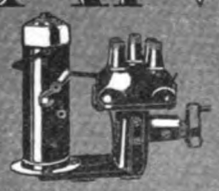
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Electric Auto-Lite equipment for automobiles is as famous for the service that backs it as for the reliability and economy of its operation.
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—and that's because they're made in the most efficient plant of its kind in America—both as to *equipment* and *organization*. There's not a pressed steel part used by the automotive industry that we're not equipped to make—and make *right*. We also do annealing, case hardening, nickel plating and electric and oxy-acetylene welding.

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The most exacting physical and chemical requirements are complied with and constant inspection and tests of raw material, work in progress and finished product insure a minimum of defective castings and a saving of machine shop losses.

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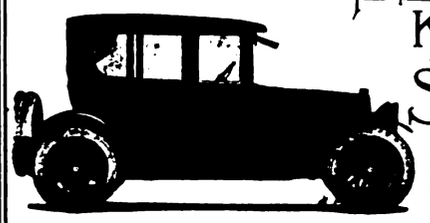
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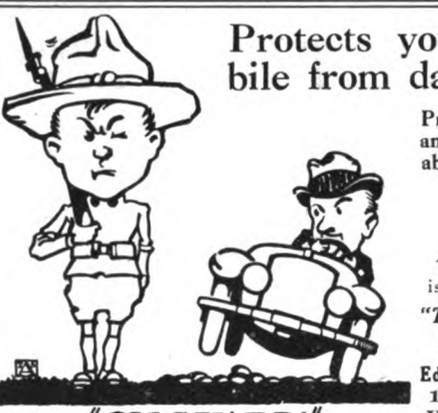
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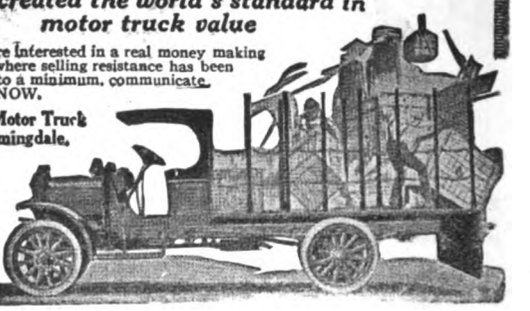
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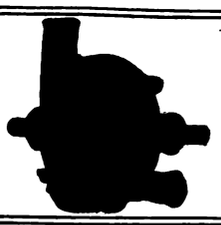
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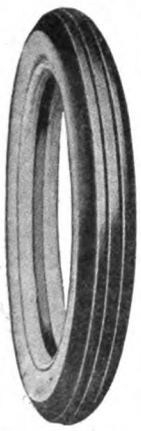
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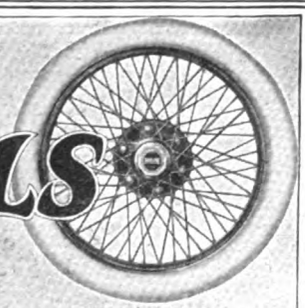
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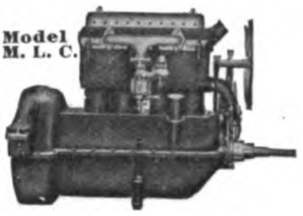
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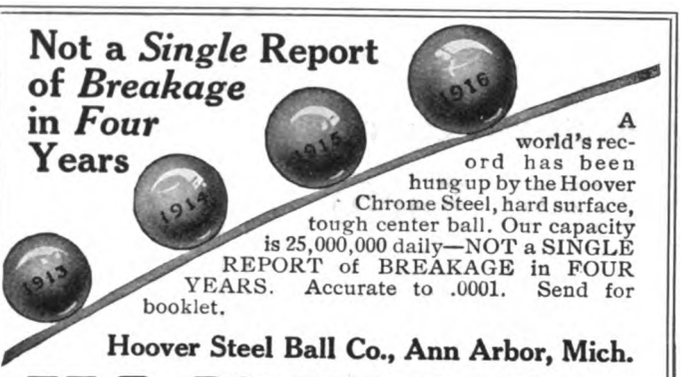


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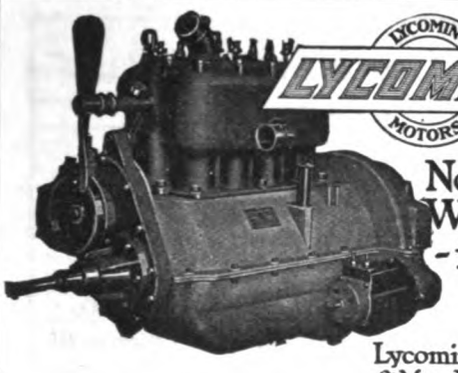
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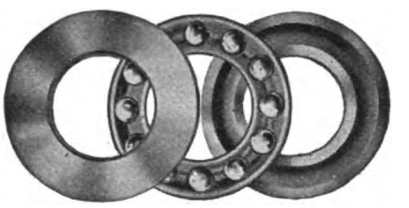
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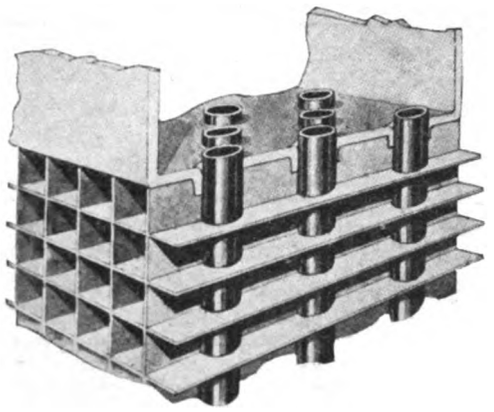
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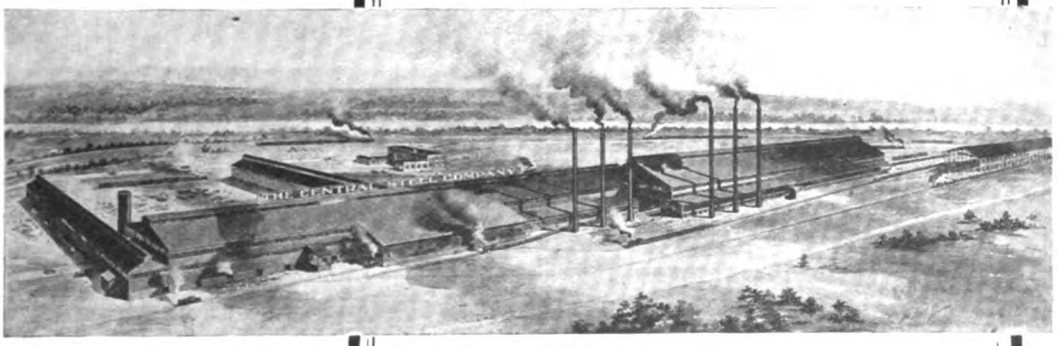
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Russel Features

The power axle is entirely independent of the load-carrying axle, wholly relieving it of road and load strains.

The load-carrying axle is a one-piece round bar of heat-treated chrome nickel steel. The Russel Differential, Internal Gears and Pinion Gears are made in our own machine shops guaranteed by Russel reputation.

Russel brakes are exceptionally large and afford unusual protection to the truck on the crowded thoroughfare and steep grade.

Less complicated parts.

More efficient and reliable under all conditions of road or load.

More ground clearance.

Less dependent upon lubrication.

Operating cost less.

Assures more tire mileage.

—THAN OTHER TYPES

SLIPPERY PAVEMENTS. Horses falling. Horses helpless. Traffic retarded. It is inhuman; it is costly; it is bad business. And it is out of date.

I am the Motor Truck. I am busy, effective, resistless as usual. Slippery pavements mean no more to me than snow or mud because I am weather-proof and feeling-proof.

I am equipped with the Russel Internal Gear Drive Axle. I deliver maximum power to both wheels, close to the rims. My load I carry on a separate axle of solid steel. Therefore, I am surefooted, unfailing and uncomplaining. These things make masters of transportation.

Russel Motor Axle Company
North Detroit

Russel
Internal Gear Drive Axles

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under all conditions Overland has steadily maintained its margin of sales leadership!

Overland

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The Thrift Car

Appearance, Performance,
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Willys-Knight and Overland Motor Cars and Light Commercial Cars

Canadian Factory, West Toronto, Canada

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B

AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Vol. XXXVIII No. 7 NEW YORK, FEBRUARY 14, 1918 Ten cents a copy Three dollars a year



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Repairs Leaky Radiators Instantly

Stop Those Leaks

THE easiest and quickest way of repairing leaks in radiators, pumps, water jackets, hose connections, etc., is to use Johnson's Radiator Cement. This will stop the leaks in just a few minutes without laying up the car. No mechanical experience is required—all you have to do is to remove the cap and pour the cement into the radiator.



JOHNSON'S RADIATOR CEMENT

Johnson's Radiator Cement blends perfectly with the water until it reaches the leaks—just as soon as it comes in contact with the air it forms a hard, tough, pressure-resisting substance which is insoluble in water and consequently makes a permanent seal.



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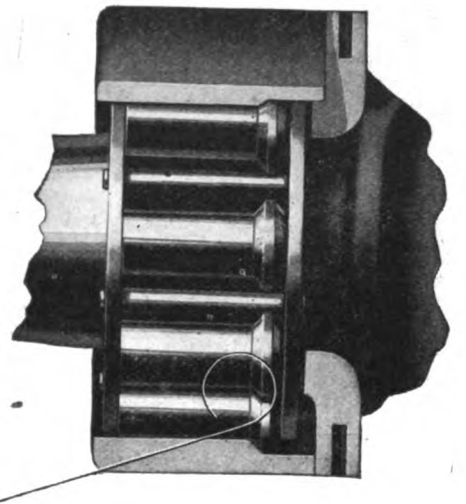
Write for our folder on "Keeping Your Car Young"—It's Free.

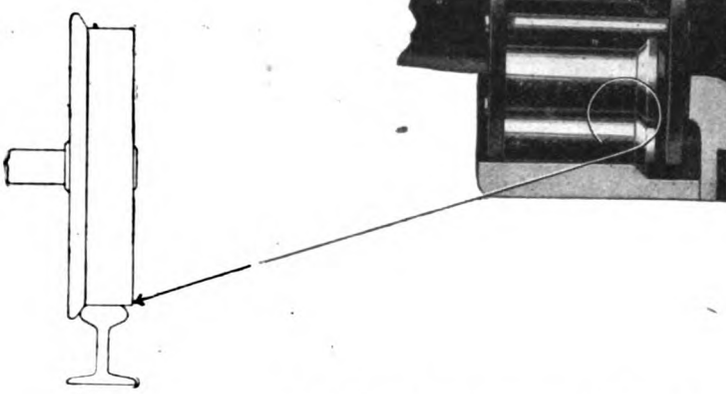
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The Standard Flange Method



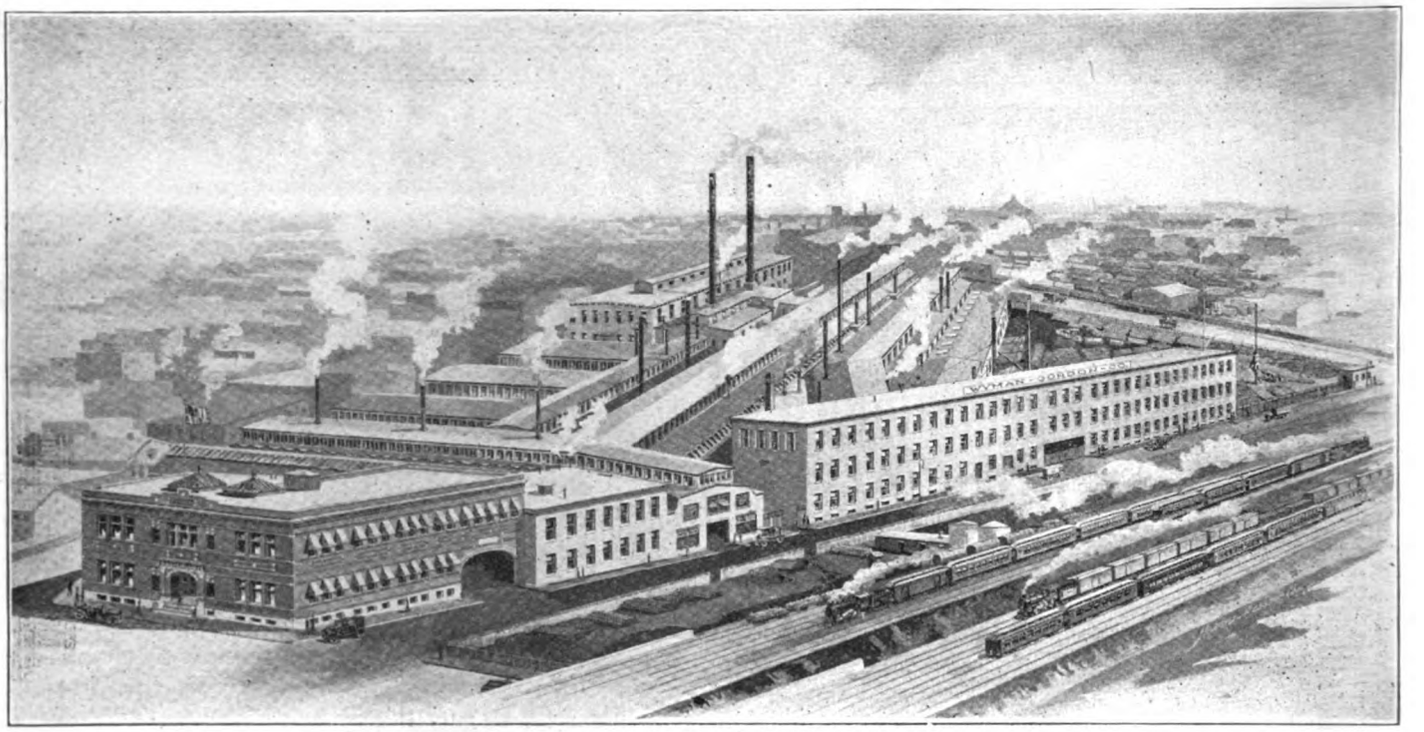


The same flange principle that is embodied in the construction of the flanged car wheel is also found in Bower Bearings.

It is the flange on the wheel that holds the big 200-ton locomotives on the track and guides them around curves. Also in Bower Bearings the flanged head on the rollers guides them and resists end-thrust.

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ROLLER BEARING CO.
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The Standard of the World

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AUTOMOTIVE INDUSTRIES
THE AUTOMOBILE
THE CLASS JOURNAL COMPANY
231–241 W. 39th STREET NEW YORK CITY

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BALL BEARINGS
(Patented)



The difference in price between an ordinary ball bearing and the best ball bearing is never large. At most, it is but the tiniest fraction of a per cent of the total cost of a car or truck. But the difference in the service rendered may be tremendous—may mark the distinction between satisfaction and dissatisfaction.

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The Farmer is interested in the service derived from his tractor and he is learning to investigate the quality of all vital parts. The mark SKF on a bearing assures him that the tractor manufacturer is sparing no expense to give the greatest service and highest quality, for ball bearings so marked are self-aligning and accurately manufactured from steel which is hardened uniformly thruout.

Hartford **SKF BALL BEARING CO.** Conn.

330

SKF
BALL BEARINGS

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XXXVIII NEW YORK—THURSDAY, FEBRUARY 14, 1918—CHICAGO No. 7

Twin Cities Stage First AUTOMOTIVE SHOW

Cars, Trucks, Tractors, Accessories and Farm Equipment Assembled in Greatest Show of Its Kind Ever Held —Dealers and Distributers Grasp Automotive Idea—Attendance Breaks All Records

By David Beecroft

TWIN CITIES, MINN., Feb. 9—It has remained for the great Northwest, the land of the late James J. Hill, to stage the first automotive show in America, and while this first attempt is not complete it is sufficiently automotive to demonstrate unmistakably that already a new regime has taken hold of the show movement.

A five-ring automotive show is being staged here in the large Overland building, which offers 286,000 sq. ft. of floor area, which is much larger than that of either Chicago or New York. There are literally five shows in one and yet there is room to spare.

There is a show of automobiles, 46 exhibitors being present. There is a show of motor trucks with 25 exhibitors on hand. There is a show of .farm tractors with 40 firms exhibiting their different models. There is a big accessory exhibit with one hundred and fifty stands.

Lastly and perhaps not automotive, and yet on hand because of the magnetism of the automotive movement, there are more than a score of concerns participating in what is called the industrial end of the show with exhibits made up of food products, etc.

The automotive idea falls short in that there is no motorcycle representation, but this was merely an oversight. There are two airplane exhibits of model machines, etc. There is one motor boat exhibit, but there is scarcely any other city in the country better positioned for motor-boat work than Minneapolis and St. Paul, nestled as they are in one of the greatest lake areas.

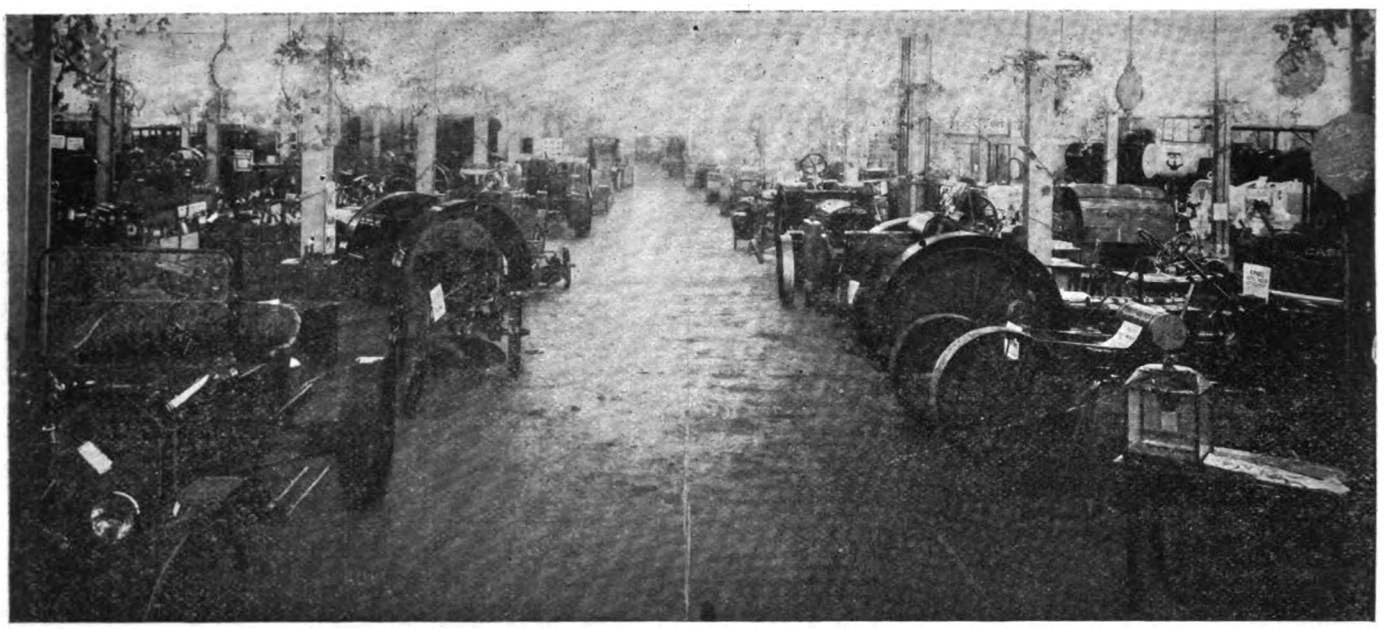
Another year both of these ends of the automotive idea will surely be on hand. The house lighting idea is here stronger than at any other show and falls quite within the circle.

Not only has the automotive idea possessed our manufacturers but it is rapidly possessing the distributers and dealers of

Attendance at the Show

Saturday	18,021
Monday	28,950
Tuesday	29,001
Wednesday	29,218
Thursday	30,012
Friday	29,617
Saturday	18,415
Total	178,270

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The Twin Cities show is the first real AUTOMOTIVE show, this view showing the tractor exhibit, which was staged in a mammoth room measuring 185 *by* 200 *feet*

this northwest area a distribution zone of 400,000 sq. miles, one of the largest areas served by any group of automotive distributers in America.

Already hundreds of these dealers have for some years been selling motor trucks and more are taking on trucks each year.

For the last year quite a number have been selling farm tractors and the 40 tractor makers exhibiting frankly state that they are looking for automobile men to handle the tractors in that they are well fitted to care for the internal combustion engine as used in the tractor.

The house lighting equipment has been generally taken up by the dealer and should soon be entirely in his hands; he is the logical man for it. The same is going to apply to the motorcycle and the motor boat.

That the public has already taken hold of the automotive idea is evidenced by the attendance, which is a record breaker for a Twin Cities show. Although the show is located in the middle of the 12-mile avenue which connects the two cities, so that it requires 35 minutes to reach it in a motor cab, the attendance is far beyond that of any other year. The huge Overland storage building, the largest storage depot in the Northwest, was crowded from opening until closing each day.

The big restaurant in the basement made it convenient to spend the entire day at the show and if one got tired looking at automotive apparatus there was a movie show in the basement. For those who wished to dance there was a great dancing floor.

So completely had the Twin Cities distributers and dealers gone into the subject that they evolved the greatest transportation exhibit this country has known and unconsciously broadened the automobile sphere into the automotive, but not before the idea had already spread generally throughout the cities, towns and farms of the Northwest.

The automotive idea is one bred in the minds of the people by the natural and logical grouping of the apparatus and is not some outside idea that the show is attempting to inject into this section.

The idea was in this territory before the present show was thought of. It is the natural evolution of the explosion type engine.

Farmer Chief Buyer in Twin Cities Territory

Forty Per Cent of Cars Are Owned by Farmers, But 75,000 Still Have No Cars—Immense Market for Trucks and Tractors

ATTENDANCE figures testify best as to the hold the automotive idea has already established on the minds of the people. The total registered attendance for the seven days was 178,270, as compared with a total at the automobile show a year ago of 67,212. There were five days this year when the attendance was close to 30,000, or when the attendance each day was nearly one-half that of the entire week last year.

Such attendance figures tell a dominant story, namely: the citizens of the Northwest are not surfeited with automobiles, and in spite of war and the sacrifices of war the necessity of automotive apparatus is numerically three times what it was a year ago.

Over 5000 dealers from the territory had registered with the show management by Thursday evening, which was nearly 1000 more than for the whole week last year. The country bankers who were invited to attend by the show management had registered to the number of 2500, as compared with 2000 registrations a year ago.

There is no question but that the farm tractors and

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the trucks were largely responsible for the greatly increased attendance. Still another factor must be considered, namely, that the show this year was held at a point midway between St. Paul and Minneapolis, and so drew heavily from both cities; but with all of these matters given due consideration, the attendance figures are still far above the attendance at shows last year in this zone. The necessity of motor apparatus on the farm is the big deduction from the attendance.

The analysis of automobile registrations in Minnesota during the past year shows an increasing sale of automobiles to farmers as compared with residents of cities. To-day approximately one-half of the farmers of the State of Minnesota own cars. Of the total automobile registration in the State of 184,600 cars on Jan. 1, 1918, 73,900 are owned by farmers, or 40 per cent.

Assuming that these 73,900 automobiles are distributed one to a farm, it means that almost one-half of the farmers own cars, and that, not counting replacement sales, there remain approximately 75,000 farmers who are not car owners.

The sale of automobiles in the State during the past calendar year approximated 40,000 cars, so that the farmer demand alone should absorb this allotment for the next 2 years. But in the Northwest the cities benefit very directly, too, and, where sales to the farmer increase, sales to city residents also increase.

According to *The Farmer*, the three large cities of Minnesota, namely, Minneapolis, St. Paul and Duluth, have 750,000 of the total State population of 2,500,000. Nearly one-third of the population is located in these cities, and the registration of automobiles in them is one-quarter of the total State registration.

The majority of the cars of the State are owned in the smaller cities and towns. An analysis of the State registration to date shows 41 per cent of the automobiles registered in towns of 1000 population and under. Further analysis shows that 65 per cent of all registrations are in towns of 5000 population or under.

In the 1917 calendar year there were approximately 40,000 automobiles sold in the State, which is a bigger sale than made in any previous year, these figures indicating an increase of perhaps 15 per cent over 1916. The State had hoped for 200,000 registrations by the first of this year, but the difficulty of getting cars during the selling season of the last two years made the fulfillment of this wish an impossibility. The cars could have been sold, but they could not be obtained. The registration totals for each year since 1909, when registration was started, follow:

1909	7,000	1914	68,500
1910	12,500	1915	94,000
1911	19,000	1916	138,000
1912	28,400	1917	184,600
1913	45,800		

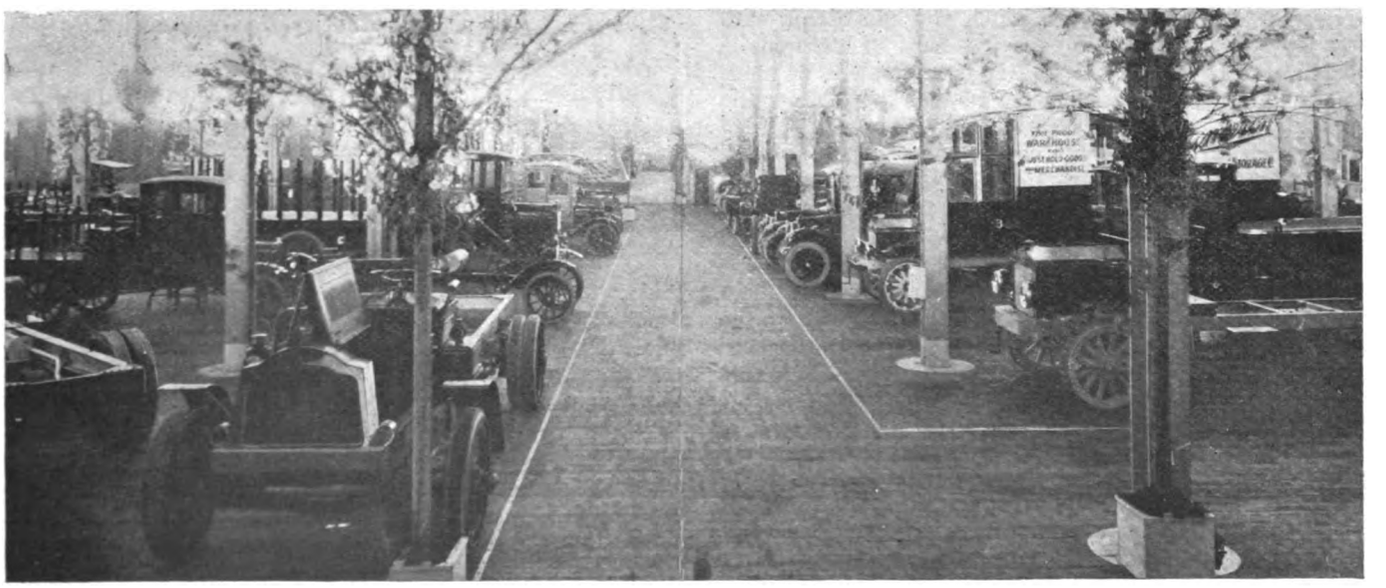
These figures indicate a steady increase each year for the past eight seasons, with three prominent seasons so far as increase in sales over preceding seasons goes. The year 1914 showed a big increase over 1913 and 1916 showed a big increase over 1915, and 1917 showed a heavy increase over 1916.

For two years the Northwest has suffered because of not being able to get enough cars, and the Pence company, Buick distributer for the States of Minnesota, North Dakota, South Dakota and Montana, started last April to get more cars than it was possible to obtain through regular shipping facilities, and incidentally exhibited one aspect of the push spirit of the Northwest.

In April the assembly of Buick cars was started in Minneapolis, and to-day Pence has a large three-story assembly factory in Minneapolis in which he has capacity for forty cars per day. Since July 1 over 2700 Buicks have been assembled, as against 450 machines shipped assembled from the factory in the same period.

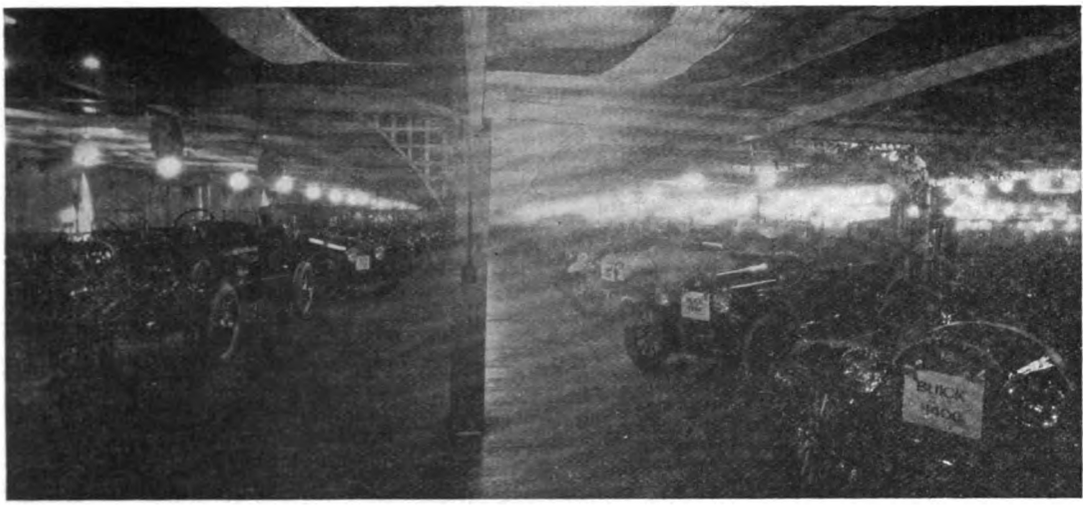
The assembly building, 222 by 150 ft., is a three-story brick structure, alongside of which are two loading and two unloading railroad switches built specially for this job. The scheme of assembly is well laid out with metal tracks to guide the assembly trucks on which the chassis progress. There are overhead cranes to mount axles, engines and other parts. From this assembly floor the chassis move directly into a large steam cleaning room and then to the paint floor, where they are sprayed as in the factory. There is a drying oven that accommodates 36 chassis.

Only two models are assembled, the small six and the four cylinder, and these only in touring bodies. The bodies on the small four are enameled at the factory and are shipped ready to attach, but the bodies on the small six are painted by Pence, and he accelerates sales by furnishing color options that cannot be obtained from the



The truck exhibit at the Twin Cities show was only slightly smaller than the tractor exhibit and was placed in a room which measured 160 *by* 200 *feet*

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Only one room at the Twin Cities show was devoted exclusively to passenger cars. Like the other exhibits, this was of truly heroic size, the room measuring 185 *by* 200 *feet*

factory. This color option is popular chiefly in Montana and the Dakotas, where as much brilliance in car finish is found as in any Eastern city.

Good economy in shipments is made by Pence in that the factory ships the materials in units, Pence aiming always to carry a stock of car units for two weeks' assembly. With the exception of the frames, which come direct from the frame maker, all car units come from Flint. These parts are shipped in carload lots; thus there is a carload of engines, another of axles, another of tops, another of bodies, and others of miscellaneous parts. It is possible to use 36-ft., small-door railroad cars, and in each can be carried the parts for 10 automobiles. This size of railroad car could not be used for shipping complete cars.

The economy of shipping ten automobiles in one small freight car appears when you recall that you can only ship four Buick cars, assembled, in one 40-foot railroad car.

The shipping capacity of a railroad car is increased over two and one-half times.

It is possible to ship 24 bodies in one car; forty motors can be shipped in a car; and other parts are shipped in carload lots, even to wheels mounted with tires that are inflated at Flint.

The example of the Pence company unquestionably will be generally imitated by other distributers serving large territories. It is one way in which you can obtain cars when it is not possible to get flat cars or automobile railroad cars to ship them in. It is equivalent to more than doubling railroad capacity so far as automobile shipments go. By this assembly plan Pence is able to get ahead on cars for his 450 dealers, and already is storing cars for dealers in many parts of the territory.

The distributing territory known as the Northwest must be seen to be appreciated. It embraces in the four States, Minnesota, two Dakotas and Montana, nearly 400,000 sq. miles. This represents a larger area than all of France. It is practically six times as large as the New England States, served by the Boston distributers.

James J. Hill once gave a good indication of the area served by the Twin Cities. He said that if you take the map of the United States, and, with Twin Cities as the center, draw a circle that cuts Jacksonville on the southeast, that circle on the west will not be outside of the Minneapolis-St. Paul territory.

From Minneapolis west you have a 36-hr. railroad trip, and you are still in the territory. It is no wonder then that Twin Cities automobile distributers cannot drive their cars overland even from the Twin Cities to their far-away dealers. Pence dealers drive approximately one-third of their cars from Minneapolis, but the distant ones in the Dakotas and Montana cannot.

Thinking automotively, the Twin Cities territory, while holding large possibilities for automobiles, offers the greatest market in farm tractors and motor trucks, as well as house lighting outfits and other applications of the internal-combustion engine. There were thirty-two different farm applications for the explosion engine exhibited at the show.

With 150,000 farmers in Minnesota alone, and with the average crop value per farm in 1917 of $2,868, there is no question as to the possible tractor market that remains to be developed, and it is not surprising that Minneapolis tractor builders consider the city a good center for manufacture.

The average farm size is 177 acres, which is well suited for the three-plow tractor as made to-day. In the Dakotas and Montana, average farm sizes are much greater, permitting the use of the largest type of tractor, those pulling as high as ten or twelve plows.

Crop conditions in all four of the Northwest States represent a higher money value than in any previous year; in fact, the crop valuation in the four States is nearly 60 per cent above that of 1916. The government figures place the crop valuation at $1,019,272,000, a new record. Some meaning is read into these figures when they are compared with past seasons. The 1916 crop valuation was but $649,297,000, and other crop valuations are:

Northwest Crop Valuations

1917	$1,019,272,000
1916	649,297,000
1915	618,456,000
1914	479,055,000
1913	435,082,000
1912	455,722,000

The following government figures of farm crops for 1917, and farm values in the four States of Minnesota, North Dakota, South Dakota and Montana, have special significance to all makers of automotive apparatus:

Four States	Quantity	Farm value
Wheat	183,952,000	$365,545,000
Corn	193,562,000	225,369,000
Oats	236,925,000	150,646,000
Barley	88,700,000	95,332,000
Rye	23,179,000	37,738,000
Flaxseed	7,990,000	23,798,000
Potatoes	50,085,000	49,122,000
*Hay	5,557,000	71,722,000
		$1,019,272,000

*Tons.

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One immense section of the Twin Cities show was given over to industrial exhibits such as farm implements, farm lighting systems and nearly every piece of equipment which the farmer normally uses

Value of Products of States in the Twin Cities Territory

Minnesota

	Production	Farm price	Farm value
Winter wheat	1,440,000	$2.02	$2,909,000
Spring wheat	56,525,000	2.02	114,180,000
Corn	90,000,000	1.10	99,000,000
Oats	120,250,000	.63	75,758,000
Barley	37,800,000	1.11	41,958,000
Rye	7,585,000	1.67	12,667,000
Flaxseed	1,980,000	2.95	5,841,000
Potatoes	33,600,000	.91	30,576,000
*Hay	2,868,000	12.10	34,703,000
Total			$417,592,000

North Dakota

	Production	Farm price	Farm value
Spring wheat	56,000,000	$2.00	$112,000,000
Corn	5,310,000	1.51	8,018,000
Oats	38,625,000	.62	23,948,000
Barley	22,812,000	1.00	22,812,000
Rye	9,880,000	1.64	16,203,000
Flaxseed	3,764,000	3.00	11,292,000
Potatoes	3,870,000	1.30	5,031,000
*Hay	484,000	11.50	5,566,000
Total			$204,870,000

*Tons

South Dakota

	Production	Farm price	Farm value
Winter wheat	1,680,000	$1.96	$3,293,000
Spring wheat	50,344,000	1.96	98,674,000
Corn	97,150,000	1.20	116,580,000
Oats	64,450,000	.61	39,924,000
Barley	26,738,000	1.10	29,172,000
Rye	5,600,000	1.55	8,680,000
Flaxseed	980,000	2.99	2,930,000
Potatoes	7,200,000	1.11	7,992,000
*Hay	1,162,000	10.60	11,681,000
Total			$318,926,000

Montana

	Production	Farm price	Farm value
Winter wheat	7,865,000	$1.92	$15,101,000
Spring wheat	10,098,000	1.92	19,388,000
Corn	1,102,000	1.75	1,771,000
Oats	13,600,000	.81	11,016,000
Barley	1,350,000	1.03	1,390,000
Rye	114,000	1.65	188,000
Flaxseed	1,266,000	2.95	3,735,000
Potatoes	5,415,000	1.02	5,523,000
*Hay	1,063,000	18.60	19,772,000
Total			$77,884,000

*Tons

Standardization in Great Britain

STANDARDIZATION was the main topic at the recent fourth meeting of the Technical Committee of the Motor Industries in London. Recommendations were submitted for the consideratiton of the Engineering Standards Committee in regard to bolt type detachable wheels for pneumatic tires, tire sizes, loads and inflation pressures, road springs and chassis dimensions for carriage work. Three sub-committees were appointed to consider and report upon: (1) Fuel for internal-combustion engines; (2) the formation of an education committee; (3) the proposed laboratory for internal-combustion engine research. These are solely internal committees, and are not put forward in any way with a view to overlapping the work which is being carried out by other committees in the same direction. The standardization of automobile parts has now been under consideration by the Engineering Standards Committee for some considerable time, and the result of the work of the numerous sub-committees is beginning to bear fruit. The following reports have already been issued by that body, and may be obtained from the Engineering Standards Committee, 28 Victoria Street, S. W. 1: No. 71, Report on British Standard Dimensions of Wheel Rims and Tire Bands for Solid Rubber Tires; No. 80, Report on British Standard Dimensions of Magnetos; No. 45, Report on Dimensions for Spark Plugs.

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Fundamentals of Tractor Design*

Size of Tractor, Horsepower and Drawbar Pull—Existing Tractors Analyzed as to Weight and Piston Displacement—Probable Future Development—A Liberty Tractor Design Suggested

By George T. Strite

THE first question to be settled in the design of a tractor is that relating to the size of the machine, the number of plows it will pull or the drawbar pull it will develop. This has been a very hard question to settle. For many years the tendency has been to keep increasing or trying to do just a little more, no matter what size you started with. Even in the days of the big tractor, of 8 and 10 plows capacity, the pressure exerted by customers calling for just a little more power was hard to resist, and the temptation was continually before us to build something larger, although even then most of us knew that the time would come when the small tractor would have its day.

Since the complete readjustment of the tractor manufacturing business, when most companies started with the two and three-plow machine, there has been a constant demand for just a little more pulling capacity. One of the hardest things in the tractor business is to have the nerve to stand pat and build one size and not keep constantly increasing the size so that it will do a little more work.

Power and Traction Required

The next step after the size has been determined is to deal with two related factors, the amount of power and the traction. Here again is a hard question to decide: Whether or not to provide sufficient power so that the motor will not stall but will turn the wheels regardless of the kind of ground or footing you have. If you put in 5 or 10 hp. more than required for ordinary work, then the entire transmission and tractor must have sufficient strength to take care of the additional load and turn the wheels under extreme conditions. Would we think of buying an automobile to-day with power enough (and transmission enough) so that we could spin the wheels on high gear and dry ground? This would be absurd.

However, from a sales point of view, there is one reason why we have done this in tractors. In demonstrating the tractor it is generally loaded to the limit, and if we kill the motor it is a hard knock against that tractor, while if there is sufficient power to keep on turning the wheels, even to the extent of burying the tractor in the ground, this brings out applause and the farmers will say: "Gee, but that tractor has got the power."

Personally, I am inclined to think that we have carried this to extremes. What the average wheel tractor needs is more traction in proportion to the amount of power. The farmer would then get a more efficient machine, and a better balanced one, a machine that could be used under extreme conditions, on wet soft ground or sandy ground. I am inclined to think that as soon as the farmer is educated on this point we will all begin to build tractors better balanced for average efficiency, and not build tractors that will do certain stunts, regardless of the average work the tractor will be expected to do. In other words, both the farmer and manufacturer will use more horse sense and keep an eye on average efficiency.

Weight and Ground Surface

When we have settled between power and traction the third item to consider is ground contact surface and weight of the tractor. In the old days we built tractors which were exceedingly long in weight and rather shy in supporting surface. The tractor of to-day is being built with less weight, this having been made possible by the use of multiple cylinder motors, high grade materials and more surface on the ground. The surface must also be backed up by the proper shape and style of grounders or lugs.

After the total weight of the tractor is determined, there arises the question of the proper distribution of this weight. If it is a four wheel machine with two drivers in the rear and two front wheels, then careful judgment must be used as to how much weight to place on the drive wheels and how much on the front wheels. The best practice to-day seems to be about 70 per cent of the total weight on the rear drive wheels and 30 per cent on the front wheels when the tractor is not exerting any drawbar pull. This means that when the tractor is pulling a reasonably heavy load, there will be 85 per cent to 90 per cent of the total weight of the tractor, plus a certain percentage of the drawbar pull, on the rear wheels. This last mentioned item depends upon the height of the drawbar hitch on the tractor, the height of the hitch on the plow and the load being pulled. This leaves from 10 per cent to 15 per cent on the front wheels, which for all practical purposes is enough to steer the tractor. However, in going up a steep grade the front wheels are apt to rise and make it hard to steer the tractor.

The motor horsepower for the tractor depends first upon the drawbar pull, which, however, does not mean anything unless the speed is taken into consideration. It takes practically the same power to pull two plows at 3 m.p.h. as it does to pull three plows 2 m.p.h. This is a point in regard to which the farmer has been greatly deceived. Some companies have sold their tractors on drawbar pull in pounds, saying nothing about the miles per hour, while other companies made a strong point of the miles per hour. Both factors together determine the drawbar horsepower.

Power Based on Total Displacement

In connection with the speed and drawbar pull the type of motor and the weight of the tractor must be taken into consideration. From an engineering standpoint—and I think, eventually for the convenience of the farmer—the power should be rated in the specification books on the basis of total displacement. In the following figures I am not going to take into consideration the speed of the different tractors in miles per hour. There is very little difference in the speed of the three machines in group A. In group B there is also surprisingly little difference in speed, in practical farm work, although there is a difference between groups A, B and C, as the small tractors will average from 10 per cent to 15 per cent higher in speed. However, for the sake of comparison, we will disregard the miles per hour in the table.

Out of ninety-five different models in the tractor specifications books, I have taken ten tractors which are among the most noted. The makers of all of them have 500 or more tractors actually in the field. The first three in group A are the large type, two two cylinder and one four cylinder. The next group, B, are the four cylinder 3 and 4 plow tractors of late models and light weight. In group C we have three of the two-cylinder 3 and 4 plow tractors of recent design, but possibly not the latest design. For comparison I wish to take up—

First, the cubic inches of piston displacement per minute for each 14-in. plow pull.

Second, the cubic inches of piston displacement for each 100 lb. rated drawbar pull.

Third, the cubic inches of displacement for each rated drawbar horsepower.

*Read at the S. A. E. tractor meeting held at Chicago on Feb. 1.

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SELECTED TRACTOR DATA

	Drawbar Brake, H.P.	Drawbar Pull, Lb.	No. of Plows	No. of Cylinders	Cylinder Dimensions, In.		Cubic Inches Piston Displacement					Piston Travel per Minute in Ft.	Pounds Weight			
					Bore—Stroke	Engine, R.P.M.	Per Rev.	Total per Minute	Per Plow	Per 100 Lb. Drawbar Pull	Per Drawbar H.P.		Of Tractor	Per Plow	Per Drawbar, H.P.	Per 100 Lb. Drawbar Pull
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A-1	38-60	6,000	3	2	10x15	500	2,356	1,178,000	147,250	19,633	31,000	1,250	20,100	2,512	529	335
A-2	30-60	6,000	3	4	6¼x8	650	1,061	689,650	86,206	11,494	22,988	866	19,500	2,437	650	325
A-3	30-60	5,600	3	2	10x12	375	1,884	706,500	88,312	12,616	23,550	750	26,000	3,250	866	464
Averages	.....	5,866	.....	.....	.....	.....	.....	.....	107,256	14,581	25,846	955	21,866	2,733	681	374
B-1	12-20	2,250	3	4	4½x5	800	318	254,400	84,800	11,563	21,200	666	6,500	2,166	542	295
B-2	18-36	3,300	3	4	4½x6¾	850	429	364,650	91,162	11,050	20,258	956	5,900	1,475	327	178
B-3	12-25	2,500	3	4	4¼x5½	900	312	280,800	93,600	11,232	33,400	825	5,200	1,733	433	208
B-4	15-30	2,600	3	4	4¼x5¾	900	322	289,800	96,600	11,146	19,320	862	3,000	1,000	200	115
Averages	.....	2,661	.....	.....	.....	.....	.....	.....	11,546	11,247	23,544	827	5,150	1,593	375	199
C-1	12-24	2,200	3	2	6x7	750	395	296,250	98,750	13,465	24,687	875	5,000	1,666	416	227
C-2	12-24	2,000	3	2	5½x7	750	332	249,000	83,000	12,450	20,750	875	5,000	1,666	416	250
C-3	12-25	2,500	3	2	6½x7	570	464	264,480	75,565	10,579	22,040	665	7,400	2,114	616	296
Averages	.....	2,233	.....	.....	.....	.....	.....	.....	85,771	12,164	22,728	802	5,800	1,815	482	257

Fourth, weight of tractor for each 14-in. plow pulled.

Fifth, weight of tractor for each 100 lb. drawbar pull.

Sixth, weight of tractor for each rated drawbar horsepower.

You will note in column nine, tractor No. A-1 has a piston displacement of 147,250 cu. in. per minute for each 14-in. plow pulled.

Tractor No. A-2 has a piston displacement of 86,206 cu. in. per minute for each plow pulled.

Tractor No. A-3 has a piston displacement of 88,312 cu. in. per minute for each plow pulled.

In column nine, the average piston displacement per minute per plow, of the three tractors in group A is 107,256.

The average piston displacement per minute per plow of the four tractors in group B is 91,450, or 15,000 cu. in. less than group A.

The average piston displacement per minute per plow of the three tractors in group C is 85,771, or 21,000 cu. in. less than group A. You will notice that the two-cylinder tractors in group C have less displacement per minute than group B, the four-cylinder machines of the same size, or less power per plow.

In column ten we have in group A the average piston displacement per minute per 100 lb. pull on the drawbar, 14,581 cu. in.

In group B the average piston displacement per minute per 100 lb. rated drawbar pull is 11,247 cu. in., or about 3300 cu. in. less than in group A.

In group C the average piston displacement per minute per 100 lb. rated drawbar pull is 12,164 cu. in. You will notice that in this case there are 900 cu. in. displacement more than in group B and 2400 cu. in. less than in group A per 100 lb. rated drawbar pull.

In column eleven we have in group A the average piston displacement per minute for each rated drawbar horsepower, 25,846 cu. in.

In group B, the average piston displacement per minute for each rated drawbar horsepower is 23,544 cu. in.

We have in group C for the average piston displacement per minute for each rated drawbar horsepower, 22,728 cu. in. You will notice that group B, the four-cylinder machines, have 700 cu. in. more displacement than group C.

In column thirteen we begin the relative weights of the three different groups of tractors. You will notice the average weight of the three large tractors in group A is 21,866 lb. The average weight of the four-cylinder tractors in group B is 5160 lb. and the average weight of group C, the two-cylinder tractors, is 5800 lb. or 650 lb. more per tractor than the four-cylinder machines, while the average drawbar pull of group B tractors is 429 lb. more than that of the group C two-cylinder machines.

In column fourteen we have the weight for each 14-in. plow pulled. You will notice the average weight of the large tractor in group A is 2733 lb. for each 14-in. plow pulled.

The average weight of the tractors in group B, which are four-cylinder, three and four plow machines, is 1593 lb., or nearly 250 lb. less for each 14-in. plow pulled than the weight of group A machines.

The average weight of the group C two-cylinder tractors is 1815 lb. for each 14-in. plow pulled, or nearly 250 lb. more than the average four-cylinder machine and about 1100 lb. per plow less than group A.

In column fifteen we come to the weight of tractor for each rated drawbar horsepower. In the large tractor we find this to be 681 lb. In group B, the four-cylinder tractors, we find an average weight of 374 lb. for each rated drawbar horsepower. In group C we find a tractor weight in the two-cylinder tractor of 482 lb. for each drawbar horsepower, or 108 lb. more than in group B and 200 lb. less than in group A.

In column sixteen we have the weight for each 100 lb. of rated drawbar pull. In group A you will notice this to be 374 lb. In the group B four-cylinder tractors the average is 199 lb. or 75 lb. less than in group A, and in group C it is 258 lb. more than in group B and 117 lb. less than in group A.

It is interesting to note in this connection that the highest piston speed in feet per minute is in group A and the highest crankshaft speeds are in groups B and C.

Both Types Show Development

Both the four-cylinder and two-cylinder late type tractors show a wonderful development, especially so in regard to the weight per plow and per horsepower. There is every reason why the large tractor should weigh less for each plow and for each 100 lb. of drawbar pull than the small tractor. This is due to the initial weight of the tractor, which in a one or two plow tractor is very high. The more plows we have to distribute the initial weight over, the less the weight for each plow.

For instance, it takes an initial weight of 1500 to 2000 lb. to pull one 14-in. plow; 500 to 1000 lb. more to pull two plows and 300 to 700 lb. more to pull the third plow. The displacement is affected in the same way, as it takes a certain displacement for the machine itself.

You will note that there is some variation in these averages. I think these are caused by some tractors being overrated in drawbar horsepower and drawbar pull, while others are very conservatively rated. As a rule, the four-cylinder machine shows a higher state of development than the two-cylinder machine. You will notice that in one case the rated drawbar pull is almost equal to the entire weight.

There is a question as to how far we can go in reducing the

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weight per 100 lb. for practical everyday use under average conditions of soil. I can see how we can eventually build tractors so that they will pull more than their weight, providing the speed is not too high, and that they are, as it were, geared to the ground, or used in certain sections where this is possible, I do not think it is possible under average conditions. However, our friend W. N. Smith will probably tell us later on that this can be done by the use of the "Never Slip" or "Caterpillar type." I admit that there is a big field in certain sections and for certain uses for the machine that Mr. Smith will tell us about, but the wheeled machine is going to be the popular machine and the big seller for average agricultural purposes.

Tractor engineers have been severely criticized in some cases for the past and present state of the tractor, with its various different designs. However, it is only through the development of different types and different designs that the law of the survival of the fittest can assert itself.

From now on the tractor industry is going to advance either by the survival of the fittest and the natural evolution of the right tractors succeeding and the wrong gradually dying out or getting in the right track, or, the tractor engineers and manufacturers getting together and through standardization avoid a lot of wrecks and failures which must come some time.

The tractor manufacturers of to-day have the greatest opportunity that any manufacturing industry has ever had in the history of the world. They have an opportunity of carrying standardization farther, if they will get together, work together, and, through the Society of Automotive Engineers, assist in putting through the standards which are necessary, and not try to hold back.

It has been said that eastern automobile manufacturers are going to try to get into the tractor manufacturing business. They are going to get in, and personally I believe that the sooner they get in the better, although they will probably spend fortunes to learn just what many of us have learned, but the automobile manufacturer has four advantages over the tractor manufacturer:

1—He has the money and is looked up to by the investor as a successful business man.

2—He knows how to get production, and he has the organization and equipment to get production.

3—By past experience in the automobile industry he knows the value of standardization, and will help standardize the parts of tractors.

4—He has learned to cut out petty jealousies and petty ideas, and to look at average results. One of the greatest troubles in the tractor business to-day is the prevalence of jealousy, of the craze to "beat" the other fellow, and of petty ideas. Some tractor men stick to these ideas until their company is bankrupt.

The tractor business is an important business. It is going to be one of the greatest in volume of all businesses. The tractor has a greater bearing on the food problem and the general happiness and welfare of mankind than any other machine ever brought out. It is going to entirely revolutionize farming in all parts of the world. It will lead to the adoption of better methods of tillage which are going to mean more food for the world at far less cost.

Considering the state of the tractor industry at this time, the inability of the companies to produce tractors fast enough and the quality of tractors that are being turned out, I believe that a Liberty tractor should be designed to be manufactured by the Government during the war. Any company should be free to manufacture this tractor as a whole or to use any feature thereof it might see fit, after the war. The corps of engineers appointed to design and build this machine should be given instructions not to do any experimenting, but to work on the lines of the best we have in the tractor as it is to-day.

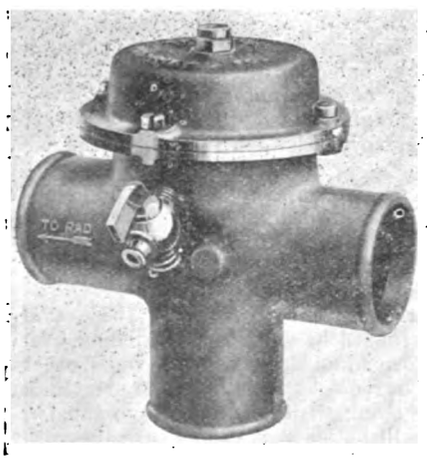
This move would do more to bring about standardization and development of the tractor than any other move that could possibly be made. It would result in the greatest good to all and especially to the tractor manufacturer. The war has emphasized the need and advantages of standardization in other machines. Why should not the same apply to the tractor?

Standardization has been greatly misunderstood. It does not mean that the different tractors will lose their individual characteristics; it does not mean a standard tractor. It does mean standard dimensions for certain parts and cutting out odd sizes, which will cut out unnecessary time and expense in the engineering department. It will reduce cost of parts by reducing multiplicity of parts. It will mean quicker and better service to users. Standard dimensions as, for instance, a drawbar height of 17 in. and a standard speed of 2 1/3 m.p.h., will do away with confusion, misunderstanding and unnecessary expense.

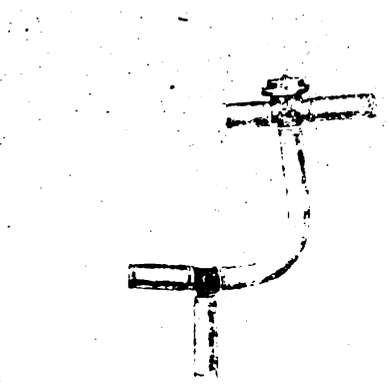
Standard units or parts mean that parts of different makes will fit in the same place, with the same bolt, interchangeably. It means that any magneto, carbureter or clutch can be used on the same motor of the same size. It means that a Waukesha, Buda or Erd motor of the same size can be used without change. It will eventually mean that a Foote, Nuttall or any other standard transmission will fit the tractor without change, of even a bolt hole. Many different tractors have the Waukesha motor. Do they look alike? Doesn't each have its own individuality?

Rayfield Thermostat Control Involves New Principle

HERETOFORE thermostatic valves in cooling circuits simply obturated the circuit at one point when the temperature of the water dropped below a certain point, thus preventing all circulation through both the engine jackets and the radiator. There is a clearly defined object in shutting off circulation through the jackets—namely, to maintain the cylinder walls at a relatively high temperature. This object is not furthered, however, by preventing circulation through the radiator, as with the jackets shut off from the radiator no heat can be transferred from the former to the latter.



Rayfield thermostat



Method of installation

Charles Rayfield, engineer of the Findeisen & Kropf Mfg. Co., Chicago, has developed a circulation control system embodying two butterfly valves linked together, in connection with an expansion coil which opens the upper valve and closes the lower one when the circulating water reaches a temperature of 170 deg. Fahr., thus permitting circulation through the radiator, whereas if the engine is cold the upper valve is closed and the lower one open, water circulating through the radiator and pump only. Thus the water in the cylinder block is gradually displaced until all of the water in the system is raised to the predetermined temperature, which in this case is 170 deg. Fahr.

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Fiat Tractor for Hauling Field Guns

Weighs Eight Tons and Is Capable of Hauling 25 Tons Up a 15 Per Cent Grade—Chain Drive to Rear Wheels

A VEHICLE designed to haul guns naturally must differ considerably in design from a touring car or truck. Not only must it be capable of hauling heavy loads, but it must possess the ability to travel over any kind of country and get itself and its trailers out of every kind of difficulty. The three main types of artillery tractors are four-wheel drivers—in which power is delivered to the front as well as to the rear wheels; the caterpillar or track laying tractor; and the rear wheel driver with special driving wheels.

The most extensively employed of the latter is the Fiat 70 hp. tractor, used throughout the Italian artillery service, and also by the French. This tractor, which weighs nearly 8 tons empty and carries a load of 3½ tons on its platform, is capable of hauling 100 tons on good level roads and can climb gradients of 15 per cent with 25 tons in tow. Its road speed varies from 1 to 8 m.p.h. It is claimed to be able to handle the largest guns used in the field, and to have taken big guns into mountain positions altogether inaccessible to horse teams.

Chain Drive Inclosed

On the Fiat tractor the power is transmitted to the rear wheels through inclosed side chains, the housings of which not only act as radius rods but are sufficiently heavy to carry the weight of the vehicle if the wheels embed. Front wheels are cast steel shod with rubber tires, while at the rear there are big diameter steel wheels of a patented type designed to receive around their circumference an endless steel band. When not in use on the wheel these bands are carried on platforms which form mud-guards alongside the body. Being heavy, they are hauled into this position or lowered to the ground by means of a hand winch. These bands, which are only put on when roads are in very bad condition, or when the tractor has to operate away from made roads, increase the supporting surface and also increase the adherence.

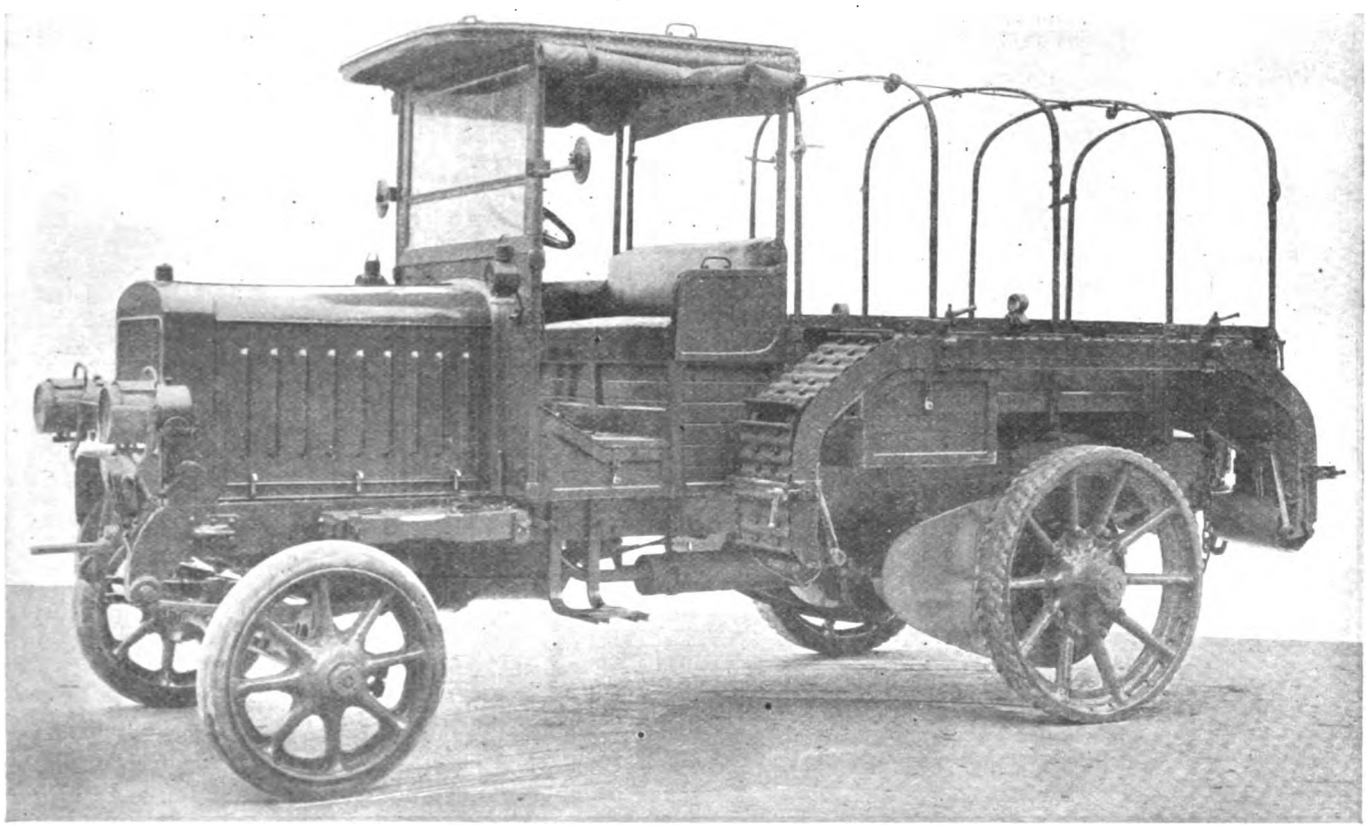
The tractor is fitted at the rear with a powerful winding drum having 60 yd. of 15 mm. steel cable. This drum is made use of when the tractor cannot get its trailers or its gun up a hill by direct haulage. Then it climbs alone, unwinds its cable and hauls its load up slowly.

The engine has four cylinders of 5⅛ in. bore by 8⅛ in. stroke, with a normal speed of 1000 r.p.m. Four speeds and reverse are afforded by the transmission. A differential lock and very powerful water-cooled brakes are other features. There is a special device whereby the hand brake can lock either wheel, as desired, thereby facilitating getting round corners on steep mountain roads.

The Fiat tractor is at present employed exclusively in war service. The results obtained in the haulage of artillery in the Alps have induced the makers to believe that it will be used extensively after the war in peaceful occupations, particularly in the colonies and new countries.

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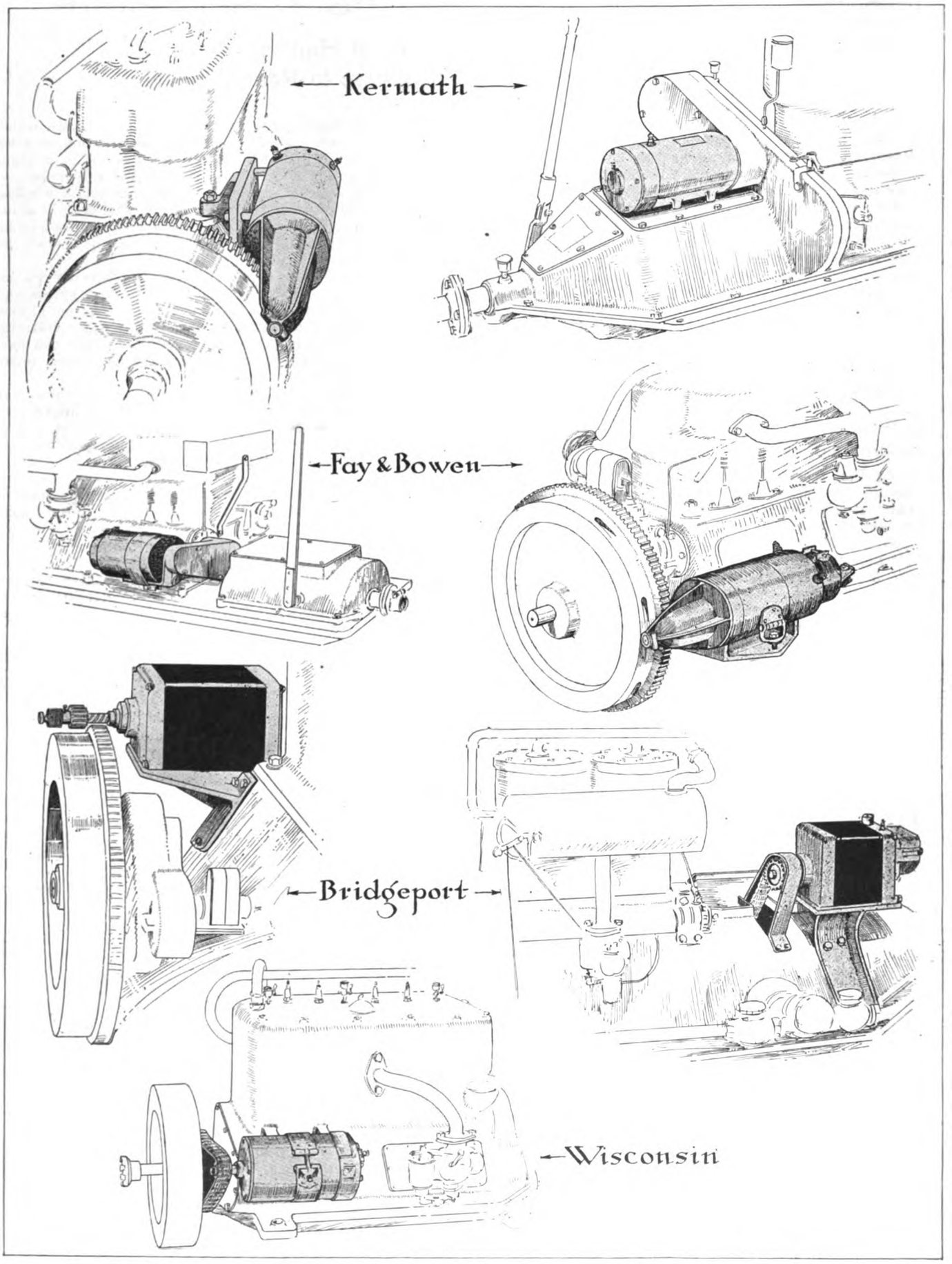
A SURVEY of aircraft traffic plans in Sweden was made at a recent meeting of the Aeronautical Society in Stockholm by Capt. Dahlbeck, the meeting being attended by the crown prince, the premier and members of the cabinet. Denmark has no air traffic society yet, but a large new factory for airplanes is in full swing. Denmark is interested in comprehensive international schemes, such as England-Denmark-Sweden and Germany-Sweden-Norway, that is as an intermediate link.



Fiat heavy road tractor for moving artillery and supplies

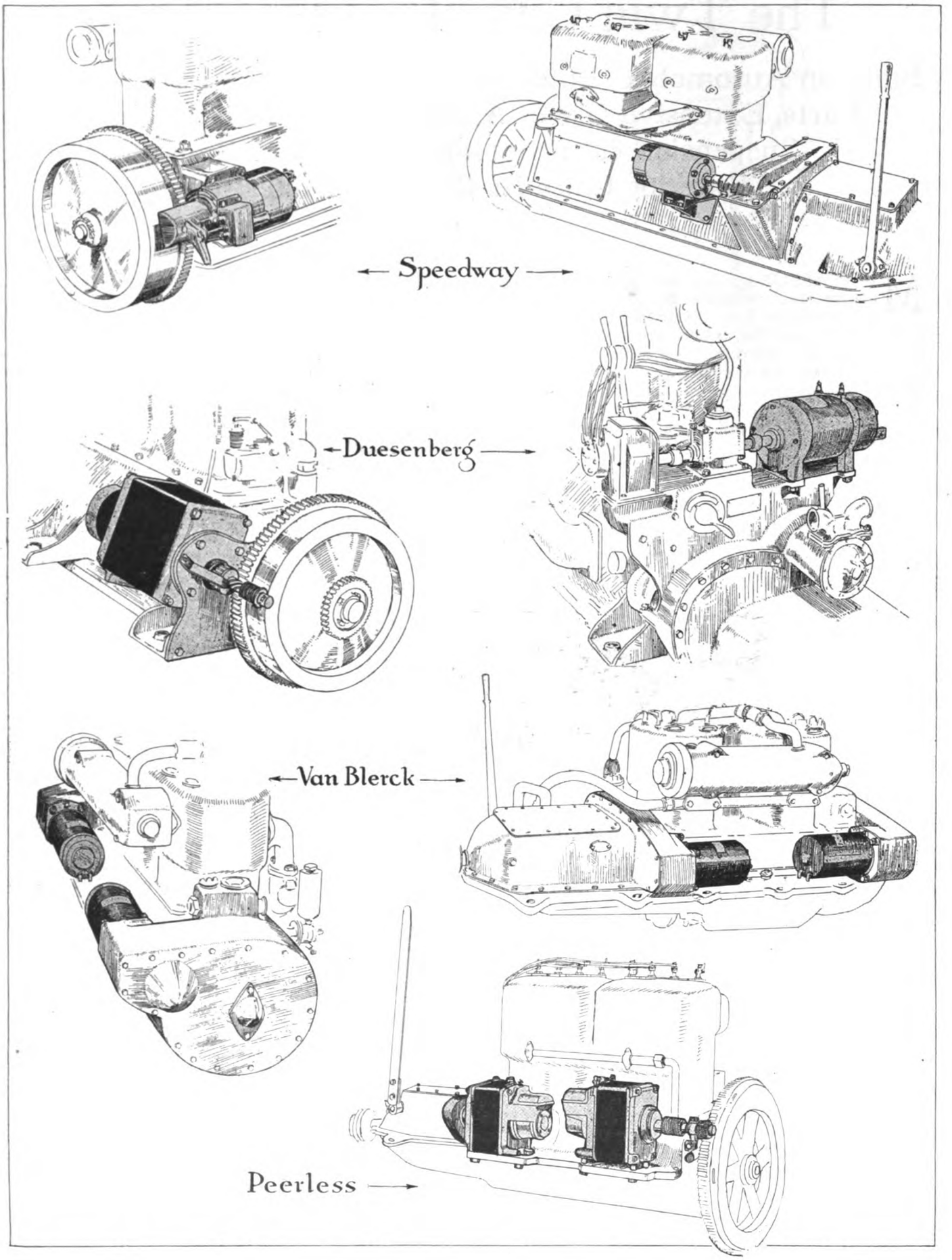
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Starter and Generator Mountings on



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Motor Boat Engines at the Recent Show



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The Twin City "16" Oil Tractor

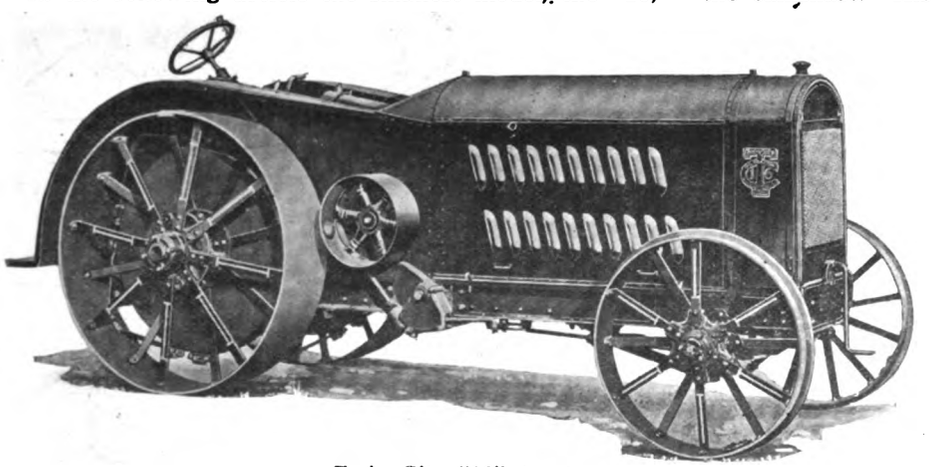
Built on Automobile Lines—Total Enclosure of All Working Parts, Extensive Use of Anti-Friction Bearings, Spring Suspension in Front and Rear, and Smooth Exterior Lines Its Chief Characteristics

By P. M. Heldt

MINNEAPOLIS has long been a center of the farm tractor industry, and among the leading concerns in the business in the Flour City is the Minneapolis Steel & Machinery Co., which turns out the Twin City line of tractors, comprising four different models. The line ranges from the moderate sized "16-30" to the huge "60-90" and covers every requirement of farm work. Three of the four models are fitted with four-cylinder engines, while the largest has a six cylinder one. The cylinder dimensions and piston displacements are as follows:

16-30	25-45	40-65	60-90
5 x 7½ in.	6¼ x 8 in.	7¼ x 9 in.	7¼ x 9 in.
589 cu. in.	982 cu. in.	1486 cu. in.	2229 cu. in.

In the following article the smallest model, the "16," is specially dealt with. The latter is equipped with an engine of thoroughly modern design. Its four cylinders are cast in a block and the cylinder heads are detachable. The jacket space tapers slightly from the top to the bottom, so that the greatest amount of water is carried where the greatest cooling effect is needed. It will be noticed from the sectional view herewith that the water space is especially liberal around the head. The spark plug is so located as to insure effective cooling—a point of considerable importance where kerosene is the fuel used. A somewhat unusual feature is the high bosses for the cylinder head retaining bolts. Their object is apparent, however, for it will be seen that the faces of these bosses are in a plane with the faces of a number of other bosses on the head, so that all can be milled off in one operation. In order to obviate condensation of the fuel in the intake manifold, the latter is cast integral with the cylinder block, and there is only a single joint between the inlet pipe and the engine. The exhaust manifold is outside the cylinder casting and is of special design.



Twin City "16" tractor

The pistons are comparatively long and are provided with three compression rings at the upper end. Over the piston pin, the piston is deeply relieved, making it of what has come to be known as the hour-glass type. Adjacent to the piston pin ends the relief extends considerably farther up and down the pistons. A hollow, hardened piston pin is used. It has its bearing in the connecting-rod, being secured in the piston bosses by means of a key and set screw. The connecting-rods are drop forgings of the usual I section.

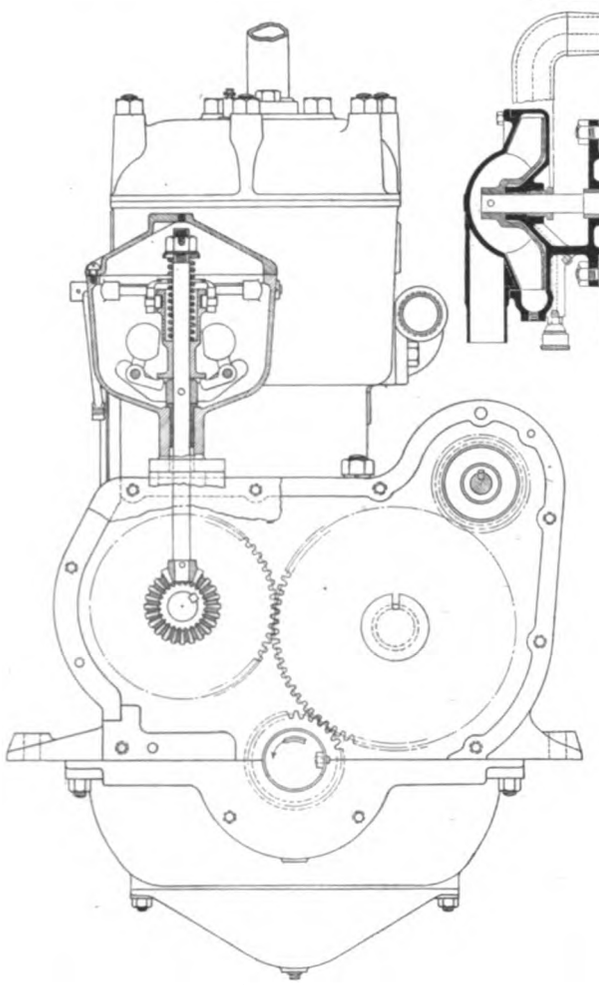
The small pinion on the crankshaft meshes with a large idler gear and the latter in turn meshes with the gear on the camshaft. Also meshing with the idler gear is a small gear for driving the water pump and the magneto shaft, both of which latter devices run at crankshaft speed. The crankshaft pinion is of forged steel. In fact, all of the gears of the camshaft drive are of steel and the idler gear is hardened. From the forward end of the camshaft the governor is driven through bevel pinions. The governor is mounted on a vertical shaft and acts on a forked lever the spindle of which extends through the wall of the governor housing. A lever arm secured to the spindle outside the housing connects to a butterfly valve in the inlet pipe. There is another, hand-controlled butterfly valve in the carbureter. By removing a plate at the forward end of the engine all of the gears of the camshaft and accessories drive are rendered accessible.

Valves of the usual 45 deg. poppet type are used and are located all on the same side of the cylinder block, which is of the L-head type. There are no caps over the valves, and in order to get at them it is necessary to remove the cylinder head. Valve caps or plugs often are a source of trouble, because of their overheating and causing preignition, and, besides, it is figured that when one valve needs attention it is generally good policy to look them all over and the cylinder head can be taken off as easily as eight valve plugs can be removed.

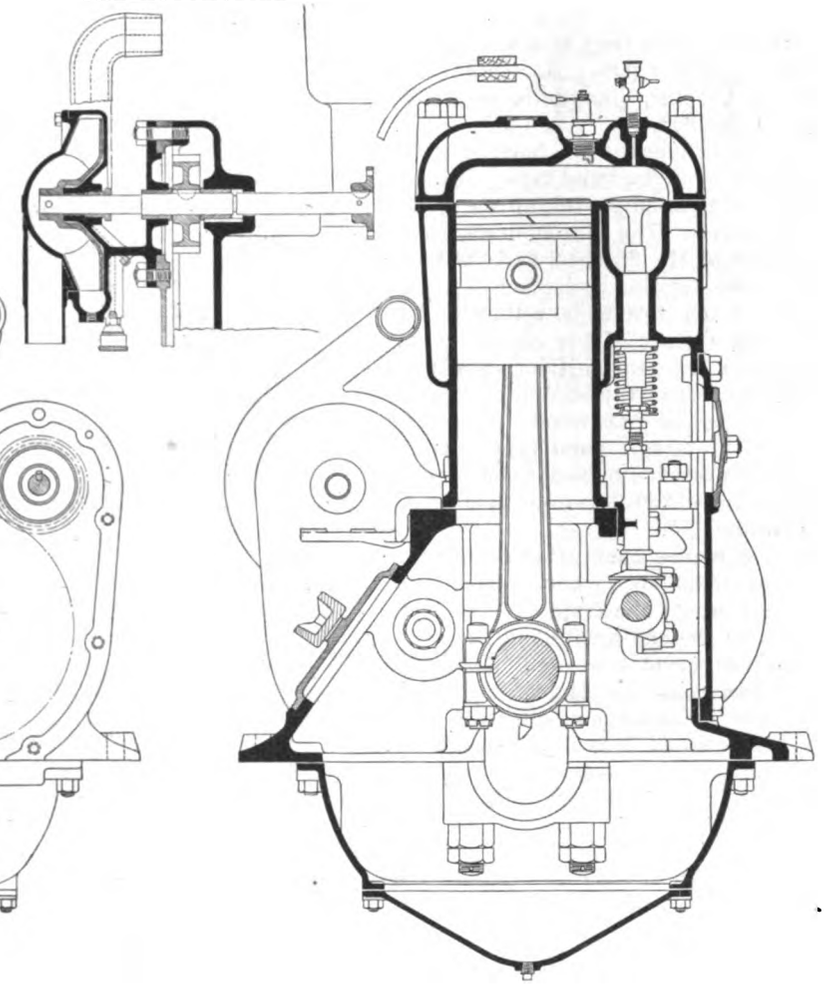
The push rods or cam followers, which have flat bottom ends, are mounted in guides bolted against the upper part of the crankcase, four guides being in one piece.

The entire side wall of the engine from the lower edge of the valve pockets to near the central flange on the

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Front view of engine, showing gearing and governor



Section through engine, indicating accessibility of parts

crankcase is removable, but there are hand holes in this large side plate directly opposite the valve adjusting nuts, and the hand hole covers can be removed in case an adjustment is to be made. On the opposite side of the crankcase there are two large hand holes with cover plates through which the connecting-rod bearings may be adjusted and piston and connecting rods removed if desired. For the adjustment of the camshaft bearings it is necessary to remove the large side plates. The camshaft has its bearings between the side of the crankcase and bearing caps. It can be easily removed. All of the three crankshaft main bearings are supported by the upper part of the crankcase, thus making it possible to remove the lower half of the case without disturbing any other part.

A Kingston 1¾ in. carbureter is used, in connection with a special vaporizing manifold. The exhaust manifold is of what may be described as the looped type. A part of the lower branch of the loop is surrounded by the vaporizer. At each end of the upper branch of the exhaust manifold there is a butterfly valve by which means it is possible to let any part or all of the exhaust gases pass through the lower branch, thus increasing or decreasing the heating effects in the vaporizer at will. The vaporizer is in the form of a jacket over the exhaust pipe within which jacket there is a series of baffles compelling the gases to take a zigzag course.

Under ordinary conditions, the Twin City "16" operates on kerosene, its carbureter being fed from a 33 gal. tank. The engine is started on gasoline, however, and a storage capacity of 3 gal. of gasoline is provided. By means of a three-way valve located close to the seat of the driver, the change from one fuel to the other can be made. The kerosene tank is located under the rear platform or floor and is of sufficient capacity for a day's work. The gasoline tank is cylindrical and is located on the left hand rear wheel guard. From the kerosene tank the fuel is fed to the carbureter by the Stewart vacuum system.

Ignition is effected by a K-W magneto with impulse starter. Timing of the spark is controlled by hand. Lubrication is by means of a Detroit lubricator which is mounted on a bracket at the side of the cylinder block. From this lubricator oil leads run to each of the three main bearings and to each cylinder. The lower part of the crankcase is made in the form of a set of troughs under the connecting-rod heads, and splash lubrication is used in addition to the force feed. Each connecting-rod cap is provided with an oil spoon which dips into the oil in the troughs. The lubricator is driven through a round leather belt from the rear end of the camshaft.

Liberal Cooling System

A centrifugal water pump of liberal size is mounted as a unit at the front end of the cam gear case. A horizontal, tubular type of radiator is used, the tubes being of small diameter and placed close together. There is no less than 154 sq. ft. of cooling surface in the radiator and the cooling system has a capacity of 35 gal. A four-bladed fan 24 in. in diameter is mounted on the front cover and is driven by a 2½-in. flat leather belt off the crankshaft at 1900 r.p.m. There is one water inlet to the engine jacket, at the bottom of same, and a single outlet centrally in the head.

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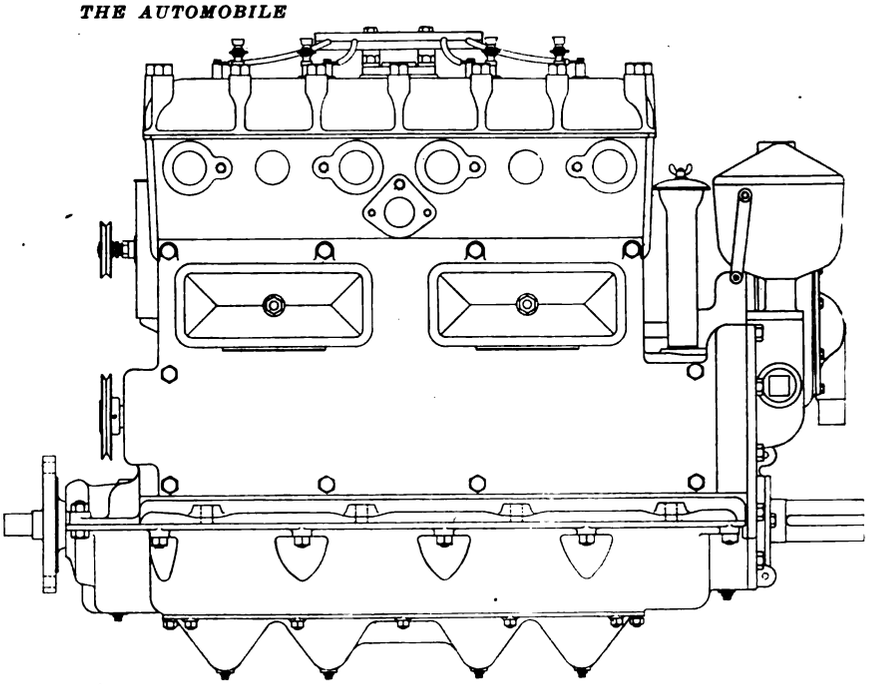
The engine is governed to run at a normal speed of 650 r.p.m. Its weight, including carbureter, magneto, manifold and fan, is 1650 lb.

Ease of adjustment is the feature of the clutch, which is of the band type. Adjustment may be effected by taking up on the anchoring screw. The clutch drum is an integral part of the flywheel and the band is lined with friction material. A cup and cone clutch brake is automatically applied upon release of the clutch, thereby facilitating the gear shifting operation. The male member of this clutch brake consists of a block of hardwood. Since the clutch is of the single band type, a counterweight is provided opposite the bracket supporting the clutch lever, to insure balanced running.

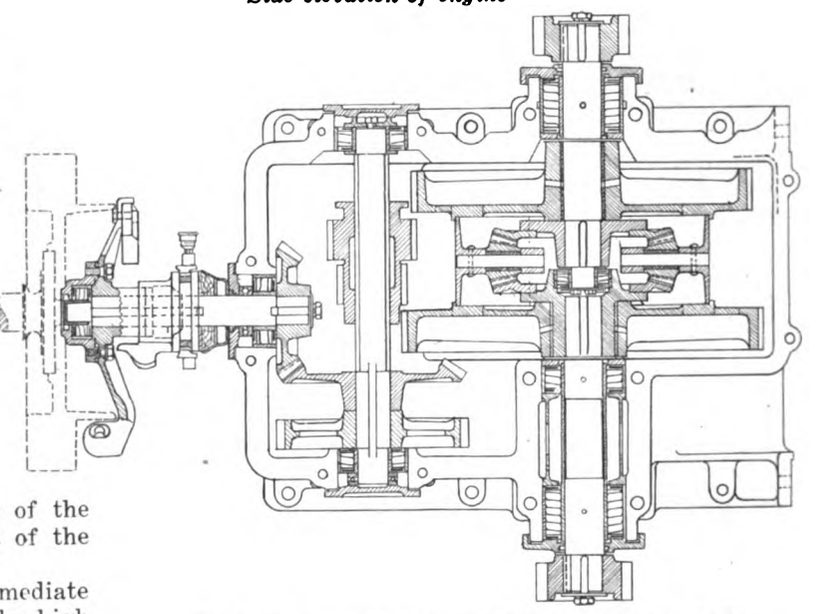
A short distance back of the engine is located the gear-box, whose shafts run transversely across the frame. Therefore, the pinion on the shaft entering the gearbox is of the bevel type, and it meshes with a bevel gear on the intermediate shaft of the transmission, effecting a reduction in the ratio of 3 to 2. Directly back of the bevel gear on the intermediate shaft is a spur gear which meshes with another spur gear on a shaft in the forward part of the gearcase. This shaft extends outside the gearbox and carries the belt pulley. Hence belt power is controlled by the same clutch as the motion of the tractor. The pulley is 17 in. in diameter and has a width of face of 8 in.; it runs at 528 r.p.m., giving a belt speed of 2350 ft. p.m. The intermediate shaft is squared over the greater portion of its length and carries a double sliding pinion, one of the pinions serving for the low gear and the other for the high gear. These pinions are adapted to mesh with two large gears on the differential shaft, one of the gears being located on either side of the differential gear and forming part of the differential housing or frame.

For the reverse speed an intermediate pinion is slipped into mesh with the high speed pinion and gear. Control of the change gear is effected selectively. All shafts of the transmission are of alloy steel, heat-treated and ground and the gears are of special gear steel and cut with stub teeth. All of the shafts are mounted in Hyatt roller bearings. The two forward speeds are 2 and 2¾ m.p.h., respectively, and the reverse speed is the same as the higher of the two forward speeds—2¾ m.p.h. The differential is of the bevel pinion type with four pinions and is so designed that all bevel gear thrust is self-contained.

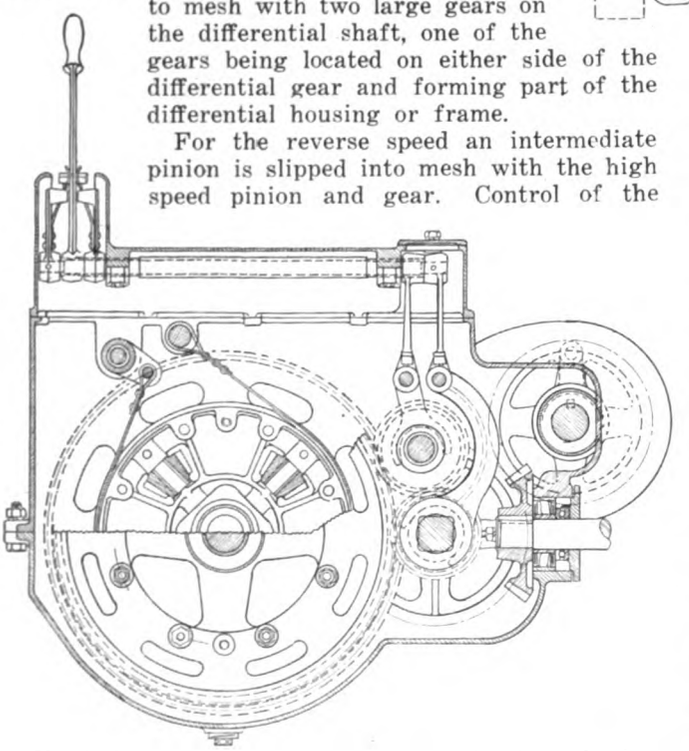
The final drive to the rear wheels is by completely inclosed internal gears. The pinions of this gear are secured to the outer end of the differential shaft. The bull gears are centered on a turned shoulder on the drive wheel hubs, so that they are maintained perfectly concentric to the wheel, which permits of a correct mesh of the gears and pinions and of a silent and efficient drive. The bull gear, however, drives directly to the wheel rim through tension bars, thereby relieving the web of the bull gear and also the drive wheel of all torsional strain. Bull gears and pinions are completely inclosed by a sheet metal guard which telescopes the rim of the gear, making



Side elevation of engine

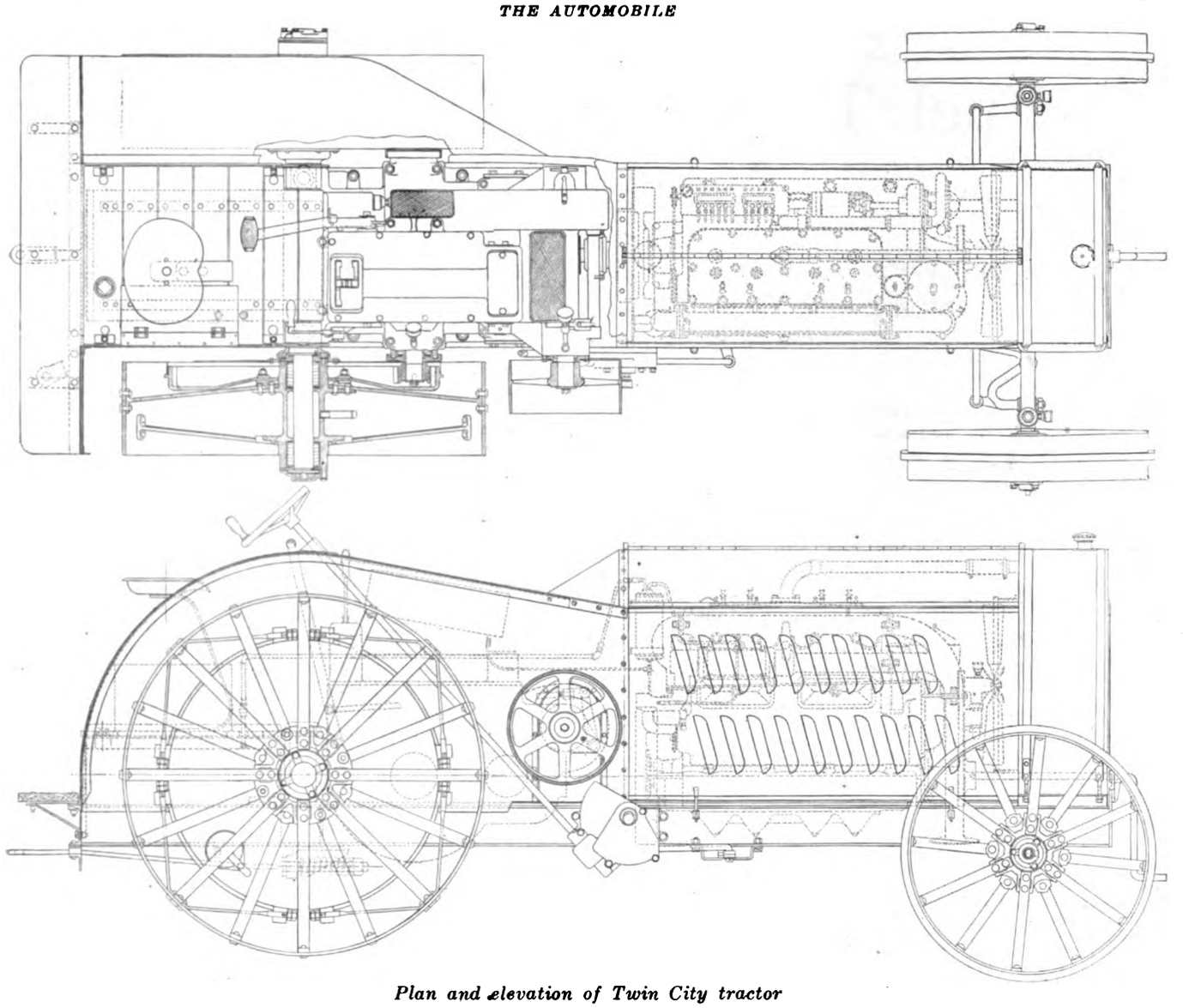


Horizontal section through clutch and transmission



Vertical section through transmission, showing selective control, differential and brake

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Plan and elevation of Twin City tractor

a running joint between the gear and the guard. By the use of a special lining all dirt is excluded from the gear and efficient lubrication is made possible. The bull pinions are made of steel forgings and are hardened, and the bull gears are made of semi-steel.

The rear wheels are 54 in. in diameter and have rims 14 in. wide. They are mounted on Hyatt roller bearings on the stationary or dead rear axle. The latter is heat treated and ground, and is mounted in guide bearings which sustain the weight of the tractor through coiled springs. The front axle is of the automobile type, its main portion being of I section. Spring suspension is also provided for the forward end of the frame, the weight being carried on the axle through springs concealed in the frame, beneath the radiator. Hyatt bearings are used also in the front wheels, which are mounted on heat treated and ground steel knuckles. The hubs of all four wheels are provided with large grease chambers, an oil tight cap and end plate insuring perfect lubrication without the need of frequent attention. The front wheels are 36 in. in diameter and have rims 7 in. wide. A brake is placed on the housing of the differential gear. It is of the band type and operated by a pedal.

The frame is made of 6-in. structural steel of heavy section, and is reinforced by plates at both top and bottom flanges. All joints are hot riveted. The steering gear is of the worm and sector type and is inclosed in an oil tight case. A neat hood is provided over the engine which conforms exactly to the outline of the radiator and joins the wheel guards which are formed to line up nicely with it. It is securely held in place by spring clasps but can be easily and quickly removed.

The draw bar, which is spring cushioned, is located at a height of 15½ in. from the ground. The tractor has a wheelbase of 9 ft. and its total weight is 7800 lb.

New Instrument for Thermal Investigations

IN A PAPER published in a recent number of the *Revue de Metallurgie,* Pierre Chevenard describes a type of differential dilatometer which he has designed for thermal investigations on steels in connection with their heat treatment. He claims that this instrument is highly suitable for use in a steel works laboratory owing to the reliability and simplicity of its design. Only small quantities of metal are required; the instrument is easy to set up, and the readings are not affected by the vibrations which are unavoidable in a steel works laboratory. An instrument of the type referred to has been in use for some time for routine testing in a large steel works in France. It provides a useful complement to the chemical and micrographical examinations of certain steels. Finally, the instrument has proved useful in examining, qualitatively, slight modifications in the dilatability of metals owing to thermal or mechanical influences.

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Fuel Tanks and Other Sheet Metal Parts

Tank Designs Worked Out by Geuder, Paeschke & Frey in Great Variety—Strong and Weak Points of Various Forms—Drawn Steel Oil Pans and Radiator Shells

FORMERLY the fuel tanks of automobiles were made from copper, riveted and soldered. This was a very expensive process because of the large amount of work involved. Copper was the material used, because it presents a clean surface and the solder flows well on it and adheres well. At the present time the commercial material for built-up type gasoline tanks is terne plate, which is sheet steel coated with an alloy composed of approximately 75 per cent of lead and 25 per cent of tin. The stock generally specified varies from No. 18 gauge to No. 22 gauge, the latter being used only where the tank is not exposed to injury. Where it is exposed it is better and quite usual practice to make the body of No. 20 gauge and the heads of No. 18 gauge.

There are numerous constructions of gas tanks, and the writer recently had occasion to discuss the subject with an engineer of Geuder, Paeschke & Frey of Milwaukee, who specialize in tanks of all kinds for use on motor cars, trucks and tractors, as well as in deep-drawn sheet metal stampings.

Forms of Seams Used

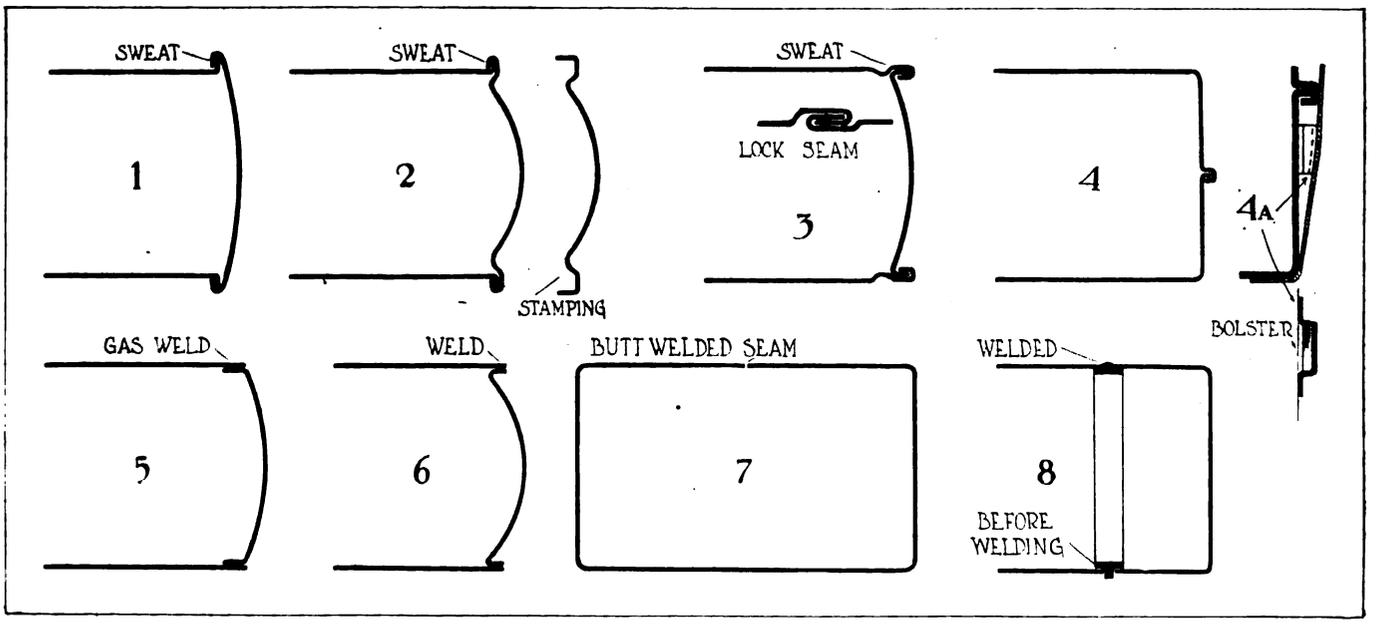
A few of the different types of construction are here described. The construction shown at 1 is unsatisfactory because the body of the tank is not properly supported. It will be noticed that the body is flanged out at the end—this being done in a flanging machine—and the convex head is then spun or beaded over the flange and sweated.

A better construction is that shown at 2. Here the head is pressed in the form shown on the right and is forced onto the end of the tank body. It is obvious that with such a tank there is much less likelihood of distortion from the cylindrical shape. The flange on the head is first spun over and the joint is then sweated as shown.

Another construction, and which is considered the best of all by the G. P. F. engineers, is that shown at 3. Here a small corrugation is rolled in the body sheet near the head to stiffen the body and support the head. The convex head with its outwardly turned flange is forced in, the edge of the body sheet is spun over and the joint sweated. One advantage of this construction is that there is no flange on the outside of the cylinder, so the tank can be put in a very restricted space. Also, the sweated joint is in a protected place. The form of lock seam used on the body of the tank is shown in the small sketch.

Baffle plates are sometimes riveted and soldered but generally only soldered. Of course, it is better to both rivet and solder them, as in that case all chances of their coming loose are eliminated. In the average 14-16-gal. tank, 12 in. in diameter by about 30 in. long, two baffle plates are usually specified.

Recently drawn tanks have come into use. These might be described as consisting of two deep pans joined together at their flanges. One advantage of the drawing process for making tanks is that it permits of irregular shapes as required in cowl tanks of great



Forms of seams and joints used in fuel tanks

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strength. The drawn tank costs somewhat more than the ordinary built-up tank, but when a cowl tank is used no vacuum feed system is required and the saving thus effected may be made to more than offset the slight additional cost of this type of tank over one hung at the rear of the car.

Truck and Tractor Tanks

For truck and tractor purposes welded tanks of heavier stock, usually No. 16 gauge, are used. There are also several forms of construction in this line of tanks. The ends may be formed as shown at 5 or as shown at 6. There is probably very little difference between the two constructions as regards their merits, and it is largely a matter of taste—one engineer prefers one type and another the other. In both cases the tank body is supported on a wide circular ring. There are also two methods of making the longitudinal seams of these tanks. They may be either butt-welded, as shown at 7, or lap welded.

Cut 8 illustrates a distinctive Geuder, Paeschke & Frey construction. In this a T sectional piece of rolled material is provided to act as support. The web of the support extends slightly above the outside surface at first, but after being fused down, at the same time welding the body, head and reinforcement solidly together, it has practically disappeared.

Materials for Tanks

Tanks are furnished either in the black, galvanized or in terne coat. Baffle plates are usually omitted in truck tanks, on account of the low speed, the heavier stock used and the more rigid supports.

Designers of automobiles should realize the necessity of properly supporting the tank. Owing to the great weight of a full tank the stresses imposed on the supports at high car speeds are heavy, and the supports should be made of adequate strength to withstand the load and protect the joints of the tank. A rear-hung tank must not be supported too rigidly, as the frame weaves. Probably the best method is to use straps of 18 or 20 gauge steel about 1½ in. wide, lined with brake lining (or anti-squeak material). In the case of drawn tanks with projecting longitudinal seams, it is necessary to use bolster plates, as shown at 4A, to prevent the supporting straps from bending over the seams and breaking them open.

As an illustration of the troubles sometimes experienced with tanks and the reasons therefor, the engineer of the Geuder, Paeschke & Frey Co. told the writer of the following case: One automobile company received continuous complaints about end seam leaks in their fuel tanks, but the trouble seemed to be limited to the runabout and coupe models. An investigation showed that the spring clip hit the seam of the tank, which was due to lighter springs being used on these models than on the touring model, which permitted unusual deflection and side sway.

Soldered Seams Not Dependable

Solder should not be depended on to take strains, but only to act as a seal. The former applies also to spot welding. Where strains must be taken up rivets should always be used.

Gasoline tanks are made by the Geuder, Paeschke & Frey Co. both with and without sediment cups. If the gasoline feed tube enters at the top it is well to secure it at the bottom to prevent vibration. It has been found preferable to put the filler spouts on the body rather than on one of the heads. If the spout is placed on top of the body it is impossible to get an air trap and the tank can be filled full without difficulty.

Geuder, Paeschke & Frey have been specializing in deep drawing work since 1881. They confine themselves to drawings of light gauges, Nos. 10 and 11 being their heavy limits. Small drawings from heavy stock, such has hub caps, brake drums, rear axle housings, etc., are not made because the company's presses cannot be advantageously used for such parts.

Some of the automobile parts other than gasoline tanks which the firm is producing in great numbers are radiator shells, engine oil pans, gear covers, cylinder head covers, side cover plates, top water manifolds, flywheel housings, miscellaneous covers, rocker arm housings and pulleys for Vee belts. By reason of its electric spot and autogenous welding facilities in conjunction with its press and die sinking equipment the company can produce very complicated stamped and drawn assemblies.

Engine Oil Pans

Probably one of the most advantageous applications of deep drawing in automobile construction is in the production of oil pans for engines. In deep drawing the gauge of the metal is practically not changed. A drawn steel oil pan weighs about the same as an aluminum pan, but is much cheaper to make and, besides, it is practically indestructible. It can be dented, but the dent can be hammered out again.

A great deal of drawn work requires to be rust-proofed in some way, and if several parts are assembled they must be rust-proofed after assembling, for riveting and similar methods are apt to injure the rust proofing. This applies particularly in the case of oil pans for engines. Geuder, Paeschke & Frey either terne coat or galvanize the pans after assembly. After the pan has been galvanized or terne coated, it presents an ideal surface for soldering on fittings, so that the pan is made oil tight. The fittings that must be secured to the pan include drain flanges, gauge fittings and oil supply fittings. A starting crank bracket casting may be riveted and sweated to the timing gear cover in this way and thus provide a most satisfactory substitute for the grey iron or aluminum casting formerly used.

As regards interchangeability, drawn steel parts compare very favorably with machined castings. They are formed and perforated on dies and are fully interchangeable. All are inspected, of course, before leaving the plant.

Cork Gaskets Used

Wherever an oil-tight joint is required a cork gasket 1/16 in. thick is used, and is shellacked either on one side or on both sides. It is claimed that a properly designed stamping will not give any more trouble from oil leakage than a machined casting. The usual practice in connection with pressed steel oil pans is to let the end opening edges enter into grooves on the bearing caps, which are packed with felt. Some firms, however, machine the end openings of the stampings to exact dimensions and fit them against the bearings.

Drawn steel radiator shells are now very extensively used on passenger cars, except on cars of small production, which do not warrant the tool expense. The use of a pressed steel radiator shell reduces the cost of the radiator, because it makes it unnecessary to finish the core all over; it protects the core and tanks and yet makes them more accessible for repairs. Also, it is more in harmony with the finish of the rest of the car. Many car builders buy their radiator cores and shells separately, in which case they avoid the risk of damage in transportation and they enamel them them-

(*Continued on page* 391)

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Concerning Wire Rope for Aircraft

Wire Must Show High Elongation as Well as Great Tensile Strength—Tricks in Wire Drawing Permit of Obtaining High Breaking Strength at the Expense of Toughness

IN *Aeronautical Engineering* for Jan. 9, J. and W. Ker Wilson discuss the subject of wire ropes as used in airplane construction. They express the belief that eventually it will be possible to make flexible cable in streamline form, and to dispense with the unreliable streamline solid wire. Wire rope is frequently the weakest link in strong engineering structures. The material should not only have sufficient strength, but also sufficient elasticity to withstand the severe stresses imposed upon it. In the authors' opinion, elasticity is fully as important a property as tensile strength, and a tensile test alone is not sufficient for judging the wire. There is a possibility that in the future a simple form of streamline fairing will be developed, which will eliminate the so-called "vibrant strains." Not only does the fairing reduce the vibration and consequently the strain upon the wire, but it greatly reduces the resistance to motion. It is claimed that a small wire vibrating rapidly offers as much resistance to motion as a flat surface as wide as the amplitude of the vibration.

Hardened by Drawing Process

All rope specifications should provide for not only torsion, bending and tensile tests of the individual wire after drawing, but also for the material in rod form before drawing. Wire rope of the requisite quality can not be produced from cheap material. The following practice is to be absolutely condemned. A manufacturer starts with low carbon rod, anneals it and instead of drawing it down by one-half to one-quarter gage sizes, pulls it down to the required size in steps of 1½ to 2 sizes. The stresses thus imposed upon the material harden the wire at the cost of elasticity. If tensile strength is the only test called for, such a wire may pass. In one instance a manufacturer ordered 120-ton quality wire from his wire drawer to show 135 to 140 ton tensile strength in individual wire form. The idea was that such abnormal wire would show a high tensile strength when made up into rope form, with a straight-pull test, and so satisfy inspection. With proper inspection no wire showing a greater breakage stress than 125 tons would be accepted. The authors emphasize that, in the future, specifications of wire rope must not only demand a certain breaking load but also specify the elongation.

Hardness may be further intensified by very high machine speed in stranding and closing the rope. If the elastic limit is not exceeded in the drawing operation no hardness results, but if the drawing subjects the material to stresses beyond the elastic limit, a certain amount of permanent set is produced and hardness is the result. The more the stress exceeds the elastic limit the greater the hardness. Of course, in all wire drawing the elastic limit is exceeded.

Hardness can be kept within reasonable limits in three ways, viz., (1) by giving careful heat treatment during manufacture; (2) by carefully drawing down the wire by one-quarter to one-half

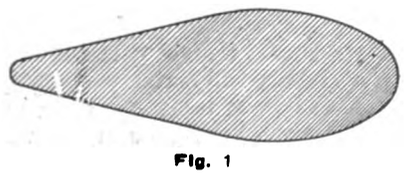


Fig. 1

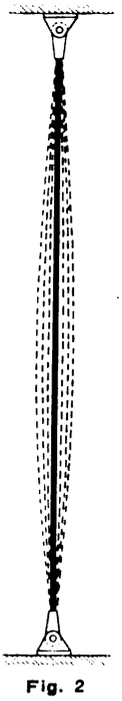


Fig. 2

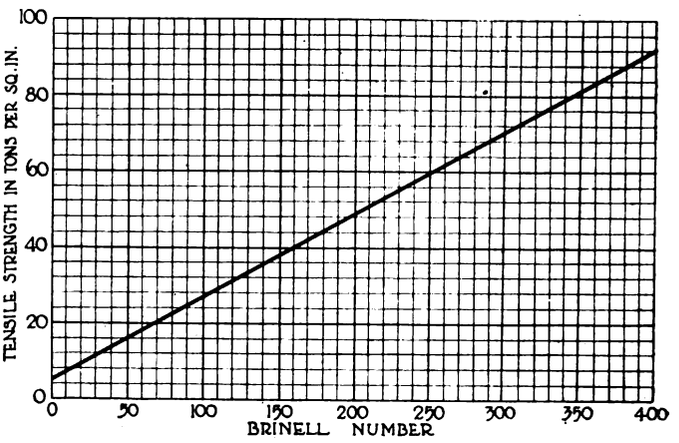


Fig. 3

sizes; (3) by using durable speed (moderate) for stranding and closing the rope. A certain amount of hardness is desirable, because, for a given weight, hard-drawn steel wire will support a heavier load than the untreated steel; but it must always be remembered that the increased tenacity has been obtained at the expense of elasticity, and the hardening should never be carried so far that the material becomes dangerously brittle. Fig. 3 shows how hardening the material raises its tensile strength and reduces its elasticity, or what is more correctly called its plasticity.

The authors made a study of the relation between the Brinell hardness numbers of drawn steel and its tensile strength. This relation may be very closely expressed by the following equation:

Tensile strength in tons per square inch = 0.213 Brinell number + 5.

In the report of the hardness test research committee Dr. Unwin stated that the ratio of tensile strength to hardness number was very nearly 0.325.

Stranding Produces Stresses

As previously pointed out, the usual practice in stranding wire is to draw the wire at high speed through imperfectly made machines, thereby subjecting the wire to terrific stresses. The wire is drawn from the spools through the closing die, thence around a large diameter drum and so on to a take-off reel. Unbelievable though it may seem, when drawing high tensile wire, the same speed is used as in stranding ordinary mild steel wire. It is the opinion of Messrs. Wilson that many failures of high tensile wire in service can be traced to the terrible stresses imposed on individual wires when being laid together and stranded at high speeds. The same criticism may be passed upon the operation known as closing, when the finished strands are laid together and twisted into rope form. Frequently, the wire forming the crown of the rope—the outside wires—are cut during their rapid passage through the closing die sufficiently to reduce their strength individually 50 per cent.

Steel rope intended for stranding members on aircraft need not possess as much flexibility as inner and outer drag wires, lift wires and diagonal bracing. These wires could be Lang's Lay instead of the ordinary Lay, the strands and rope being laid opposite and so causing additional stress.

For a test of wire ropes in the finished form the authors recommend the following: The load is run up to 25 per

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cent of the guaranteed breaking load and is then taken off, when the permanent set can easily be measured with an ordinary rule. This operation is repeated for loads of 50 per cent and 75 per cent and finally the breaking load itself is determined. An extension of 5 per cent to 10 per cent on a length of about 25 in. should be insisted upon. Care must be exercised to insure that the initial straightening out of the strands is not measured as extension. To this end one-sixth of the breaking load is allowed for straightening out the wire. The ultimate tensile strength is then 6/5 of the value recorded by the testing machine.

It is recommended that the Air Board provide for analysis, tensile and bend tests of the steel in rod form before the manufacture of wire begins. A very searching torsion test should be made of the finished individual wires and of course also a tensile test. The specifications should also include a maximum rate of speed for all machinery forming high tensile wires into strands, to safeguard against over-stressing the wire at too high speed. Further, the sequence of gage sizes through which the wire is to be drawn might be specified, as well as the limiting hardness after drawing.

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Increasing Oil Recovery from Sands

A COPY has been received of Bulletin 148 issued by the Bureau of Mines and dealing with methods for increasing the recovery of oil from oil sand. J. O. Lewis is the author of the bulletin. According to Mr. Lewis's investigation, less than 50 per cent of the oil in the average field remains unrecovered when the field is abandoned as exhausted. In the bulletin referred to are considered the principles involved in increasing recovery and methods of extracting more oil from the oil bearing formations than by the usual ways of producing. These methods are: The use of gas or vacuum pump, forcing compressed air or gas through the oil bearing formations, displacing the oil by water, and better utilization of the natural pressure in the oil bearing formation. Special attention is being given to a process—commonly known as the Smith-Dunn—for forcing compressed air through oil bearing formations.

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Aspect Ratio and Critical Angle

IN a recent issue of *Engineering* C. H. Powell discusses the influence of the aspect ratio on the critical angle of inclined surfaces, which problem has a bearing on airplane design. In the case of a flat plate inclined to a wind it is known that there is a certain angle of incidence at which the lift or cross-wind force is a maximum. This may be called the critical angle. Mr. Powell refers to some experiments made by M. Eiffel on planes of aspect ratio varying from 1/6 to 9* and from these experiments he calculated the values of the critical angle for each plane. These are plotted against aspect ratio in Fig. 1, which shows very clearly the following experimental fact: The critical angle increases as the aspect ratio diminishes according to a definite function.

In view of the natural unsteadiness of the air flow usually experienced at the critical angle it is remarkable that a smooth curve can be drawn through as many as six points out of the eight. Supplementary to this, investigations at the National Physical Laboratory on a long inclined wire, which approaches zero aspect ratio, show that the normal force is very nearly proportional to $\sin^2\alpha$, where α is the angle of incidence, Fig. 2, *i.e.*,

$$N = N_{90} \sin^2 \alpha$$

roughly. This is quite in accordance with the foregoing, and it also appears that the nearer we approach to an infinitesimally small aspect ratio, or, the closer the inclined edges of a plane approach together and mutually affect each other, the more nearly will the normal force be proportional to $\sin^2\alpha$. It is interesting to note that Newton deduced this *sine* squared law for a purely hypothetical fluid.

An investigation is made of the value of the critical angle for the case where the normal force is coincident with the resultant and varies as $\sin^2\alpha$.

*"La Resistance de l'Air et l'Aviation, 1911," pages 44-134.

Let L represent lift and N normal force, then

$$L = N \cos\alpha = N_{90} \sin^2\alpha \cos\alpha$$

For maximum value of L we have by differentiating and equating to zero:

$$\frac{dL}{d\alpha} = N_{90} [2 \sin\alpha \cos^2\alpha - \sin^3\alpha] = 0$$

Whence

$$\text{Sin}\,\alpha = \frac{\sqrt{2}}{3} = .817$$

or

$$\alpha = 54.8 \text{ deg.}$$

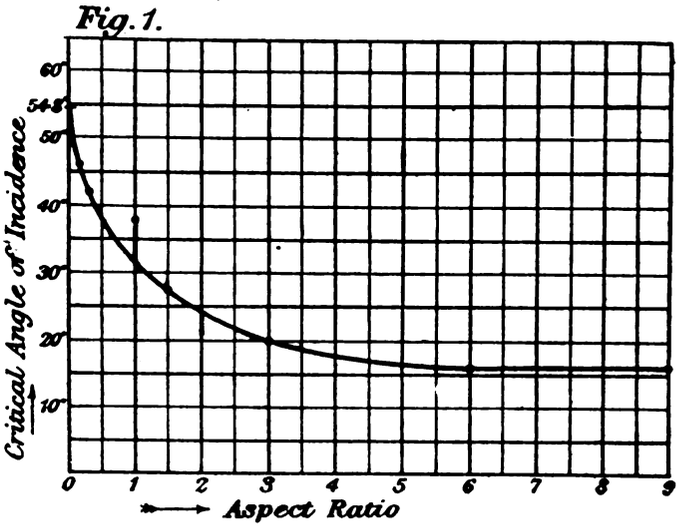
This angle is marked in Fig. 1 in the position for aspect ratio → zero.

It must be understood that variations in speed have also a considerable effect upon the critical angle. In the case of higher speeds than that of the experiments a curve would be obtained similar to, but probably slightly above that in Fig. 1, still, however, passing through 54.8 deg. for zero aspect ratio; while for lower speeds the criticals would occur at lower angles.

The practical importance of high critical angles from an airplane designer's point of view is that a control surface, such as a rudder or elevator of high aspect ratio, will not give any further effect on the airplane after about 20 deg., whereas it is desirable for special maneuvers and "taxying" that the control surfaces should give a cross wind force increasing with angle throughout their range of movement, which at the present time on most machines is generally not greater than 40 deg.

The arrangement of having the controls as being part of the fin or tail, as the case may be, has the effect of increasing the critical angle because the aspect ratio of the combined surface is lower than that of either movable surface alone. There is no particular advantage of having the directive organs and control surfaces of a very efficient type usually associated with high aspect ratio. The main point is that they should respond evenly to the joy stick and rudder bar movements.

Fig. 1.



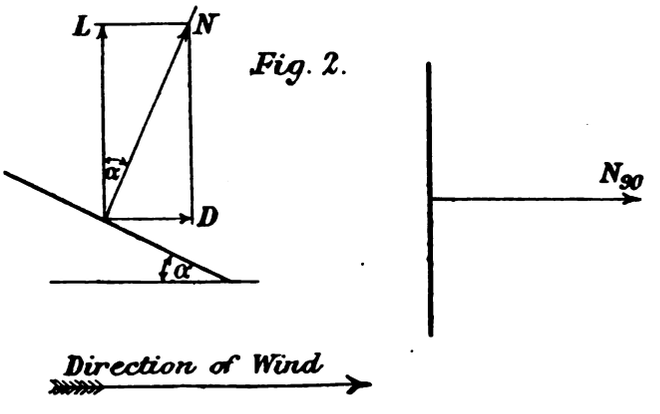
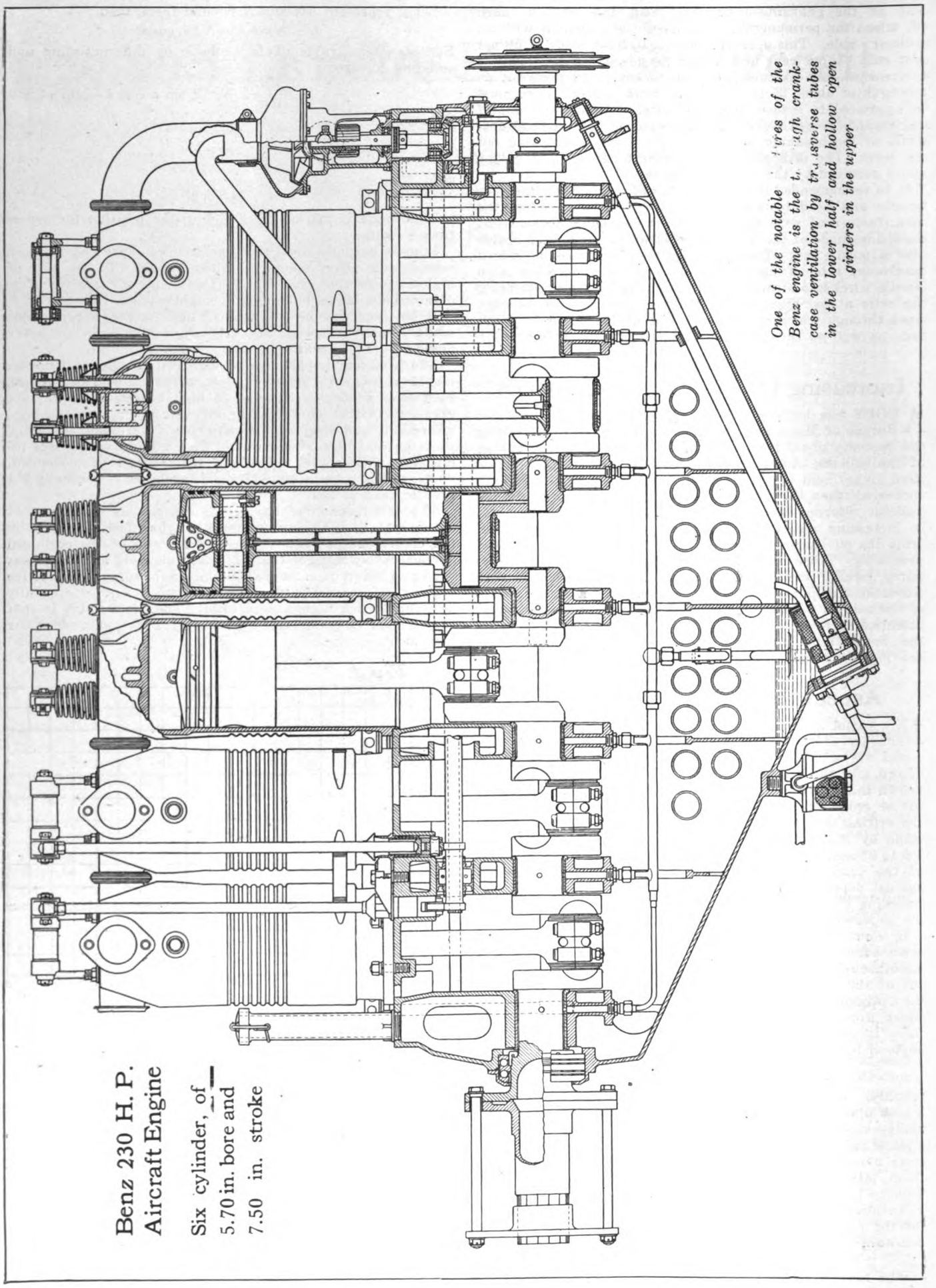


Fig. 2.

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Benz 230 H. P. Aircraft Engine

Six cylinder, of 5.70 in. bore and 7.50 in. stroke

One of the notable features of the Benz engine is the through crankcase ventilation by transverse tubes in the lower half and hollow open girders in the upper

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The Benz 230-Hp. Aircraft Engine

Has Cast Iron Cylinder and Head Castings in One Piece and Sheet Steel Jackets—Four Valves Per Cylinder Operated from a Camshaft in the Crank Case

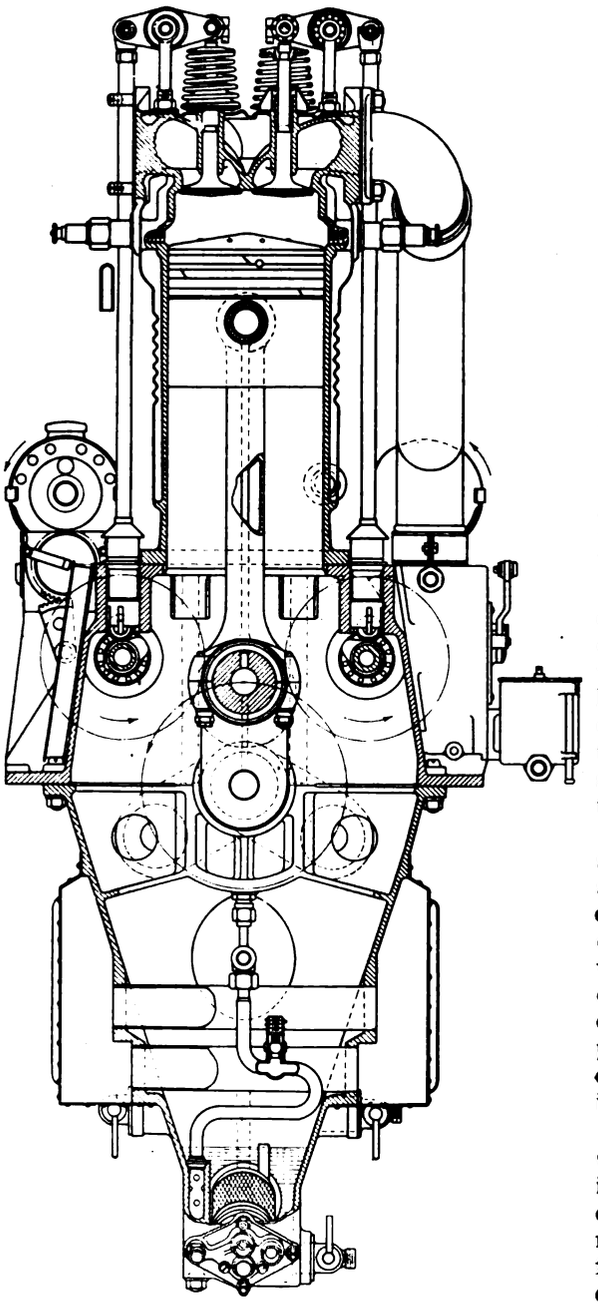
A FURTHER instalment of data on enemy aircraft engines has been issued by the British Air Board, this covering in very great detail the Benz 230-hp. engine. The design is in many respects similar to the 160-hp. engine of the same make described in a recent issue and the weight efficiency is almost exactly the same, viz., 3.68 lb. per horsepower. Owing to the strong trend in the direction of increased power this larger engine is, of course, of the greater interest. The illustrations are reproduced from the *Automobile Engineer*.

The 230-hp. Benz engine, 145 mm. bore by 190 mm. stroke, as fitted to the Aviatik biplane, follows the usual German practice for aircraft engines of this type. It is a six-cylinder vertical water-cooled layout, each separate cylinder bolting to the crank case by long studs which pass through the top half of the crank chamber and secure the crank-shaft bearings between the top and bottom halves.

Two inlet and exhaust valves are fitted in the head of each cylinder, and they are operated through overhead valve rockers mounted on ball bearings, the rockers being actuated by push rods on either side of the cylinders in the usual manner. The two camshafts, which run in plain bearings, are, as usual, arranged inside the top half of the crank case, and the floating exhaust camshaft carries the usual half compression cams.

The pistons are of cast iron, fitted with three exceptionally wide rings, and the piston heads, following usual Benz practice, are supported by conical steel forgings riveted and welded to the piston crown, these supports bearing on the center portion of the gudgeon pins through slots cut in the connecting-rod small ends.

As in the 160-hp. Benz engines, two separate two-jet carbureters are fitted, each having its air intake passages through the top half of the crankcase casting. The carbureters supply three cylinders each, through independent branched induction pipes built up of light aluminium tube.



Transverse section through engine

The lubrication of the crankshaft and connecting rod bearings is effected by a gear pump of very interesting design, which works in an auxiliary oil reservoir formed in the bottom of the air-cooled base chamber.

An oil-sealed fuel pump supplies gasoline to the carbureters in conjunction with a supplementary pressure reservoir enclosed in the main fuel tank. The pump is driven off the rear end of the inlet camshaft, the same driving spindle also operating the machine gun interrupter gear and the tachometer drive.

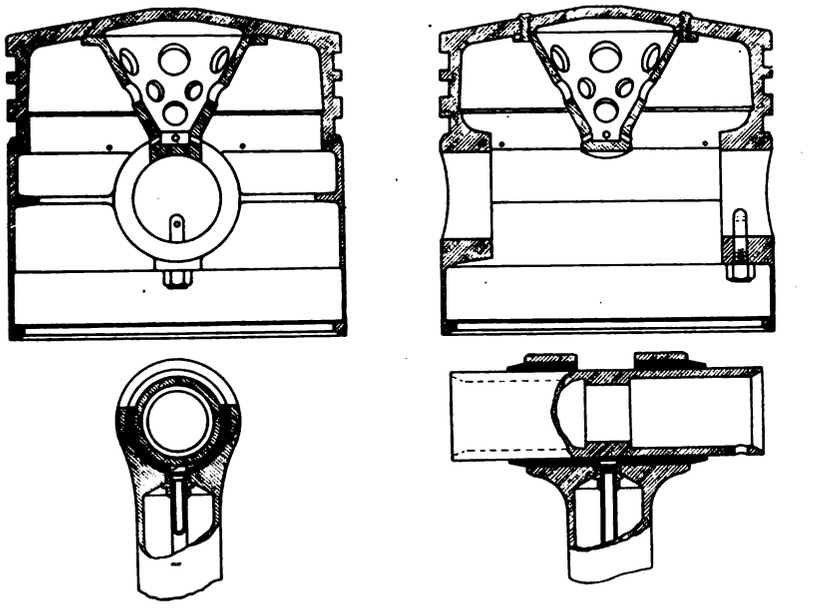
Except for the steel water-jackets, the cylinders are entirely of cast iron, the water-jacketed heads, including the twin inlet and exhaust valve passages, being cast integral with the cylinder bodies.

Pressed steel water-jackets are fitted, these being built up in half sections and welded together at the vertical joints. At the bottom they are welded to flanges machined on the outside of the cylinders. The cylinder walls are taper, being 5.5 mm. at the base and 6.5 mm. at the top. Exceptionally long water-jackets are arranged, these extending to within 45 mm. of the cylinder base flanges. Seven annular corrugations are formed about the center of the jackets to allow for expansion, and three transversely in the jacketing over the heads. The general construction of the cylinders and jackets with their water connections is clearly shown in the various illustrations.

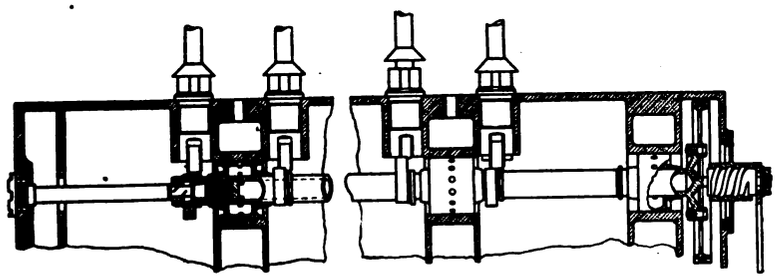
The arrangement of the water space in the cylinder heads and around the valve pockets is well carried out, and, in addition, dished plates are welded in the water space above the crown of each cylinder to deflect the flow of water on to the exhaust valve pockets. The diameter of the cylinder head water connections is 60 mm.

The cylinder registers extend well into the crankcase top, being 10 mm. deep, and the cylinder flanges are held by four 12 mm. studs and also by dogs at four points. The dogs are pulled down through long studs that pass through the top half of the

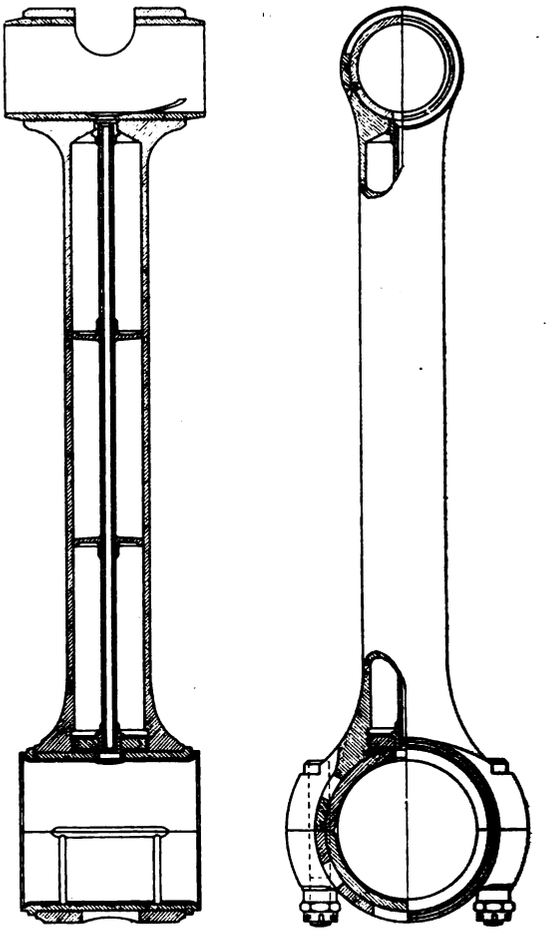
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Sectional views of the piston, showing the hollow conical pillar supporting the piston pin



Arrangement of exhaust camshaft and compression relief



The tubular connecting rod

crank chamber and are screwed into the bottom halves of the main bearing housings, cast integral with the base chamber. The portions of the holding-down studs that screw into the aluminium are of larger diameter and of coarser pitch. The nuts that secure the holding-down dogs are of interesting design, being of circular cupped formation drilled radially with four 12 mm. holes for application of the "tommy bar." The total weight of each cylinder, complete with valves, valve springs and valve rocker supports, is 44.25 lb.

Pistons

The pistons, with the exception of the small conical pillars, are entirely of cast iron, and weigh 7.62 lb. each, complete with rings and piston pin. Three rings are arranged above the piston pin, the lower one being a scraper ring. Each ring is 8 mm. wide, and the width of gap when fitted is .45 mm. The two top rings are 4.25 mm. apart, while the scraper ring is 10 mm. below; 4 mm. diameter pins are provided to locate the radial position of each ring, and six 2 mm. holes are drilled equally spaced around a slight annular recess below the scraper ring.

The hollow conical pillar supporting the piston head is machined from a steel forging, and is riveted in place, as shown in the sections of the piston. The lower end of the pillar, which is finished in position at the same time as the holes in the piston pin bosses, bears on the center part of the piston pin, and to accomplish this a portion of the top of the connecting rod small end and piston pin bush is cut away. By this construction the greater part of the force of the explosion is transmitted from the head of the piston to the connecting rod.

The piston pins are 38 mm. diameter, bored with a 30 mm. hole at the ends, while the center portion is bored 25 mm. for a length of 20 mm. where the conical piston head support bears. The diameter at the top of the piston is 144.15 mm., and at the bottom 144.67 mm. The piston ring side clearance is 0.004 in.

Connecting Rods

In general design these are fairly orthodox, as will be seen from the illustrations. The whole of the rod, including the lugs for the four bolts securing the halves of the big end, is machined all over from a steel forging. The outside diameter of the rod is 36 mm., and a 30-mm. hole is bored from the crank pin end to within 6 mm. of the piston pin bush, the hole being closed at the big end with a threaded plug. The big end itself is lightened by four 12 mm. holes and one 30-mm. hole drilled radially.

A 6-mm. steel pipe, for lubricating the piston pin, is fixed inside the center of the connecting rod, the pipe being supported in the center by two flanged discs, as shown in the illustrations. Two semicircular oil grooves are machined in the white metal big end bearing caps, and one lateral groove is cut in the top of the big end bearing. The total weight of the complete connecting rod is 7 lb. 1 oz., the big end weighing 4 lb. 12 oz. and the small end 2 lb. 5 oz. The total big end side clearance is 0.15 mm., and the float of the small end bush between the piston pin bosses is 14 mm.

Crankshaft

The six-throw crankshaft runs in seven plain bearings; it weighs 109.25 lb., including the propeller boss, and the cranks are, of course, set at 120 deg.

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The diameter of the journals is 62 mm., while that of the crank pins is 60 mm. The length of the front journal bearing (propeller end) is 79 mm., and the length of the other journal bearings is 54 mm., with the exception of the rear end bearing, which is 55 mm.

The crank pins and journals are bored, the webs being drilled with communicating lubrication holes in the usual manner. The diameter of the holes bored in both the crank pins and journals is 27 mm., and the ends are plugged with sheet steel discs sweated into the recessed ends. All the discs which plug the rear ends of the holes in both the crank pins and journals are drilled with a central 5 mm. hole to provide a certain amount of splash lubrication for general purposes.

A double-thrust ball race, 120 mm. diameter, is fitted at the front end of the crankshaft behind the front flange to which the propeller hub is bolted. The thrust races are large enough to be assembled over the cranks, and are secured in position by a split collar which is screwed on to the crankshaft. The halves of the split collar are held together on the shaft by an undercut shoulder on the crankshaft which engages a recess in the split collar.

Fitted to the rear end of the crankshaft is a friction clutch for transmitting the wireless drive, the control being so arranged that the clutch can be operated from the pilot's seat. The propeller boss is coupled to the crankshaft by a flange which bolts to a corresponding flange on the end of the crankshaft; eight 14-mm. bolts are fitted.

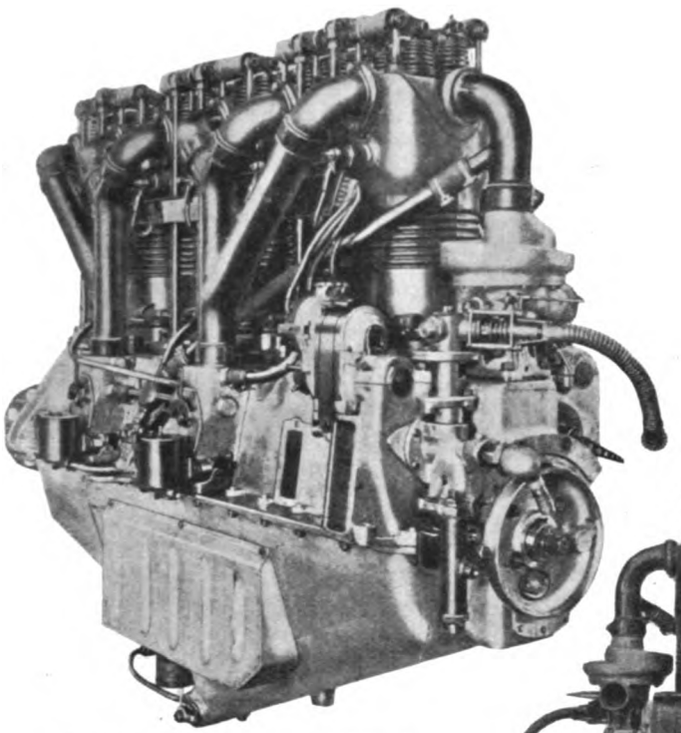
Valves and Valve Gear

The twin inlet and exhaust valves are arranged vertically in the cylinder heads, and, as previously mentioned, are actuated through rockers mounted on ball bearings that are carried by supports screwed into the cylinder head.

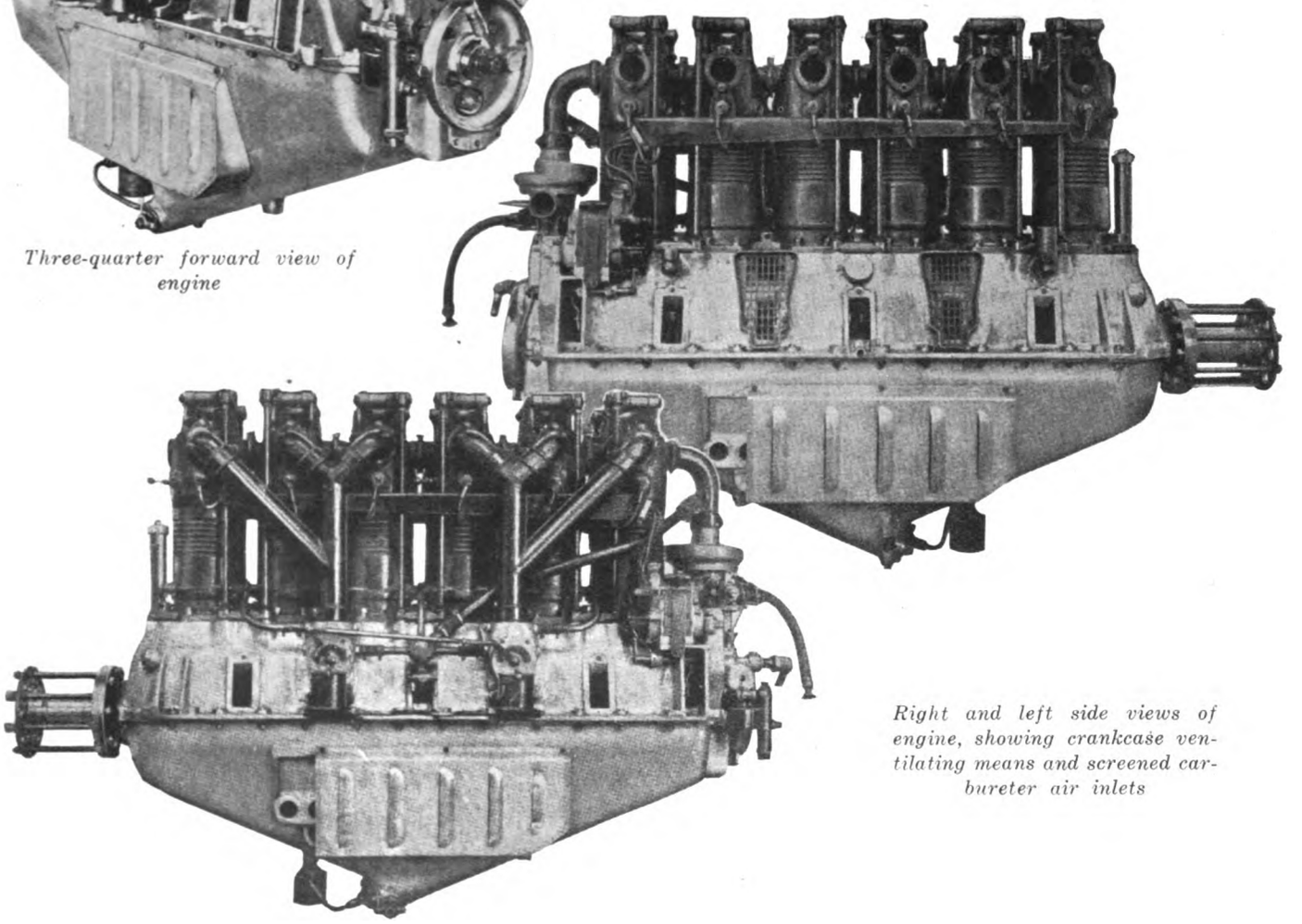
The rocker lever actuates the valves through hardened steel rollers, mounted on eccentric bolts; these, in conjunction with adjustable spherical joints screwed into the top ends of the vertical push rods on each side of the cylinders, give a fine adjustment for the tappet clearances. Spherical joints on the valve rockers are provided to simplify the alignment of the valve rocker supports which are screwed into the cylinder heads.

Semi-spherical ends are arranged at the bottoms of the push rods, which work in steel cups inside the hollow tappets. Hardened steel rollers are fitted to the tappets, which are slightly offset from the camshaft centers. Each pair of tappet guides is held in position by a steel dog.

(To be continued)

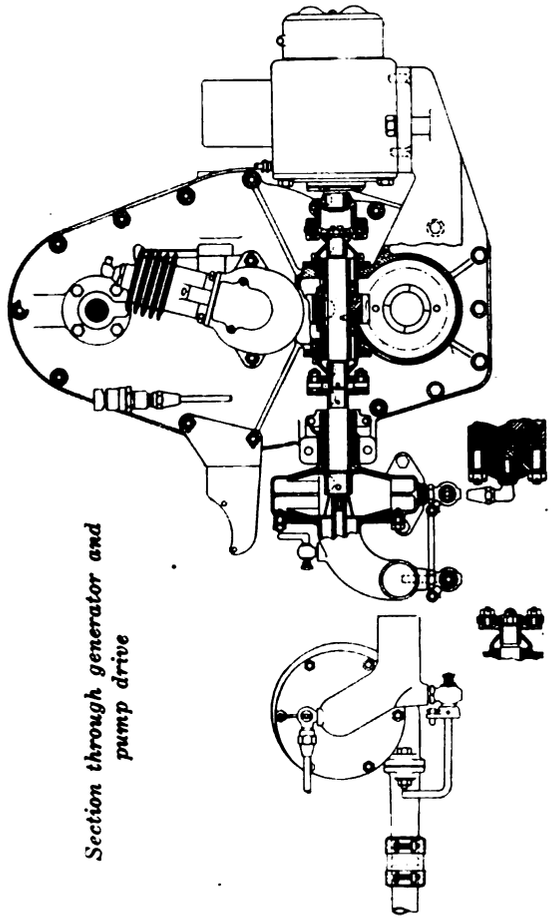


Three-quarter forward view of engine

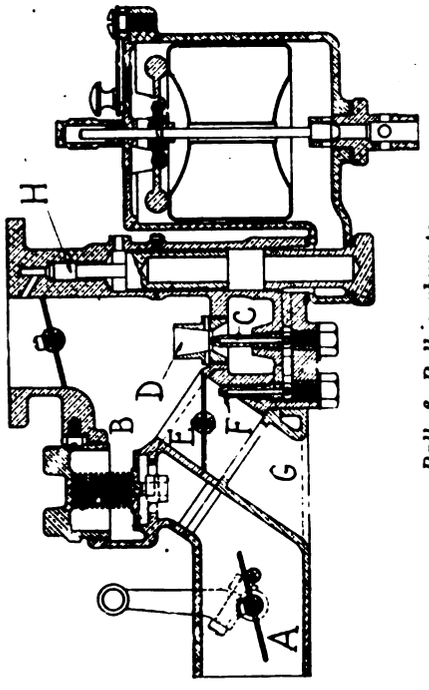


Right and left side views of engine, showing crankcase ventilating means and screened carbureter air inlets

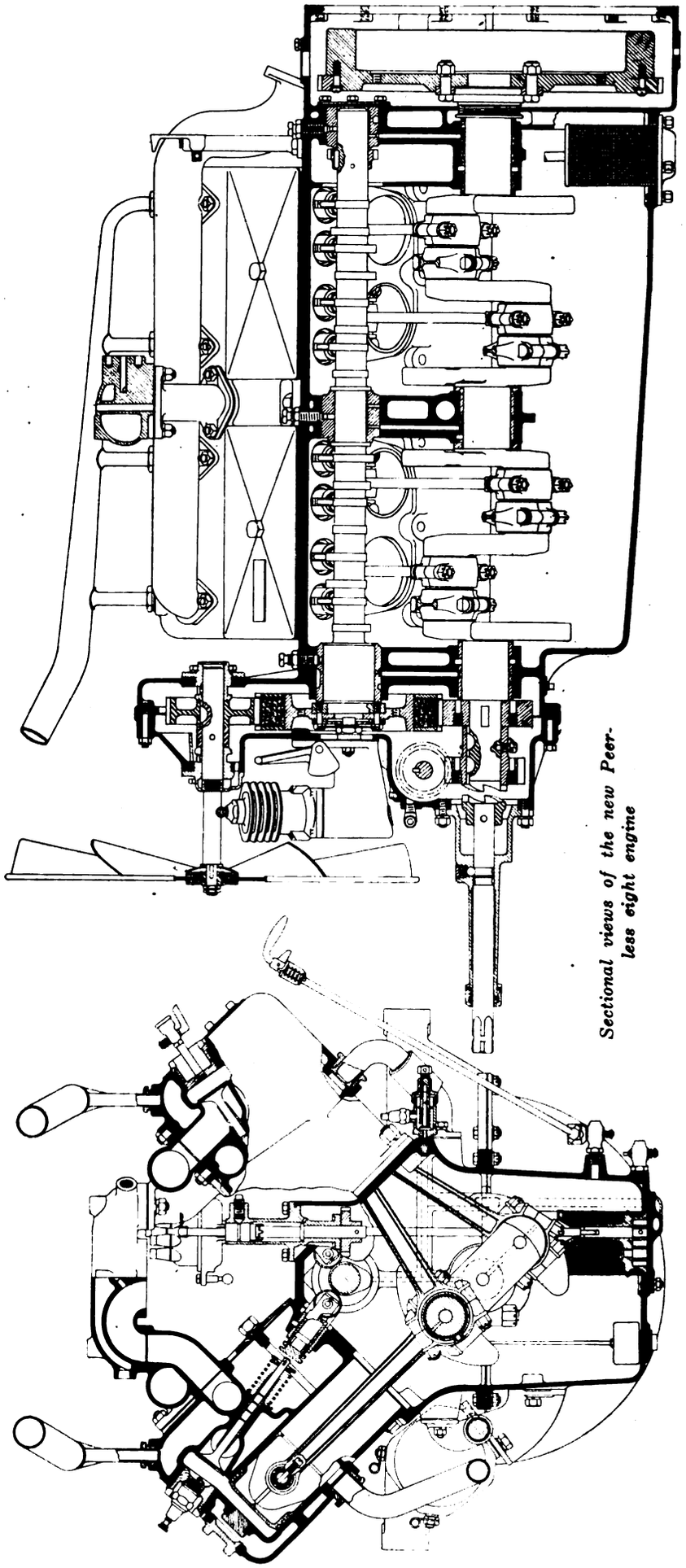
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Section through generator and pump drive



Ball & Ball carbureter



Sectional views of the new Peerless eight engine

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Changes in Peerless Eight and Reasons Therefor

SINCE the introduction of the Peerless eight-cylinder engine two years ago, some important refinements have been made, notably in the valve action and in the layout of the accessories. The sectional views give a general impression regarding the refinements which it has been possible to make in the light of experience and advanced practice.

Probably the most radical change is in the valve action. The rocker arms formerly employed have been eliminated by inclining the valves, and at the same time water-jacket space has been gained and the valves are actuated directly by roller followers on the cam. This change in the valve action has necessitated alterations in both the crankcase and cylinder block castings, and, while adding a little metal to these, has more than compensated for this by greatly simplifying the valve action. By the old method a rocker arm was used, pivoted at one end and carrying a roller follower between this pivot point and the point at which the rocker arm engaged the push rod. Thus the action of the cam was multiplied to some extent, owing to the fact that the follower was closer to the pivot center than the point of contact with the valve push rod.

The valve mechanism as it stands now is lighter and simpler. Hollow tappets are used, with an increased amount of bearing surface and better adjustment features. The combustion chamber has been slightly altered in shape, this being made necessary by the valve entering it at an angle.

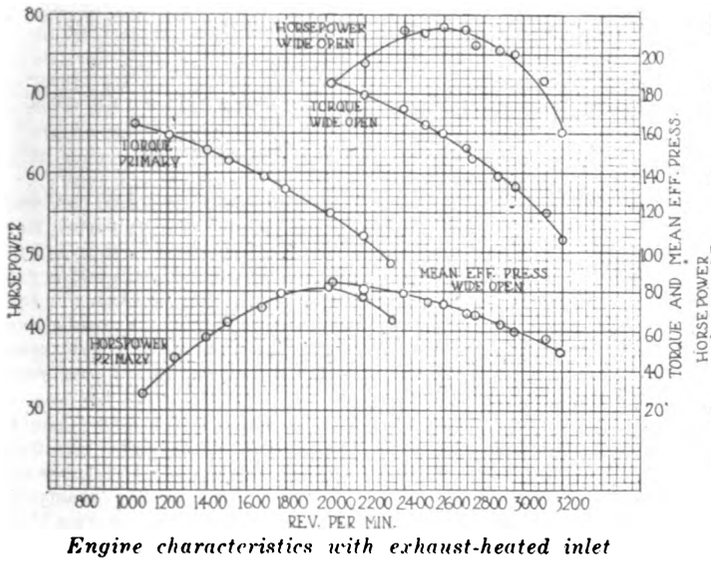
Another important change is in the mounting of the tire pump, which has been removed from the side, where it was driven by an extension of the fan shaft, and is now bolted in front of the engine and connected with a clutch to the camshaft. Formerly it was connected by means of wing nuts, as it had to be removed in order to render the valve action accessible. With the present arrangement the inside of the V is rendered much more clear and it is not necessary to touch the tire pump.

A great many other minor changes have been made to increase accessibility and facilitate manufacturing operations. For instance, the crankcase oil-gage cock operating handle has been brought up so that it is now on a level with the top of the cylinder, whereas it was formerly much lower and rather difficult to reach.

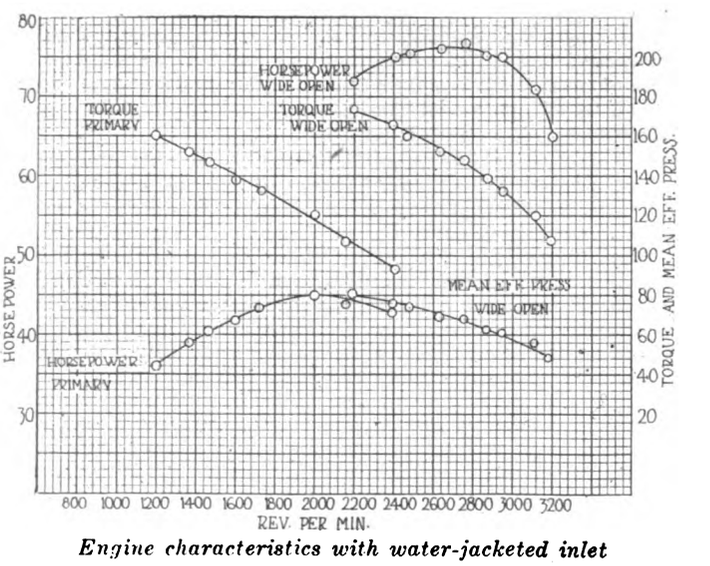
It is interesting to note the results which are obtained from a power plant of this capacity. The cylinders are 3¼ x 5 in., set at 90 deg. The S. A. E. rating is 33.8 hp., but the actual brake horsepower is approximately 80 at 2700 r.p.m. Two sets of curves are given herewith, one set showing the results with a water-jacketed inlet heater, and the other with exhaust heated inlet. Both are with a 1⅛ in. double standard Ball & Ball carbureter, with 66-67 primary jet and 54-57 secondary.

The two carbureter ranges are clearly brought out on these curves. With the primary, or lower running range, the maximum horsepower developed is 45 at 2000 r.p.m. The primary torque is above 160 ft.-lb. at 1000 r.p.m. on the primary range, and above 180 ft.-lb. at 2000 r.p.m. on the secondary, or wide-open range. The mean effective pressures are also plotted against r.p.m. for the wide-open range of the carbureter and show a pressure of around 85 lb. per sq. in. at 2000 r.p.m. These readings are all taken off the exhaust-heated inlet chart, and, as will be noted, are quite closely approximated in the other chart which shows results obtained with the inlet water-jacketed.

The Ball carbureter used on this engine is shown in Fig. 3. It is a two-stage instrument, the primary operation being taken care of by means of the air inlet *A* and auxiliary air spring valve *B*. The gasoline for the primary action enters through the jet *C* by means of the venturi *D*. For the secondary range, the throttle *E* is opened by means of a connecting link with the throttle above the mixing chamber, bringing into action the jet *F* and an additional supply of air through the opening *G*. There is also an acceleration well with a pick-up plunger at *H*, giving a quick supply of gasoline when the throttle valves are opened suddenly. Under normal conditions, the primary jet *C* is a No. 65 drill hole, and the secondary a No. 58. For higher altitudes, from 68 to 70 may be used on the primary, and No. 60 on the secondary.



Engine characteristics with exhaust-heated inlet



Engine characteristics with water-jacketed inlet

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The FORUM

Advantages of a Hand-Controlled Air Valve

By Charles E. Manierre

THERE is, of course, every reason at the present time to save as much as possible in the use of gasoline. The rising price of this commodity is the least of several reasons which need not be specified. Each of the various ways in which gasoline is wasted is worthy of consideration, and the stoppage of waste in each direction saves just so much of the fuel.

The particular loss which is at the moment considered is that sustained while the car is descending a steep grade and the engine is being used as a brake. Of course the throttle is closed. As a matter of fact, it is well understood that a so-called closed throttle is partly open. In truth it is so far open that the engine is capable of idling with the throttle in that position. Moreover, while idling, the spark is much retarded and therefore the engine is performing at a great disadvantage and also turning very slowly.

Far more mixture is drawn in through the "closed" throttle at touring speed. In fact it has been stated by one investigator that enough gasoline was consumed to run the car at the rate of 20 m.p.h. on a good level road. However that may be, it must be evident that an appreciable portion of gasoline is wasted.

There is but one apparent remedy for this loss, and that remedy is a sufficiently large opening in the intake manifold above the carbureter, which can be controlled from the dash. The necessary size of this seems to be the equivalent of what would be needed for a ⅜ or ½ in. pipe. When this opening is uncovered very little suction would be evident past the gasoline needle valve, particularly when the throttle is closed.

All authorities agree that the use of the engine as a brake does it no harm and is a proper and sometimes a vital and necessary procedure.

In a country of steep hills a very considerable saving should result from the use of such an opening in the manifold.

There are now upon the market a variety of devices to be installed upon the intake manifold, some of which supply only water and others of which supply in addition or exclusively either a fixed or a variable amount of air. A considerable saving of gasoline is claimed by all of these devices. It is probable that all of them do make such saving, and for two reasons. The water, whether in the form of steam or liquid, tends strongly to keep down the quantity of carbon formed in the cylinders and perhaps to cause it to assume its powdery amorphous condition. Certainly an engine supplied with sufficient water even at irregular intervals is capable of keeping up its efficiency and this naturally results in a very considerable saving of gasoline.

So far as these devices automatically admit air, they may be regarded as supplemental to the carbureter and they become practically a part of it, and must receive due consideration in the adjustment of it.

Whether the air opening in these devices is adjustable, either by hand or automatically by a spring, or not, the device constitutes an auxiliary air valve and it has this marked peculiarity, that it is above the throttle and only indirectly subject to the effects of throttle opening and closing. In fact, the closing of the throttle, which diminishes the suction of air below, increases the suction at these auxiliaries.

At high speeds, with open throttle and with some forms of carbureters, the extra air supplied by these auxiliaries is exactly what is not wanted, and this is true also of moderate speeds where the car is upon a slight up grade.

The best results in the running of the car can only be obtained by governing these openings from the dash by a driver sufficiently skillful to know when the valve should be opened, and how much, and equally important, when it should be closed.

There seems to be on the market to-day no carbureter so arranged as to obviate the advantages of the use of such a valve. The effort of all carbureters has been to obtain a mixture of gasoline and air of a fixed proportion to be delivered to the cylinders under all circumstances, the only choice to the driver being to set the instrument either slightly rich for the greatest power, or a little lean for the greatest economy. This arrangement does not take into consideration that very usual condition of running, in which the throttle is nearly closed and the cylinders take in a minimum quantity of the mixture on the suction stroke, and therefore a mixture much under atmospheric pressure. The compression stroke following is partially ineffective, starting as it does with gas below normal pressure, and the burning of the gas under this diminished compression is not as satisfactory as it would be if the mixture were slightly more lean and a measured quantity of additional air had been allowed to go into the cylinders and thus increase the compression.

The carbureter proper cannot supply this air but a hand controlled auxiliary device on the manifold can, and under the circumstances mentioned actually permits a greater spark advance than is otherwise possible.

Such a device when opened slowly but fully, and if of sufficient capacity, has also the effect of stopping the explosions in the engine. But it does this gradually, diminishing the force of successive explosions, as contrasted with the cutting off of the spark, which brings them to a sudden stop. And likewise, upon slowly closing such a valve, the first explosions are weak and increase smoothly in power, whereas the sudden cutting in of the spark brings a full strength explosion and the strains incident thereto.

In using such a device the sudden wide opening of the air valve is apt, at least with the older form of engines, to sweep into the cylinders a quantity of liquid fuel contained in the manifold and to produce the exact opposite of what the driver intends, *i.e.*, the engine speeds up when he intended it to cease its explosions, and if the clutch is out it races. Likewise the sudden closing of the air valve, when the car is not moving at a suitably high speed, will put a great strain on the clutch and differential mechanism—the counterpart of starting in high gear.

These are both, of course, abuses of the machine, but a careless or an incompetent driver can produce both of these abuses in other ways, and there should therefore be no objection to the use of the device.

Power Generator That Won't Work

By Joseph E. Bissell

IT was with interest that I read your editorial on one Garabed's free power device. I mean your editorial was interesting. Now won't you be so kind as to give your attention for a moment to the device here illustrated and while you are doing it forget all about perpetual motion, so that you can approach the subject with an unbiased mind. I would like you to publish the sketch in your periodical and ask your readers to explain why it will not function after being once brought up to speed.

I tried a small clumsy model and timed it the best I could. I found that it would run 10 sec. longer in the right direction than it would run backwards, which was a very favorable indication. Considering the fact that the mercury seems to squirt out between the shaft at the top bearing, it seems that the mercury stands practically perpendicularly.

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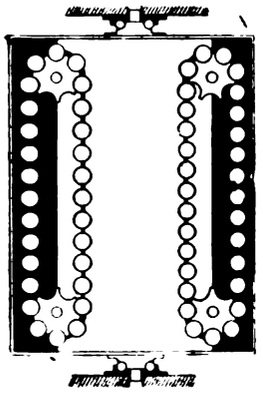


Diagram of the device

Now, if the apparatus, with a radius of 6 in., is spun at 2000 r.p.m., why will not the mercury stand up? And if the balls are as heavy as the mercury, why will they not bear down on the inner side as they hang in the air? If we took the two inner rows out altogether then the two outer rows would not move at all, but stand still, because, weighing the same as the liquid they are immersed in, there is no tendency for them to either rise or sink or move in any direction whatever.

Please look at this seriously. If you are the man who wrote that article I feel quite sure you will. It makes no particle of difference what "they" say; I want to learn the principles of the thing and that is the reason I would like your readers to cast a bias eye at it—not a biased one, though.

Ans.—There are two ways of looking at this proposition, but whichever way you look at it, you arrive at the same result—namely, that there is no reason whatever why there should be any tendency for the chain to turn its sprocket. Disregarding the mercury for the instance, one-half of the chain exactly balances the other half. You will say that owing to one-half of the chain being immersed in mercury and the balls being lighter than the mercury, there will be an upward buoyancy on the balls or chains. This is true. However, there are other effects which neutralize this. The buoyancy results from the fact that the pressure of the mercury increases with the depth and therefore is less on the top surface than on the bottom surface of any ball. The additional force referred to is the lateral buoyancy as the balls enter and leave the mercury. The pressure of the mercury against the half-excluded ball is much greater than the pressure of the air. Even when the ball is completely immersed in the mercury there is a radially inward buoyancy force on the balls, as the pressure within the mercury due to centrifugal force increases from the inner surface to the outer surface, the same as the pressure due to the weight or to gravity increases from top to bottom.

Let us look at the problem from the standpoint of work done by and upon a ball in passing through the mercury. First, to get the ball entirely into the mercury at the bottom, you have to do work upon it, the same as you have to do upon a piece of wood to submerse it in water. The ball in rising through the mercury from its lowest to its highest position, by reason of the buoyancy of the mercury, is capable of doing a certain amount of work. As a result of the pressure of the mercury upon the ball as the latter passes out of the vertical layer, the ball is capable of doing an additional amount of work. The work which must be done upon the ball to get it into the mercury at the bottom is equal to the sum of the amount which the ball is capable of giving out due to its rise in the mercury and the amount of work due to its exclusion therefrom, consequently the ball will give out only as much mechanical energy as has been expended upon it, leaving no surplus. This result is arrived at by neglecting the friction. Owing to the friction of the balls in the mercury some of the energy given to them is converted into heat and the mechanical energy they are capable of giving out is therefore even less than that imparted to them.—Ed.

University Course for Personnel Managers

New Course of Instruction Designed to Give the Training Required to Men in Charge of Factory Help Opened at Columbia

PERSONNEL management has become a very important phase of factory administration during the past few years. The development of industry on a large scale and the growing strength of organized labor have created a demand for resourceful, wide-visioned, and trained men to handle the human problems arising in the big industries of the country.

The head of the personnel work in a large plant to-day should know the experience of other plants in dealing with their industrial relations problems and the history and purposes of trade unionism, and he should be able to apply this knowledge in the light of the particular circumstances of his own organization.

Columbia University, New York City, has established a course to investigate the complicated problems which personnel managers are called upon to solve. This class, which started Feb. 8, is intended for those who are in the administration end of factory labor departments, for executives who wish to extend their knowledge of methods of meeting employment problems, and for men or women who expect to enter the field of personnel management.

The course will first of all attempt to establish a human point of view toward labor. This sounds academic, theoretic; but it is rather of the utmost practical use. The personnel manager must first of all shape a definite policy, subject to change if it proves unsatisfactory, toward his employees. His methods of carrying out that policy are a comparatively minor matter. Labor's demands are by no means always a matter of dollars and cents. The demand, for instance, is frequently made for the union shop as a matter of principle, without regard to the wage scale. Should the union shop be recognized? What has happened where it has or has not been recognized? How will it work out in any given industry? For settling practical questions such as these, the personnel manager should first have a "point of view," as the announcement calls it, toward labor. In other words he should have a definite attitude toward his subject based on a clear understanding of his employees both as an organization and as individual human beings.

Industrial Relations Work Analyzed

Industrial relations work, represented by the establishment of clubhouses, benefit associations, athletic fields, clubhouses, has been introduced into many large plants. In some cases the experiments have been failures, in others successful. More frequently the projects have been partly satisfactory and partly objectionable. The original "welfare" idea which started this type of work has been practically done away with. The employees will not stand for anything that sounds like charity, and whatever is done in respect to providing recreation and health facilities for the workers must be offered on the principle that it is a partial wage equivalent and a stimulus to greater production. The concrete experiences of industrial relations work in different plants will be used to show how policies of this nature may be worked out.

Labor turnover will be discussed, together with methods of record keeping, and analysis of turnover costs. In connection with the selection of employees existing methods and systems will be considered; and the underlying elements of a sound method will be studied. Successful experiments in the manner of selecting new workers who will "make good" have been carried out at various plants, and these will be brought to the attention of students in this class.

Handling grievances is a job that bothers every labor executive and one that has dynamic possibilities for either the good or the evil of the organization. The stories of men who have been able to solve the question of "kicks" and discharges harmoniously will be used to indicate principles which personnel managers may apply in their own factories.

Ordway Tead, a partner in the firm of Valentine, Tead, & Gregg, industrial counselors, is the instructor in the course which will meet every Friday evening at Hamilton Hall on the university grounds.

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

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Standards and Competition

IT appears that some tractor manufacturers look askance at the proposal to introduce standardization in their industry, believing it to be a scheme of the automobile manufacturers to annex the tractor business. It is not only likely that automobile manufacturers will enter the tractor field, but some of the largest of them—Ford, Olds and Maxwell—are already actively engaged in it. However, the entrance of these firms into the tractor field was not in any way related to the standardization plan. All the firms mentioned are among the largest producers in the automobile industry, and they will no doubt operate on a large scale also in the tractor industry. Now, it is a well known fact that standardization is of the greatest benefit to the small and moderate-sized firms. Where a machine is produced on the scale of the Ford car, there is little advantage to the manufacturer in having parts or fittings interchangeable with similar parts on other cars, as the parts have to be produced in such enormous quantities that the pro rata tool cost is insignificant. This is borne out by the fact that the Ford car uses fewer S. A. E. standards than probably any other car made in this country.

If standardization served to help outsiders to enter an established industry, it is not likely that automobile manufacturers would have supported it in their own field so whole-heartedly. It tends to enable the smaller concerns to hold their own against the larger ones, and there have been instances of leading firms in some parts lines opposing standardization, but when carried out rationally standardization has so much inherent merit that even this strong opposition could not stop its progress.

Let no one be deceived as to the future course of the tractor industry. If farming conditions favor the tractor so that the demand can be greatly increased, new firms will continue to enter the industry and will make a bid for patronage in competition with the older firms. Sooner or later the supply will catch up with the demand, competition will become keen and some of the weaker firms may be forced to the wall. This, however, is the natural course of development for any new industry, which cannot be altered by ostrich methods such as antagonizing rational standardization.

Starter Mountings

ONE thing that mitigated against the success of electric starting and generating apparatus on automobiles in former years was that inadequate provision was made in the design of the engines for mounting the starters and generators. By extensive experimentation a method of mounting was finally arrived at which seemed to be superior to all others, and its advantages were so generally admitted that it was standardized by the S. A. E. It is known as the flange mounting, the starter or generator being provided with a substantial flange at the driving end by which it is bolted to the flywheel housing or the timing gear housing. The flanges are provided with pilots to locate the starter or generator accurately in a bored hole in the housing if gear drive is used, but in the case of chain drive for the generator the pilot is given a certain amount of play and adjustment can be made by means of slots in the flange for the two upper bolts, which permit the machine to be swung toward and away from the crank axis around the axis of the lower retaining bolt.

Electric starting and lighting apparatus is rapidly being adopted in motor boat work, especially in connection with large engines which are difficult to start by hand. In fact, some manufacturers specializing in large engines have made it a rule not to sell them without starters, for the reason that if hand cranking is relied upon the owners soon meet with difficulty and in consequence rather heavy demands are made upon the service department.

Unfortunately the avidity with which marine engine manufacturers have taken to the starter is not an index of the good judgment shown by them in mounting the device. This was plainly evident at the recent motor boat show and the evidence is reproduced in this issue in the form of two pages of sketches of starter and generator mountings which one of our artists drew at the show. In most cases it is quite plain that these electrical machines were

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not considered when the engines were first designed, but were after-thoughts.

Next to the flange mounting the clamp mounting is probably the best, as it permits of quick removal and replacement of the machine, and—if well worked out—holds it securely. At the present time not all marine engines fitted with electric starters have their flywheel enclosed, so the flange mounting is not universally applicable. However, the practice of enclosing the flywheel is gaining ground in marine practice and it can hardly be denied that a flywheel with a gear crown for starting should properly be enclosed. Generators also are best driven by enclosed gearing, even though marine engine men do not have to provide against road dust. Therefore, it is to be expected that the flange mounting will eventually also prove best for marine engines.

At present there are only two sizes listed by the S. A. E. for both starter and generator mountings, and these were worked out for automobile service. For marine work, in which low-speed engines up to several hundred horsepower output are used, the mountings have to be larger, and it is to be hoped that through co-operation between the marine engine division and the electrical equipment division of the Standards Committee, the list of standard mountings will be extended in the near future so as to cover the heavier marine practice.

Aerial Mail Service

EVERY one of the large nations hopes that after the war practical uses may be found for aircraft which may warrant keeping in operation at least some of its large works for aircraft production. Millions upon millions are being invested in buildings, machine tools and special equipment, and if all of this plant had to be liquidated at the end of the war the loss would be enormous. Consequently there has been a great deal of speculation as to possible commercial uses of aircraft, and several papers on the subject have been presented to British aeronautic bodies.

The chief attribute of the airplane being its speediness, its greatest possibilities seem to lie in the transportation of mail matter. Our fastest trains make only about 50 m.p.h. average over long distances, and this can be more than doubled by the airplane. The advantage of such fast mail service is very considerable to business, and would be especially appreciated in times like these when trains are oftener hours behind schedule than on time.

A serious attempt to introduce an aerial mail service between New York, Philadelphia and Washington will be made next summer, calls for bids for suitable machines having been issued by the Post Office Department. It appears from an announcement made by the Department that the practicability of the scheme will be fully determined before the service is really begun. This we take to mean that a considerable number of trips back and forth will be made with equivalent loads to determine the reliability of the machines and the competency of the operators before any regular mail will be carried. To make the plan feasible, it was necessary for the War Department to release the necessary number of aero engines, but this was probably done gladly because anything tending to expedite the transaction of business between these important centers will facilitate the work of that Department.

Kerosene Carburetion

IT is quite apparent from the discussion at the recent Minneapolis S. A. E. section meeting that, although practically all modern farm tractors are being sold as kerosene-burning, they are far from burning this fuel satisfactorily in the service of farmers. Many tractor engineers (and perhaps also carbureter engineers) in the past have proceeded on the theory that a tractor engine works substantially under constant load, and though this assumption has some foundation in fact, there still is enough variation in the load to cause difficulties in the way of carburetion.

To effect vaporization of the kerosene in the exceedingly short period of time available for the operation, it must first be very finely divided by spraying. When kerosene thus finely divided is mixed with the proper proportion of air it will either remain in the liquid state, as a mist, or become gasified, according to the temperature and pressure of the mixture. High temperature favors gasification, as does low pressure. But both high temperature and low pressure mean a rarefied charge, low volumetric efficiency and small maximum horsepower from an engine of given dimensions. Thus it does not seem to matter much whether gasification of the fuel is induced by raising the temperature or by lowering the pressure of the charge as it enters the cylinder—the effect on the output is equally detrimental.

If the fuel is not finely divided by spraying but is emitted from the nozzle in relatively large drops, as will happen under a weak suction, then, of course, the difficulties of gasifying it are greatly enhanced. This is due to the fact that the rate at which heat can enter a globule of the fuel is proportional to the surface area of same, which latter varies at a lesser rate than the volume. Therefore, even though the temperature and pressure conditions in the cylinder during the suction stroke are such as to permit of the existence of dry gas, liquid fuel may still get into the cylinders if the spraying pressure is too low. If the fuel could be sprayed by means of compressed air or gas under a pressure of several atmospheres, controlled in proportion to the throttle opening, very fine division of the fuel could be insured under all conditions. This, however, would necessitate the shutting off, by automatic means, of either the nozzle or the air pressure upon the fuel whenever the suction ceased, and would entail serious complications.

The use of a well-regulated heat supply together with the most energetic spraying possible with the engine suction seems to be the simplest solution of the problem. The best method of heat supply and regulation remains an open question.

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□ Latest News of the

Automotive Show Draws 178,270

Automotive Idea Triples Attendance at Twin Cities—Tractors the Best Card

MINNEAPOLIS, Feb. 9—After running seven days, the Twin Cities automotive show held in the large Overland storage building came to a successful close to-night with a total attendance for the week of 178,270 as compared with an attendance of 67,000 a year ago. The present figures entirely dispel any question as to the necessity of war shows, and they also indicate how desirable it is to have an automotive show; that it, one with cars, trucks, tractors and the thirty-two other applications of the internal combustion engine, which were on exhibition.

It was the broad automotive idea that was responsible for the unprecedented crowds, and undoubtedly next year the Twin Cities people will have a better representation of motorcycles and airplanes, as well as motor boats and small stationary gas engines, all of which fall within the automotive sphere.

During the middle of the week the greatest interest was in tractors and trucks, and the forty different tractor makers present did a good business. There were retail sales and many agencies were placed. One tractor maker admitted selling 70 per cent of his output through motor car dealers, or automotive dealers as they will soon be known. Several of the largest Minneapolis distributers have recently taken on tractor accounts and are planning a campaign with the 150,000 Minnesota farmers and the farmers of the Dakotas and Montana.

Estimates of show sales mean more at the Twin Cities show than they do at a Chicago or New York show, and reports of at least 200 tractors being sold give some indication of the interest. The fact that over 5000 dealers were registered by Thursday night was the best proof of the increased interest in the show. These dealers came from all parts of the four States that make up the 400,000 square miles of Twin City territory, an area that is roughly six times as large as the six New England States combined; an area larger than all of France or all of Germany. This area would accommodate all of our 104,000,000 people and the population per square mile would then be only about as dense as in the State of Massachusetts.

The truck show did not attract so generally as the tractor show, due perhaps to the greater novelty of the tractor. Truck sales were made, but in relatively small numbers and these were confined to the Twin Cities. Various estimates have been made as to the value of car sales, figures going as high as $1,000,000, but nothing definite can be computed further than that there were many retail sales and not a few dealer accounts closed.

The growing importance of the Twin Cities in automotive circles was emphasided by the Society of Automotive En-

(*Continued on page* 387)

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Ford to Make Complete Liberty Engines

Packard Now in Production—Marmon and General Motors in 30-60 Days

WASHINGTON, Feb. 12.—The Ford Motor Co., Detroit, will be the largest single producer of Liberty airplane engines. Although the company has been producing only cylinders, under a new program the engines will be made complete. The Ford company has so perfected the processes of manufacturing cylinders that a saving of from 40 to 50 per cent in their cost has become possible. According to its contract with the government, the Ford company is entitled to but 25 per cent of the saving, the remainder going to the government.

It is understood that the Ford company will commence the production of complete engines this month. Already the Packard company is in production on 12-cylinder types. It is expected that the Nordyke & Marmon Co., Indianapolis, and the various General Motors Co. divisions will be in production in from 30 to 60 days.

—

Class AA Trucks Going to Washington

WASHINGTON, D. C., Feb. 12—The four Class AA Quartermaster ¾-ton war trucks assembled by the Willys-Overland Co., Reo Motor Car. Co., Maxwell Motor Co., and Federal Motor Truck Co. are en route to Washington and will probably arrive here Thursday morning, Feb. 14. The trucks reached Pittsburgh last night and left there this morning for Chambersburg, Pa.

—

Eidlitz to Direct Housing of Labor

WASHINGTON, Feb. 12—Otto Eidlitz, a New York architect, has been appointed Director of Housing by the Department of Labor. He will direct a huge program for housing labor other than that engaged on ship building. Congress has been asked for an appropriation of $50,000,000 to carry on the work.

Tractor Makers Work at Capacity

Twin Cities Makers All Are Rushed—Many Companies Add to Their Plants

MINNEAPOLIS, Feb. 9.—Tractor makers in the Twin Cities are working at capacity and factories are being added to in order to speed up production as fast as building work can be pushed. Emerson-Brantingham is adding a stock warehouse, the steel framework of which is up. The company has 600 employees working exclusively on tractors and will produce approximately 3,000 machines this year. A new engine testing room with eleven engine test stands is being fitted up. In this test the engines will be run with their complete tractor equipment including radiators.

The Minneapolis Steel and Machinery Co. which manufactures the Twin City tractor has just completed a new testing laboratory fitted with a 100-hp. Sprague electric testing dynamometer. There are two testing stands one at each end of the Sprague unit so as to admit of having two engines worked on, one under test and the other being prepared for test or otherwise used as needed. The Sprague unit is made for 100-hp. at 500 r.p.m. and will serve for high speed work up to 2,000 r.p.m. The new building is a brick structure, with tile floor and fitted with all modern conveniences.

The Gray Tractor Co., busy with export orders has already shipped 160 tractors to France, has forty more awaiting shipment and a large order yet to complete. The company is assembling two machines per day at present.

The Wilcox-Bennett Carbureter Co. maker of kerosene carbureters and the Bennett air cleaner for tractors and trucks is busy on both of these devices.

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Mobilize Schools to Train Soldiers

WASHINGTON, Feb. 12—Secretary of War Baker has organized a committee to mobilize the various schools and colleges of the country, including automobile schools to give technical training to soldiers. It is estimated that 100,000 soldiers will be trained in these schools in the next 6 months. The committee is composed of: Col. Hugh S. Johnson; Lieut-Col. Robert Rees; Major Grenville Clark; Dr. Charles R. Mann, Massachusetts Institute of Technology; Dr. James R. Angell, dean of the faculty of the Western Electric Co.; J. P. Monroe, Boston, and Dr. Samuel Capen, Washington.

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Automotive Industries

Airplane Mail Route Planned

Government Wants Round Trip a Day Between Washington, Philadelphia, New York

WASHINGTON, Feb. 12—An airplane mail service between Washington, Philadelphia and New York with a schedule of a round trip per day will soon be in operation, according to plans made public to-day by Postmaster-General Burleson.

The Post Office has asked for bids for construction and provision of the five airplanes to be used in the establishment of an air route for delivery of first-class mail. It is expected the service will be greatly increased later.

The War Department has arranged to release a sufficient number of Hispano-Suiza 150-hp. engines to equip the planes. Bids will be open Feb. 21 and the contract will be awarded to the bidder whose machines meet the service tests of the War and Navy Departments.

The airplanes and parts are to be delivered at such points in Washington, Philadelphia and New York as the Post Office designates not later than April 25. The contractor will also be required to furnish in addition to the five planes a sufficient stock of spare parts and to have in reserve a sixth airplane. He must detail to the Post Office Department a supervisor for 3 months to try out the aviators and mechanics in the operation of the planes.

Stipulations include that the machines must be capable of carrying 300 lb. of mail matter a distance not less than 200 miles without stop, maximum speed of 100 m.p.h., minimum of 45 m.p.h., and climbing speed of 6000 ft. in 10 minutes.

The Government will make a special postage rate not exceeding 25 cents per ounce for the transmission of mail by the air route, and will guarantee to observe a regular time schedule.

Congress has already made an appropriation of $100,000 for preliminary steps establishing airplane postal service.

Postmaster-General Burleson states that once the scheme is established it will remain a permanent service.

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Favor Daylight Saving Bill

WASHINGTON, D. C., Feb. 11—The daylight saving bill was given a favorable report by the House Interstate Commerce Committee Saturday. The bill has already passed the Senate and it is expected to find no opposition in the House. As amended, it makes daylight saving effective from March 30 to Oct. 30, during which period an extra hour of daylight will be obtained by turning the clock back one hour.

Washington News Letter

Transportation Under One Head—No Word on Fuel—Rubber Exports Licensed—War Department Reorganized

WASHINGTON, D. C., Feb. 11—Washington is seething this week with undercurrents reported to include radical changes in handling of army trucks, considerable discord between individuals and companies in the industry, and rumors that imports and exports will be subject to regulation. There is also an undercurrent pertaining to fuel as regards the industry and which carries reports of personal interest and internal difficulties.

As has been told frequently, the truck business of the army now is more or less chaotic. The standardized war trucks of the Quartermaster Corps, really the army war trucks, have not been taken up by all departments, with a result that there are numerous makes of trucks, and various other so-called standardized trucks with the attendant confusion.

Complaints this week have been received from tire makers who point out that there is no standardization of tire sizes; for example that the 1½-ton signal corps truck carries a tire that does not correspond in size with the standardized A truck. In addition there have been complaints of duplication of effort created by the separate truck divisions.

A fairly substantial report this week is to the effect that all of the motor transportation work of the army, including design, procurement and maintenance, will be first under one head. The report has it that the head of this work will be an automobile man working as a civilian under a high army officer.

It is quite likely that Christian Girl, chairman of the motor truck section of the Quartermaster Corps and president of the Standard Parts Co., Cleveland, will

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Farm Tractors Follow Automobile Design

Kansas City Show Reveals Reduction in Weight and Inclosure of Parts

KANSAS CITY, Feb. 12—The third annual farm tractor show opened here to-day with forty different makes of tractors, exhibited in a special one-story frame building erected for the purpose and which is a great improvement on the tent used for the last 2 years.

The present show is one of the largest tractor exhibits ever staged in this country and while the majority of the leading makers are represented there are several important makers not here.

The exhibit shows a very great change in design in the last year, the two most notable lines of improvement being:

1—Reduction in weight and,

2—Inclosing of parts to protect them from water and dust.

The influence of automobile design is plainly seen in many new models and in improvements on old models. There is shown a new Trojan tractor which might be designated as the first tractor built with a live rear axle design and with all parts as completely inclosed and in which use is made of 60-in. rear driving wheels yet without pressure on the teeth of the gears higher.

Tendency Toward Four Wheels

In a word what was declared a year or two ago as the impossible in tractor design has been accomplished. In this Trojan tractor is used the Foote gearset and rear axle and rear wheel design, and as the Foote company manufactures parts for all concerns wishing to buy them there will not be any restrictions on the new design shown here for the first time.

There is a very marked tendency toward the use of four wheels instead of three, and the single front wheel in tractors is almost at an end. It is rumored that some of the important concerns using the single front wheel have new designs in which two front wheels for steering are used. There is also a notable tendency toward the use of larger diameter front wheels for steering.

The reduction of weight is very apparent in not a few models. One concern which has a new model which is not shown here has succeeded in cutting 2200 lb. out of its tractor which has largely been done by a new design of gearset in which forged gears are used and by improving the design of the rear wheels and both axles. The weight has not been

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Kerosene Burning Problem Discussed

Heat Supply Must Be Regulated to Maintain the Volumetric Efficiency

MINNEAPOLIS, Feb. 9—That the ordinary hotspot manifold or double manifold does not fully solve the problem of burning kerosene in tractor engines was the consensus of opinion among engineers attending the regular monthly meeting of the Minneapolis Section of the S. A. E. held here on Wednesday evening and concerning which a short report appeared in AUTOMOTIVE INDUSTRIES.

Professor Mowry of the State Agricultural College took the stand that the increased use of kerosene and heavier fuels is more dependent on engine designers than on carbureter or manifold makers. A questionnaire addressed to 400 tractor owners in Minnesota brought out that none of them was using distillate or motor spirit in his machine. The majority replied that they used kerosene, less than 12 per cent using gasoline, except for starting. That many of these owners are not satisfied with the performance of their machines on kerosene was indicated by the fact that only 40 per cent of them agreed that they would recommend tractors to their neighbors. This was apparently not due to the cost of maintenance, because Professor Mowry showed figures in which the average maintenance or repair cost for 200 tractors in the state, all of which were less than 3 years old, was $28.05 per tractor, an unexpectedly low figure. No figures were given to show the average number of days these machines worked per year.

University Tests

Professor Mowry quoted figures from tests made by his university on keresene fuel with hotspot manifolds. The tests were made with a four-cylinder, L-head engine with a removable head and the duration of the tests was 1 hr. Water temperatures ranged from 190 to 212 deg.

The test with the Clapper manifold was made at an engine speed of 750 r.p.m. and the dilution of the crankcase oil due to kerosene cutting the oil film on the cylinder walls and getting past the piston into the crankcase was 0.1 lb.

With the Holley vaporizer the engine was run at 850 r.p.m. to get the same horsepower and the crankcase dilution was 0.7 lb.

With the Duplex manifold an engine speed of 820 r.p.m. was necessary to give the power and the crankcase dilution was 0.3 lb.

In some manifold tests the engine did not run the 1 hr., but stopped after 35 min. due to pre-ignition.

W. G. Clark, engineer of the Wilcox-Bennett Carbureter Co., maker of the Bennett kerosene carbureter, and who has just returned from a 3-months investigation trip among tractor farmers from Texas to Montana, in opening the discussion declared that the situation with the farmer so far as burning kerosene in tractors is concerned is much more serious than tractor makers generally imagine, due to tractor makers selling tractors that are supposed to burn kerosene satisfactorily but which fail to do it in the service of the farmers: As a result farmers in many sections are beginning to look with disfavor on kerosene as a tractor fuel.

Mr. Clark held that tractor makers are apt to rely too much on laboratory testing and experimentation methods, rather than getting out into the field. He claimed that the hotspot manifold is not the solution of the kerosene problem, because it increases the temperature of the mixture too much and cuts down the volumetric efficiency of the engine so that from 25 to 30 per cent of the engine power is lost.

Farmers Complain

He cited examples of farmers complaining to tractor makers that their tractors would not handle kerosene although advertised to do so, and quoted letters in which these tractor makers practically admitted that they would not, by recommending to the farmer that he use gasoline instead.

Spark plugs are giving very satisfactory service, Mr. Clark citing cases where plugs had been used for 2½ years in a tractor without changing.

With regard to lubricating oil the consensus of opinion of those engineers present was that the lubricating oil that is best for the burning of gasoline is best for kerosene, and that where very heavy oils are used with kerosene it is just that they will withstand the action of unburned kerosene a little longer and so postpone the dilution of the crankcase oil. Oils with good viscosity were recommended.

E. R. Greer, engineer of the Emerson-Brantingham company, thinks that the hotspot manifold to accomplish its object must have some form of heat control. Consideration must be given to the speed of travel of the mixture in the manifold as well as the temperature of the manifold. When there are high gas speeds with open throttle less heat is needed; in fact, you want to get the gases in as cool as possible in order to keep your power up; but when the throttle is closed on light loads and the manifold gas speed is cut down you must have added heat to prevent loading up.

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More Power for Automobile Industries Committee

WASHINGTON, Feb. 9—Directors of the Motor and Accessories Manufacturers Assn. met in Washington last week to discuss means of enlarging and broadening the scope of the Automobile Industries Committee. No definite decisions were reached and a second meeting is to be held Thursday, Feb. 14, in New York, which will be attended jointly by directors of the Motor and Accessories Manufacturers Assn. and the National Automobile Chamber of Commerce. The Automobile Industries Committee believes that its functions can be more efficiently handled and its results greatly augmented by the addition of efficiency experts, plant surveyors and production men to its present organization. This is one of the matters being handled by the directors of the M. & A. M. A. at the present meetings.

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No Fuel Restrictions on St. Louis Show

ST. LOUIS, Feb. 11—Fuel restrictions have been withdrawn from the St. Louis Automobile Show, to be held in the Exhibit Bldg., Feb. 18-23. The 30,000 sq. ft. of floorspace required were allotted last week to dealers, and preparations for the opening are going forward rapidly.

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Jordan to Add $200,000 Capital

CLEVELAND, Feb. 13—A 50 per cent increase in the production of Jordan cars, made possible by a largely increased demand and the immediate acquisition of $200,000 additional capital, and the placing of Jordan stock on a definite dividend-paying basis, is part of a plan announced after a meeting of the board of directors following the annual stockholders' meeting held last week.

Jordan has, during the past year, done a business of approximately $3,000,000 on a working capital of $300,000 producing and selling more than 2000 Jordan cars.

In the last quarter of 1917 Jordan earnings amounted to 16.7 per cent on the capital, which is equivalent to 66.8 per cent for the year.

The expense incident to starting a new business, putting a new car on the market, and establishing Jordan reputation has now been absorbed, and the earnings as shown by the last quarterly statement have been satisfactory.

The new plan provides for the sale of $200,000 of preferred stock now in the treasury, with one-half share of common stock given as a bonus with each share of preferred. This stock would be fully paid and non-assessable. The preferred stock now held by the original stockholders, together with the new preferred issue, will be placed on a 7 per cent annual dividend basis, to be paid quarterly. The new issue will first be formally offered to the present stockholders who may subscribe pro-rata to their present holdings. In the event that the new issue is not all taken by them it will then be available to new subscribers. The control of the Jordan company remains in the hands of Mr. Jordan and his working associates.

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Strikes Reduce Copper Output

WASHINGTON, D. C., Feb. 11—The Mediation Committee appointed last spring by President Wilson, states in a report that the strikes during the summer in Arizona resulted in a loss of one hundred million pounds of copper.

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England Restricts Use of Gas

Substitute Motor Fuel Is Limited to Owners, Who May Also Use Gasoline

LONDON, Jan. 9—By a new order issued to-day, the use of gas for motor cars and trucks has been limited to those cases where it is legal to use gasoline as a motor fuel. This ruling represents another curtailment on the industry. It was thought that coal gas might be used since it allowed the conservation of gasoline, but the government has apparently decided to restrict the use of automobiles, irrespective of the fuel used.

On Feb. 9, a still further curtailment order is expected to go in force. On that date a motorist must decide whether he will use coal gas or gasoline as a fuel. In other words, after Feb. 9, if your permit allows you to use gasoline, then you cannot use coal gas and vice versa.

This new ruling suggests a possible development in automobile fuels which will continue after the war. There are some sections of the country in which the use of gasoline may cease entirely, particularly those where gas is plentiful, such as bituminous coal mining areas. There the voluminous gas bag will undoubtedly disappear and the steel cylinder take its place. With the use of steel cylinders and compressors, coal gas will be carried more easily than gasoline, and in such sections, coal gas may supersede gasoline as a fuel. It is not likely that the gas bag will disappear during the period of the war, due to the difficulty of securing steel cylinders.

Another aspect to the post-war fuel situation in England is the possibility of using benzol. There will be gigantic supplies of benzol when the war is over, because the huge plants which have been put up to produce this satisfactory fuel are now doing war work only, but afterward it should sell at a lower price than gasoline.

—

Standard Parts Holds Midwinter Meeting

CLEVELAND, Feb. 11—Increased output and standardization were the principal subjects discussed at the midwinter meeting of plant and production managers of the Standard Parts Co., held in the Hotel Statler, Feb. 4 and 5. In order to prevent delay or cancellation of orders for the goods which were damaged in the fire at the Cincinnati plant, it was decided to divert this work to other plants of the company, and likewise to transfer the Cincinnati workmen to other factories for the time being.

Company executives and managers of other departments joined the production men at the midwinter dinner. Addresses were made by Christian Girl, president of the Standard Parts Co.; E. J. Hess, vice-president; T. E. Borton, treasurer; P. A. Connolly, secretary; Dan C. Swander, sales director; W. C. Keys, acting engineering director; and H. H. Newsom, director of purchases. W. E. Perrine, director of production, presided.

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Overland-Curtiss Union Increases Engine Output

BUFFALO, Feb. 11—A large output of engines for training planes is the result of the close manufacturing union of the Willys-Overland Co. and Curtiss Aeroplane & Motors Corp. The January output of Curtiss engines by the Willys-Overland company was 110, and in addition the Buffalo and Hammondsport Curtiss plants turned out 400, making a total well in excess of 500.

At present Willys-Overland is turning out more than 15 engines of the OX type daily, and when the Elyria (Ohio) plant, which has hitherto been devoted to the manufacture of Knight engines, swings into production about the middle of February, the total will be greatly augmented.

Under the expanded manufacturing schedules the Overland and Curtiss plants should produce jointly in February between 750 and 800 engines. Within 60 days it is expected that they will reach a stride of 1000 a month.

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Detroit Has 118,489 Industrial Employees

DETROIT, Feb. 13—According to the report by the Michigan Labor Commission, the automobile industry employs practically 50 per cent of the industrial employees in the six largest Michigan cities. Detroit, alone, employees, 118,489; Flint, 18,262; Lansing, 7875; Jackson, 4683; Muskegon, 2847; Pontiac, 5747.

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Loans Urged for Tractors

COLUMBUS, OHIO, Feb. 11—That farmers who want to purchase tractors should be given preference in loans was urged upon all Ohio bankers by Philip Berg, state superintendent of banks. He says that large crops are a war necessity, and that "worthy farmers should have the fullest line of credit, consistent with good banking principles, for the purchase of farm tractors."

—

Government Requests Airplane Device Ideas

WASHINGTON, Feb. 11—The National Advisory Committee for Aeronautics has invited all inventors of airplanes or airplane equipment to submit their ideas. A comprehensive outline of the proposed device, with necessary data, and the results of any tests that have been made, should be sent to the committee. All suggestions of inventions will be considered confidential, and those of merit will be turned over to the proper officials, with suitable recommendation. A special sub-committee has been formed to examine these inventions, and it is suggested that inventors obtain scientific and technical advice before taking the time of the government for ideas which violate scientific laws or are contrary to the best aeronautic practice.

Ford Starts Work on Sub-Chasers

Keel of First Boat Already Laid—Side Frames Ready to Go Up—Designed in 10 Days

WASHINGTON, Feb. 9—Henry Ford laid the keel for the first of the new type patrol boats to be built in the Ford plant yesterday. The side frames are ready to go up.

Secretary Daniels made public to-day a number of details regarding the Ford contract. In December, Henry Ford offered, by letter, to build naval vessels in his plant. A few hours after the letter was received a telegram was sent requesting Mr. Ford to come to Washington for conference. A few days later Mr. Ford and his staff went into consultation with officials of the navy, following which the Ford party went to Philadelphia to inspect shipyards and plants. They returned to Washington for further consultation, and on Dec. 31 had the preliminary plans and specifications of the boats to be built. Several days later complete plans were delivered to Ford, who on Jan. 15 telegraphed his proposition to Secretary Daniels, and in return received a contract for a large number of the boats. Rear Admiral C. W. Dyson representing the Bureau of Steam Engineering, and Naval Constructor Robert Stocker, representing the Bureau of Construction and Repair, are in Detroit assisting Mr. Ford.

The Ford company, according to Secretary Daniels, is pushing construction at a rate that will probably exceed all previous records for building steel naval vessels.

The new type of patrol boats being built by Mr. Ford was designed in ten days. A model was made and tested at the Washington navy yard before the placing of contracts.

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Goodyear Must Pay $750,000 Tax

COLUMBUS, OHIO, Feb. 11—The Goodyear Tire & Rubber Co., Akron, must pay the Willis tax of 3/20 of 1 per cent on its $50,000,000 increase of capital, a total tax of $750,000. This decision was made by Attorney-General Joseph McGhee, who ruled that when a corporation files an increase of capital within 6 months prior to the time of filing the annual report, that part of the increase which is subscribed, or issued and outstanding at the time the report is filed, must be taken into consideration in computing the franchise tax.

—

Marshall Vice-President of Jones

WICHITA, KAN., Feb. 11—Deering J. Marshall has been elected vice-president of the Jones Motor Car Co., and John Engstrom has been made a new director to fill the place of J. W. Farmer, resigned.

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Chicago to New York Truck Line

Master Truck Transportation Co. to Operate Motor Freight Fleets on Schedule

CHICAGO, Feb. 12—Details of the arrangements for the Chicago and New York truck service of the Master Truck Transportation Co. indicate very thorough preparation for maintaining the movement of truck trains on schedule. As previously reported, this new service is to operate a freight line between Chicago, Buffalo and New York, and the first fleet of 24 2-ton Master trucks is expected to be ready for the pioneer trip as soon as the weather conditions permit. Some idea of the thoroughness of the preparations will be gained from the fact that the fleet will have with it one truck devoted entirely to carrying oil and gasoline for the convoy, another is equipped as a kitchen to prepare meals for the drivers and mechanics en route, while a third will carry tents and sleeping equipment for the men. It is designed to eliminate the necessity for depending upon any hotel or restaurant accommodations.

According to General Manager Goldman, this method of freight transportation will be sufficiently popular for it to become general with other truck concerns, as already the new company just formed has had requests from more Chicago and New York manufacturers to make deliveries between the two points than a fleet three times the size could handle.

All of the hauling will be done under contract, and there will be no "less-than-truckload" shipments taken. Further, these full loads must all go to one destination. There will be no intermediate stations for the present, shipments being taken only for Buffalo and New York delivery at first. Officials announce that contracts have been signed to insure full loads for the trucks for the return trip.

The trucks will run in convoy formation, and 10 or 11 hrs. will constitute a day's run. The drivers that start with the trucks will continue with them throughout the trip. The character of the freight to be handled will include everything that moves by a truck of this capacity.

Rates for hauling will be the same as for express, but there will be the added feature that the power that carries the shipment across the country will deliver it at the door of the consignee. Present plans do not include way stations for concentrating freight or for unloading for further distribution. By handling all this business under contract there will be no necessity for interstate commerce regulations.

One feature of the truck will be a pneumatic tire equipment, with the use of which a speed of 25 to 30 m.p.h. is anticipated. Special changes in construction to permit of this speed have been made. In addition to the 2-ton internal gear drive there will be also probably some 3½-ton worm-drive trucks in service. All will have special bodies of the stake type, with tarpaulin covers, the loading capacity being 12 by 6 by 6 feet.

California to Have Tractor Demonstration

DAVIS, CAL., Feb. 13—A tractor demonstration will be held on the University of California Farm, April 17, 18 and 19 under the auspices of the California Tractor and Implement Assn. This association was formed by tractor manufacturers and their representatives for the purpose of conducting such a demonstration.

A special effort will be made to show the broad scope of modern power-farming and the versatility of the modern tractor. There will be a complete showing of tractor tools, including plows, discs and drag harrows, cultivators, sub-soilers, scrapers and checkers.

Practically every make of tractor sold on the Pacific Coast will be shown. These include the Holt, Yuba, Best Tracklayer, Waterloo Boy, Cleveland, Samson, International, Avery, Case, Monarch, Bean, Moline, Wallis, Fageol, and Sandusky. Implement lines will be exhibited by the John Deere Plow Co., Oliver Plow Co., Pacific Implement Co., Baker & Hamilton, I. H. C., Moline Plow, Case, Avery, Holt, and Yuba.

The use of the tractor as a stationary power plant will also be demonstrated, and tests will be conducted as to actual drawbar horsepower and short-turning ability in plowed ground as well as on ordinary surfaces. Tests will be under the direction of Professor Davidson of the University of California.

The demonstration committee in charge of the show is composed of W. H. Gardner, Yuba Co., chairman; W. E. Price, Pacific Implement Co.; W. D. Boswell, distributer, and Prof. J. B. Davidson. Eugene Smith will manage the demonstration.

Washington-New York Truck Line

WASHINGTON, D. C., Feb. 11—The Liggett-Riker-Hegeman Drug tores have inaugurated a truck schedule between New York and Washington to overcome the uncertainties of rail shipments. A 6½-ton Packard is used and it is expected that with clear weather conditions the 300-mile journey can be made in 2½ days.

Detroit-Cleveland Truck Route Ready

DETROIT, Feb. 11—The local traffic department of the Board of Commerce has received a letter from the Highway Motor Transport Co. of Cleveland, asking for 500 tons of Detroit commodities to carry to Cleveland as soon as possible. The company has already 500 tons of Cleveland goods awaiting truck transport to Detroit. It is planned to operate these trucks in trains of from eight to twelve each, each truck being capable of carrying 6½ tons. The rate from Detroit to Cleveland will be $1.35 per hundred, and the trip each way will take not longer than 3 days.

Link Mid-West Cities by Truck

Detroit, Cincinnati, Cleveland, Toledo and Chicago to Be Regularly Served

DETROIT, Feb. 11—Detroit, Cincinnati, Cleveland, Toledo and Chicago will be connected by an inter-city motor truck line within 60 days if plans now under way mature.

A Toledo concern known as the National Motor Transport Co. is planning to put 50 trucks into operation in 2 months, and as soon as these are in successful operation to add 100 more. It is expected that 150 trucks will be on the road in 90 days. F. V. McCormick of Detroit is in Toledo organizing the company. It is stated that 25 men, most of whom are Toledo business men, are interested, and it is expected to incorporate soon for $1,500,000.

The routes between the four cities have been mapped out and test trucks have been sent over the roads that show that fast time can be made. According to tentative schedules, the distance from Toledo to Detroit will be covered in 6 hours; from Toledo to Cleveland in 12 hours; Toledo to Cincinnati in 18 hours; and Toledo to Chicago in 24 hours.

The truck equipment will be decided upon as soon as the board of directors is organized. Traffic Commissioner H. G. Wilson of the Toledo Commerce Club has taken the matter up with the Interstate Commerce Commission and has been assured that charges made by the truck company will not be interfered with, at least until after the war, as the government favors the establishment of such transport companies now to relieve railway congestion. The same assurance has been given by the Ohio Public Utilities Commission. It is planned to run the trucks in trains of five each, and it may be that branch lines will be established along the routes later. All kinds of parcels, express and freight will be carried.

Indianapolis-Chicago Line

INDIANAPOLIS, IND., Feb. 9—Racklind & Farber, produce merchants of Indianapolis and Chicago, have inaugurated a motor freight line between the two cities. The run is 186 miles, and recently a Maxwell truck loaded with 23,000 lb. of perishable freight went through in 18 hours.

Producing 60 Ford Tractors a Day

DEARBORN, MICH., Feb. 11—Henry Ford & Son are completing the order of 7000 tractors for the British Government and are now turning these tractors out at the rate of 60 per day. Six thousand of these tractors are completely assembled, while the other 1000 are made in service parts. Production is still being stepped up, and it is predicted that the output will probably reach seventy-five a day during the coming summer.

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To Make Essex at Hudson Plant

Preliminary Work of Getting New Car in Production Now Going On

DETROIT, Feb. 13—The Essex car, which will be produced by a concern headed by W. J. McAnenny, vice-president of the Hudson Motor Car Co., will be manufactured in the Hudson plant. The car was to have been built in the old Studebaker plant No. 5, which was bought for the purpose, but this was leased out for war work. Meantime, the preliminary work of getting the Essex car into production is going forward at the Hudson plant. Nothing definite regarding the entrance of the Essex into the commercial field nor any details of its specifications can be announced at present. Plans for going ahead with the production are being formulated, and extensive tests are being given to the car in its experimental form.

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AA Trucks Reach Washington

WASHINGTON, Feb. 13—The four sample ¾-ton Quartermaster trucks, Class AA, arrived in Washington last night, making the journey in less than four days from their respective factories. The trips were made without any serious mechanical troubles. The average speed was 18 miles per hour and the gasoline consumption 10 miles per gallon.

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Dahlquist and Finkenstadt Promoted

WASHINGTON, Feb. 13 — Captain Charles S. Dahlquist, formerly engineer for the Timken-Detroit Axle Co. and now in charge of axle inspection for the Motor Transport Section of the Quartermaster Corps, has been promoted to be a major. Second Lieutenant Rudolph Finkenstadt, formerly assistant to Christian Girl of the Standard Parts Co., Cleveland, now assisting Girl in the Motor Transport Section of the Quartermaster Corps, has been promoted to the rank of captain.

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Labor Shortage a Myth

WASHINGTON, Feb. 13—In direct contradiction to the cry of labor shortage and the threat of labor conscription, Secretary of Labor William B. Wilson states to-day: "The immediate labor needs of the shipyards are filled and the man who leaves his present position to seek employment in shipyards is likely to find no work. The coming month, however, will necessitate an increase in the present number of shipyard workers by several hundred thousand men who have had experience in trades used in shipbuilding.

"The Department of Labor is now enrolling men of these trades through its United States Public Reserve who are willing to go to shipyards when they are advised. The shipyard volunteers will be placed through the Department of Labor when it has full details as to when and where the men are needed, the wages and housing and other conditions.

"We appeal to all qualified men to enroll during the coming week in the reserve and to stick to their present jobs until they are called."

—

To Cut Ford Car Production 50 Per Cent

DETROIT, Feb. 14—Reports that the Ford Motor Co. will abandon the manufacture of passenger cars are denied by factory officials. The Ford plant will be largely devoted to war work on airplane and submarine destroyer parts, with the result that passenger car production will be cut about 50 per cent. At present, the normal output of the factory is about 3000 cars daily. A reduction of 50 per cent would bring this to 1500 cars a day.

The Ford company is behind with its orders in practically every section of the country, and the resulting cut in production will naturally cause a country-wide shortage of Ford cars, as soon as available supplies in branch plants are used up. Ford dealers have been urging prospects to place orders early in order to take care of the demand.

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American Machinery Plant for Shells

DETROIT, Feb. 14—The American Machines Corp., Port Huron, Mich., a munitions manufacturing company subsidiary to the American Canadian Resources Co., has purchased the American Machinery plant. Men have already been put to work on a $500,000 government contract for the manufacture of shells.

The American Machines Corp. is controlled entirely by outside capital, and the machinery and plant were purchased outright. The plant of the American Machinery Co. is fully equipped for the manufacture of shells as it was recently engaged in making shells for the Russian government. It is expected that 300 men will be employed and the factory run on a 24-hr. basis in a short time.

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65,000 Hercules Engines for Allies

CANTON, OHIO, Feb. 13—The Hercules Motor Mfg. Co. has started work on a contract placed by Henry Ford & Son, Dearborn, Mich., for 65,000 farm tractor engines for use in the allied countries. Additional workmen are being employed, and full capacity and facilities utilized for this work. Extensive repairs are being made in the plant to speed up production, and it is expected that more than 100 engines will be produced daily. These will be shipped to Cork, Ireland, where Henry Ford & Son have an assembly plant.

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$500,000 to Transport Labor

WASHINGTON, D. C., Feb. 12—The Department of Labor has asked Congress for $500,000 to be used for transporting workers about the country. An appropriation for $50,000,000 for housing and transportation will be asked in the near future.

Stettinius to Push War Work

Purchases Surveyor Will Maintain Even Flow of Production—Pierce for Priorities

WASHINGTON, Feb. 12—In making plain the exact functions of Edward R. Stettinius of New York, who has recently been appointed Surveyor of Purchases and Supplies, the War Department has indicated that Stettinius is "associated with and subordinate to Brig.-Gen. Palmer E. Pierce," who will have supervisory charge of all purchases made by the several purchasing bureaus of the War Department.

The function of Mr. Stettinius will be largely that of surveyor of the industrial field and an accelerator of war supplies. In other words, he will be largely instrumental in maintaining an even flow of production to the purchasing agencies of the War Department. He is to keep track of the capacity and production of contractors and will pass along orders for changes in the requirements of the American expeditionary forces to harmonize production with demand. General Pierce will determine priorities and make estimates of requirements, but will not take over the routine purchasing activities of the various bureaus which will be continued as heretofore.

Quartermaster General George W. Goethals has been given additional duties. He will act also as director of storage and traffic as well as quartermaster general. Among other things he will direct priorities of storage and war traffic in the United States, the embarkation of supplies and troops, inland war transportation and storage at inland points, embarkation points and overseas points.

—

All Aviation Training in U. S. Now

WASHINGTON, D. C., Feb. 12—The demands of France for American soldiers to be given advance training in the French aviation schools have been met and all advance training in France is now filled up. Hence all of the American soldiers enlisted in the flying service are being given their advance training in this country.

It is considered likely, however, that France will ask for more men to train as soon as the several thousand now undergoing flying instruction in France have completed their courses. At this time we will again send aspirants for aviation service abroad for their advance training.

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Heatless Mondays Abolished

WASHINGTON, Feb. 12—Fuel Administrator Dr. Harry Garfield has formally abolished heatless Mondays. He has stipulated, however, that certain State fuel administrators have discretion to take steps similar to the heatless order when deemed imperative.

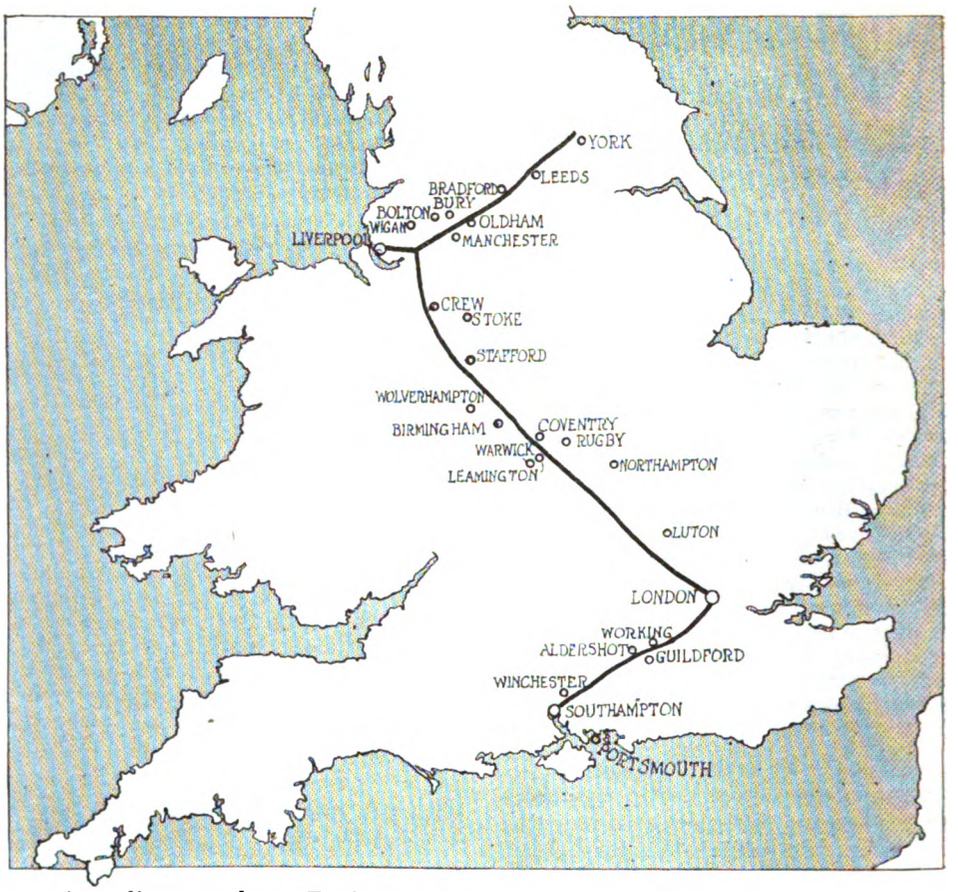
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HighwayTrunkLines for England

To Be Built on Straight-Line Principle and Pass Large Towns at Easy Distance

LONDON, Jan. 9—England is already seriously considering the development of a line of motor highways laid out largely on the principle of trunk railroad lines, which would be used exclusively for motor transportation, and built with the object of opening up cheap land transportation and connecting the large market centers.

This new system of roads, according to plans, would be built on the straight line principle and would not enter large towns, but rather pass them at easy distances. The roads would be as straight as possible, 150 ft. wide, with double driveways, and only one direction traffic on each. It is not the purpose of these roads to increase in size the already large towns, but to provide good transport facilities through the country. They will also reduce the congestion of large towns by providing cheap lands on which trades which cannot be profitably carried on in town may be developed. Factories would spring up alongside these roads just as they have followed railroads and waterways in the past. Opportunities for town and city planning would be provided, and also cheap land for homes in connection with those industries developed.



According to plans, England's highway system will run directly from Portsmouth to the northern manufacturing area. No attempt is made to have the road pass through the large towns

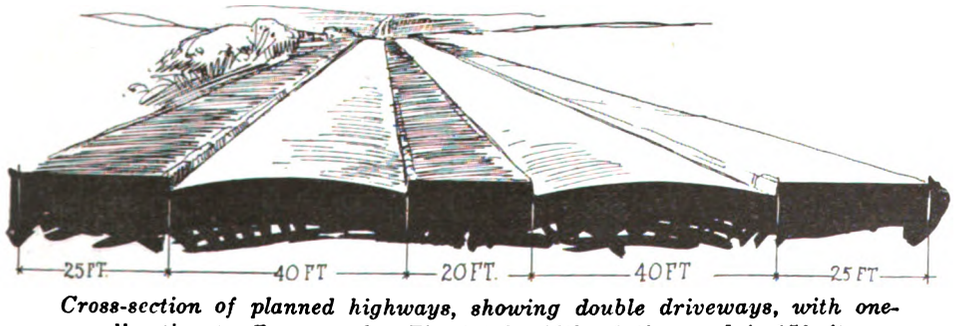
Factories Served by Motor Vehicles

Factories and buildings in connection with these new roads would rely entirely on motor vehicles for transportation, and delivery of merchandise to the retailer, the consumer or the ports for export trade. Trans-shipment would thus be eliminated and congestion of railroads greatly reduced.

No definite scheme for the entire country has been worked out, but undoubtedly there would be one main road from London to the great southern export port of Southampton. There would be a road leading north from London to Manchester and Liverpool, and others to the northern manufacturing cities such as Leeds, Bradford and York.

That such a system of roads would be of great military value has been proven by the value of those in France. These new roads would be laid out without regard for existing highways, but an existing highway, coinciding with the planned road, would be incorporated into the scheme.

A road system of this nature would thread all of the great manufacturing and producing districts. The building of such a highway system would follow as one of the after-war developments of the country, and the work of construction would absorb practically all the surplus labor of the nation.



Cross-section of planned highways, showing double driveways, with one-direction traffic on each. The total width of the road is 150 *ft.*

—

England Restricts Tractor Importation

LONDON, Jan. 9—On account of increasing freight difficulties, the importation of farm tractors is being materially reduced, and it is understood that no permits will be given for the importation of tractors excepting where the individual importer can show that he has already sold a reasonable percentage of the number he wants to import. Heretofore the importation of tractors has been encouraged and the present action indicates that the government plans to restrict tractor importation as carefully as that of motor trucks.

—

December Oil Output Slightly Decreased

WASHINGTON, Feb. 11—The December output of oil was 19,807,143 barrels, as compared with 20,492,712 in November. The decrease is due to the lessened output of the oil fields north and east of Oklahoma, where the weather was coldest. In all other fields the output showed a fair increase.

The reserve oil stocks were requisitioned in December in all fields except the Appalachian and Rocky Mountain districts, where moderate additions to stocks were made. Except in the Oklahoma-Kansas field, the surface reserve of crude oil at the end of 1917 was appreciably less than at the end of 1916.

—

477 St. Louis Automobile Men in Service

ST. LOUIS, Feb. 11—A canvass of the motor trade here shows that 477 men have gone from the industry into military and naval service. The Dorris Motor Car Co. alone sent 158 men, many of them enlisting as repair men and drivers. Othere figures are: Ford Motor Co. (St. Louis branch), 53; Chevrolet Co., 25; Overland Co., 18; Hudson-Phillips and Cadillac companies, 15 each.

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United States Rubber to Change Laws

Amendments Approved by Board of Directors to Be Submitted to Stockholders Mar. 19

NEW YORK, Feb. 11—The United States Rubber Co. will submit several amendments to the by-laws for consideration of the stockholders at the annual meeting on March 19. These have already been approved by the directors.

First, it is proposed to change the date of the annual meeting from the third Tuesday in March to the corresponding day in April, and the hour from 12:30 to 11:30 a.m. The second amendment, if adopted, will increase the number of directors from 21 to 25. The third provides for the optional election of a chairman and vice-chairman of the board of directors and a controller of the company. These offices do not exist at present, and it is understood that even if the amendment is adopted, they will not be filled in the near future. This amendment also provides that the vice-presidents need not be directors.

The chairman of the board of directors will have greater powers, according to the fourth amendment. He will be the chief executive officer of the company, subject to the board, and shall be in general charge of the affairs of the company. He will preside at all meetings of the stockholders and board, and be chairman of the executive committee. The directors, at their discretion, may elect a vice-chairman, who is to perform those duties prescribed by the executive committee, the directors or the chairman of the board.

If a chairman is not elected, the president, subject to the directors, the executive committee and the chairman of the board, will have general charge of the business of the company relating to purchasing, selling and general operation.

The seventh amendment provides that the treasurer, jointly with the president or one of the vice-presidents, shall have custody of the securities belonging to the company. The controller is to be the principal officer in charge of accounts.

Proxies for the annual meeting on March 19 are being asked for in the names of Samuel P. Colt, James B. Ford, Lester Leland, Walter S. Ballou, Nicholas F. Brady and Charles B. Segar, who comprise the executive committee.

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Maxwell Truck Ends Endurance Run

NEW YORK, Feb. 11—The Maxwell truck which left New York Dec. 1 on an endurance and demonstration run has reached its destination at Washington after covering 2488 miles by way of Philadelphia, Washington, Richmond, Atlanta, Ga., to Jacksonville, Fla., and return through Savannah, Augusta, Columbia, S. C., Raleigh and Richmond. The run was made entirely under the supervision of the American Automobile Association, James A. Hemstreet being official observer, and the official sanction, No. 1080. The average gasoline consumption was 10.56 miles to the gallon though in places this was as high as 15.1 m.p.g. The average consumption of oil was 2.0497 qts. per 100 miles and of water 1.334 pts. per 100 miles. During the entire run the weather was unfavorable, the temperature ranging from 30 deg. above to 12 below zero, Fahr. The total load transported was 2039 lbs., and during the run no adjustments except minor ones on carbureter and gasoline feed line were made. One coil radiator spring and one fan belt were replaced. The vehicle was a stock Maxwell 1-ton truck.

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National Price Increases

INDIANAPOLIS, Feb. 11—The National Motor Car & Vehicle Corp. has increased the prices of all 6 and 12-cylinder models, excepting the convertible sedan. The new prices go into effect immediately, in accordance with the prediction made at the New York and Chicago shows.

Prices follow:

Model	New Price	Old Price	Increase
6-cyl.			
7-pass. touring	$2,150	$1,995	$155
4-pass. roadster	2,150	1,995	155
4-pass. phaeton	2,150	1,995	155
Sedan	2,820	2,820	...
12-cyl.			
7-pass. touring	$2,750	$2,595	$155
4-pass. roadster	2,750	2,595	155
4-pass. phaeton	2,750	2,595	155
2-pass. dispatch roadster	2,850	2,750	100
Sedan	3,420	3,420	...

—

Automobiles Relieve St. Louis Car Strike

ST. LOUIS, Feb. 11—A street car strike lasting from Sunday, Feb. 3 to Thursday, Feb. 7, emphasized the thoroughness of the motorization of the city. More than 60 per cent of the workers got to their places of business in automobiles. The immediate lifting of all fuel and light restrictions on garages and repairshops was one of the beneficial results of the strike.

Local dealers and accessory stores had the busiest week on record, and passenger cars and trucks, of every description were brought into use.

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Chandler 1917 Output 15,000 Cars

CLEVELAND, Feb. 11—The Chandler Motor Car Co. manufactured 15,000 cars in 1917, and showed, before deduction of Federal taxes, net earnings of about 34 per cent on the $7,000,000 outstanding stock. War taxes amounted to $7 or $8 a share, and after allowing for these, the company earned its $12 dividend rate more than twice over.

The foreign trade of the company included almost every country in the world outside the fighting nations of Europe, and those where embargoes exist. This foreign business, carried on in spite of high freight rates, is taken as an indication of the demand that will exist after the war.

Plan Uniform U. S. Registration

Secretaries of State Draft Law Making Operators' Licenses Necessary in All States

TOPEKA, KAN., Feb. 11—The Association of American Secretaries of State is the sponsor for a uniform registration measure, which will apply to all states. At the second annual meeting of the association held last fall a committee was appointed to draft a law, and this has now been done. It will be submitted to all secretaries of state, and if approved will be introduced into the legislature of every state in the union. The measure provides the usual registration of a car and makes compulsory the obtaining of a license to operate a car. It also requires manufacturers and dealers to make monthly reports of all cars sold. The measure is intended primarily to discourage the theft of cars and would require secretaries of states to maintain card indexes giving the engine number and other identifying marks on cars. Persons who destroy identifying marks are to be deemed guilty of a felony, and any dealer who sells a car with a defaced or destroyed engine mark shall be deemed guilty of a misdemeanor which is punishable by a $500 fine. The measure also provides for headlamps with "dispersive lenses or glass mechanism or apparatus or otherwise so regulated as not to blind or dazzle other users of the highway or make it difficult or dangerous for other users to ride, drive or walk thereon."

—

Automobile Industry Uses Little Coal

WASHINGTON, Feb. 11—Although the automobile industry is one of the largest in magnitude, it uses a very small amount of coal. The last figures available are those compiled by the U. S. Bureau of Census for 1914, and these show that 41 other industries consumed more coal. Less than 500,000 tons were used in automobile and motor truck plants, while 31 other industries used more than 1,000,000 tons each.

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CLEVELAND, Feb. 11—Frank Willis, president of the Hal Motor Car Co., denies the rumor that he has resigned. He said that a meeting was held recently, at which there was a discussion as to whether the company should liquidate. No final decision was reached, although it seems probable that liquidation will occur.

—

Jordan Ships 1727 Cars

CLEVELAND, Feb. 11—The Jordan Motor Car Co. manufactured and shipped 1727 cars during 1917, the total volume of business amounting to $3,000,000. More cars were sold in the last three months than any other quarter of the year.

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Michigan Manufacturers Fall Back on Drive-Aways

Characterize Freight Situation as Impossible

DETROIT, Feb. 14—Manufacturers here, and in Toledo, Flint, Jackson and other centers characterize the freight situation as impossible. It is almost useless to try to move cars by freight, and manufacturers have had to fall back entirely upon drive-aways. The only drive-away gate that is open runs through Toledo, as roads to Grand Rapids and the West are still impassable.

Rains have held up the Buick drive-aways, so that they are down to 25 or 30 a day, but the company has been able to ship about 200 cars daily by freight.

The road situation is temporary, and no doubt drive-aways will be back in full swing in a day or so. The Buick output runs from 300 to 350 cars a day, so that unless drive-away conditions are improved, the output will exceed delivery. Oldsmobile drove 40 cars through to Toledo on Saturday, 40 Sunday and 40 Monday.

—

Motor Transport Gets New Office

WASHINGTON, D. C., Feb. 11—The Motor Transport Section of the Quartermaster Corps is now located at Sixth and E Streets, 1421 I Street, Union Depot Office Building and the Treasury Building. Gen. Chauncey B. Baker, who heads the Motor Transportation Division, has moved with his staff, including Col. Edward Drake and Col. James Furlow, from the State War and Navy Building to the Georgetown University Building at Sixth and E Streets. This move follows the relieving of General Baker as chief of embarkation. Christian Girl as chairman of the Motor Transport section continues his office at 1421 I Street, although it is anticipated that these will be moved shortly to a temporary Government building. The draftsmen of this section are housed in the Treasury Building, and the engineering is handled in the office building of the Union Depot.

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3 Companies to Make Nash Trucks

CHICAGO, Feb. 13—Arrangements have been made whereby the Nash Quad 4-wheel drive and steer trucks are to be manufactured for the Government by the National Car & Vehicle Corp., Indianapolis, the Paige-Detroit Motor Car Co., and the Hudson Motor Car Co., Detroit, under the Nash Motors Co. patents. It is understood that these are for the Ordnance Department, and are to be produced in large numbers. The tooling and equipment of the three factories to manufacture these is going forward and production will start as soon as possible.

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Form Kalamazoo Munitions Co.

KALAMAZOO, Feb. 14—A munitions corporation is being formed here by industrial men in line with organizations formed in other industrial centers, such as the Detroit Shell Co. The corporation will have a capital of at least $100,000, 10 per cent of which will be paid in. The business will be controlled by a board of directors of seven disinterested business men. There will also be a technical board of seven engineers acting in an advisory capacity on estimates, bids, distribution and completion of contracts.

Through centralized efforts, Jackson has already received war contracts amounting to $8,000,000 and the plan has also worked out to advantage in Grand Rapids, Cadillac, St. Johns and other cities.

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Washington Office for Highway Industries Association

WASHINGTON, D. C., Feb. 11—The Highway Industries Association, recently formed in Chicago, will hold a directors' meeting in Washington Feb. 16 to arrange for location of an office here and complete its organization. S. N. Williams, sales manager for the Garfield Motor Truck Co., chairman of the association, is already in Washington arranging for future activities. It is expected that the National Automobile Chamber of Commerce and the Motor and Accessories Manufacturers' Association will name directors for the new association this week, including one to represent the accessories makers, another to represent the motor car makers and a third the motor truck makers.

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Retire $4,000,000 Curtiss Notes

BUFFALO, Feb. 12—It is understood that the convertible 6 per cent notes of the Curtiss Aeroplane & Motor Corp. will be called soon at 102½. There are two issues of $2,000,000 each. Retirement of the notes means that a possible increase in stock amounting to 80,000 shares will not be made.

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License Rubber Exports

WASHINGTON, D. C., Feb. 11—The War Trade Board has issued a conservation list of materials which may not be exported to any country except under license and the list contains rubber and all commodities containing rubber. The War Trade Board will regulate the export of rubber tires by this form of license.

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Claim Against Hal Motor

CLEVELAND, Feb. 13—A petition asking that the Hal Motor Car Co. be adjudged an involuntary bankrupt was filed in the Federal Court here yesterday by the Universal Machinery Co., the Keyless Auto Clock Co. and the C. H. Hanson Co. The petitioners presented claims aggregating only $1,500.

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Chicago Pneumatic Earns $2,000,000

DETROIT, Feb. 14—The Chicago Pneumatic Tool Co. shows net earnings of $2,000,000 for 1917. This is an increase of 30 per cent over 1916 and amounts to $18 a share on the company's stock of $7,500,000, of which $6,485,800 is outstanding. The profits were calculated after deducting income and excess profits taxes.

Pennsylvania Crude Oil Advances 25 Cents a Barrel

Sets New High Price and Low Production Records

PITTSBURGH, Feb. 11—The price of Pennsylvania crude oil has been advanced an additional 25 cents a barrel, the present price being $4. This is a new high record.

All other grades have been marked up 5 cents a barrel, as follows: Corning to $2.85; Cabell to $2.77; Ragland to $1.25; and Somerset to $2.60.

The advance in the price of crude oil at this time is construed by oil men as government recognition of the necessity of higher prices. For some time the production in Pennsylvania has been decreasing, and the pipe line in the Pennsylvania, Kentucky and Mid-Continent fields during the last two months have set a new low record for the last 10 years.

For some time there has been an agitation for higher prices among producers, but these demands were refused by the big interests, particularly the Standard Oil Co., because of the critical situation in the oil industry.

On the strength of the Pennsylvania increase, 10 per cent premiums were posted on Ohio, Indiana and Illinois products, establishing North and South Lima at $2.18, Wooster at $2.48 and Princeton and Illinois at $2.22.

—

Packard Truck Prices Higher

DETROIT, Feb. 13—The factory prices of Packard trucks will be increased on March 1. The prices follow:

Model	New Price	Old Price	Increase
1-ton	$2650	$2450	$200
1½-ton	3000	2800	200
2-ton	3400	3200	200
3-ton	4100	3900	200
4-ton	4450	4375	75
5-ton	5150	4900	250
6-ton	5400	5150	250

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Supervise Liberty Engine Testing

DETROIT, Feb. 11—D. McCall White, vice-president and chief engineer of the Cadillac Motor Car Co.; H. M. Crane of the Wright-Martin Aircraft Corp.; John Wilkinson, vice-president and consulting engineer of the H. H. Franklin Mfg. Co., have been appointed a committee of three to supervise all testing work on the Liberty airplane engine. The duties of this committee are wide in scope, and they will pass final judgment on the engine, making their reports and recommendations direct to Howard Coffin, chairman of the aircraft board.

—

Ajax Earns $1,955,293

TRENTON, Feb. 12—The Ajax Rubber Co. increased its sales during 1917 by 63½ per cent over 1916 and earned profits of $1,955,293; from this Federal war excess profit and income taxes are to be deducted and amount to about $495,000. The balance sheet as of Dec. 31 shows assets of $11,920,449; the profit and loss account shows sales of $13,828,282.

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Washington News Letter

(Continued from page 379)

be considered and chosen for this position owing to Girl's exceptional capabilities and experience. His handling of the Class A, Class B and Class AA trucks has successfully demonstrated his ability to efficiently assume the duties of the prospective position co-ordinating the truck work of the army.

It is also likely that Gen. Chauncey B. Baker, who is head of the motor transport division of the Quartermaster Corps, has successfully displayed his ability will be the military chief to handle all motor truck requirements.

The fuel committee appointed a few weeks ago to hold further conference with the Fuel Administration regarding coal allowance for the industry has not yet called a meeting, and rumor has it that the Fuel Administration is becoming impatient and will not brook much delay. It was reported last week in Washington that one of the largest motor car makers made a flying trip to Washington and satisfactorily arranged the coal allowance for his own ompany.

Reports of Dissension

Reports of dissension between individuals of the automotive industries in Washington are frequent. The latest include difficulties arising between several truck makers submitting bids in the Ordnance Department which included approval of one make of truck in one office with blue penciling of the order in another with consequent wrangling between both companies and individuals until the order was finally placed for decision before Gen. Pierce, chief of purchases for the entire army.

There has been frequent discussion in Washington of the trouble caused by some companies which are taking every contract they can secure, regardless of what consequences may be, instead of confining their activities to a specific line. Reference has been made to several companies which are making everything from anchors to trucks. It is thought that the diversified activities reduce the efficiency of the companies so engaged.

Rubber Exports Licensed

The order of the War Trade Board prohibiting the export of commodities containing rubber except under license may have an important effect on the tire industry. At this writing it is impossible to ascertain how much, if any, limitation will be placed on the export of automobile tires.

The Presidential proclamation regulating import and export for the conservation of ship tonnage has not up to this time been approved and is still pending.

The War Credits Board, created to pass upon advances of funds to contractors engaged on war work, has approved advances of one hundred and fifty million dollars. This has stimulated the production of war material greatly. Both large and small contractors have availed themselves of the system. The law permits advances not exceeding 30 per cent of the contract price for supplies.

When a concern holding a war department contract displays to the board its financial needs and complies with the act by giving adequate security, the advance is approved and the money given without delay—in some instances the same day the application is filed. Many manufacturers on account of delays caused by railroad congestion, etc., used up their own capital, borrowed all they could from banks and still did not have the necessary requirements to complete the contracts.

Offer Financial Help

In some instances they were on the verge of closing down because of inability to meet payrolls. Many such companies as these have been relieved by the advance payments. The board will be of a particularly great value to the manufacturer of limited working capital.

Secretary McAdoo's "War Finance Corporation Bill" to provide credits for industries and enterprises in the country necessary or contributory to the war and for the licensing of "non-essential" industries met with a halt in the Senate this week when Senator Lodge asked Secretary McAdoo for an explanation of the so-called non-essential industries Secretary McAdoo has promised to take this up this week. His plan of licensing non-essentials is designed chiefly to prevent diversion of capital and labor to these industries.

War Department Reorganized

The Secretary of War has announced an entirely new schedule of operation for the war department designed to eliminate red tape and facilitate army activities. Under the new scheme there will be an executive division, war plans division, purchase and supply division, storage and traffic division and army operation division.

The purchase and supply division will be under a director of purchase and supplies and his duties will include direction of all purchases, procurement and production for the entire army, representation of U. S. army with the Allies, determination of purchasing and manufacturing priorities between the several departments within the war department and in relation to other U. S. Government agencies and also determination of preference to contractors for supplies in case of shortage of fuel or raw materials, supervision of all appropriations and other financial matters relating to purchase of munitions.

The storage and traffic division will control the transportation of all branches of the army, munitions and other supplies of land and sea under a director of storage and traffic. His duties will include all movement of troops, provisions, all supplies during manufacture and after assembling to points of embarkation, interior points, overseas points and in and out of all storage, all inland traffic, including employment of army trucks and all storage of munition.

—

Pearce Rubber in Temporary Difficulty

PHILADELPHIA, Feb. 13—Henry C. Thompson, Jr., has been appointed temporary receiver for the Pearce Rubber Co. The action was taken because of difficulties which can be straightened out in a few months. Machinery ordered by the company for its new quarters did not arrive, and this, in conjunction with a coal shortage, necessitated the shut-down of the plant. There are plenty of orders on hand, which will be filled as soon as the company can operate again. The concern is solvent, and its assets exceed its liabilities.

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Lincoln Completes First Liberty Engine

DETROIT, Feb. 11—The Lincoln Motors Co. has completed its first Liberty engine. This concern has built and equipped its plant in record time, having been incorporated in August, 1917, by Henry M. Leland and Wilfred C. Leland, who resigned as president and general manager of the Cadillac Motor Car Co. to engage in airplane manufacture for the Government in the plant formerly occupied by the Rands Mfg. Co. Since this time additional land and buildings have been acquired.

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Government Position for Tripp

WASHINGTON, D. C., Feb. 11—Guy E. Tripp, heretofore chairman of the board of directors of the Westinghouse Electric & Mfg. Co., has been appointed head of the production division of the Ordnance Department with the rank of colonel. He will work directly under Secretary Baker.

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Automotive Show Draws 178,270

(Continued from page 378)

gineers' dinner of the Minneapolis section, on Wednesday evening, when over 150 attended. The dinner was followed by a discussion on tractor fuels, which turned into a discussion on the merits of hot spot manifolds for burning kerosene in tractors. Already Minneapolis and Kansas City have been added to the winter circuit of S. A. E. meetings. The tractor makers in the Twin Cities are sure to make a big success of the Minneapolis section, which is the baby section of the S. A. E.

Dealers' meetings during the week were better attended than in former years, and while the number of dinners was not great, those held were good ones. Generally, several factory representatives were present and good talks on general conditions were given. No better opportunity could have been desired to get the dealers into the true war spirit than during show week.

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Current News of Factories

Notes of New Plants—Old Ones Enlarged

General Motors Plants Co-operate for War Work

SAGINAW, MICH., Feb. 11—The Michigan plants of the General Motors concerns are co-operating in the manufacture of war materials, and the Peninsula Shell Co. will be used as an assembling plant in this connection. The parts for assembly will be supplied by other branches of the General Motors Co. The Saginaw Malleable Iron Co. will make all the malleable iron castings to be used, and is now installing equipment for this purpose.

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Mutual Motors Buildings Bring $212,000

JACKSON, MICH., Feb. 11—The purchase of the Mutual Motors buildings by the Susquehanna Finance Corp., of Buffalo, N. Y., winds up the affairs of the company which made the Marion-Handley, Marion and Imperial automobiles. The sum of $212,000 paid for the plant will enable the referees in bankruptcy to pay about 30 cents on the dollar on outstanding obligations.

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Roddis Veneer Ordered by France

MARSHFIELD, WIS., Feb. 11—The Roddis Lumber & Veneer Co. has received from the French government a contract calling for veneer for airplane parts. The company is filling contracts for various kinds of wood material for the United States government.

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Oneida Truck Moves to New Factory

GREEN BAY, WIS., Feb. 11—The Oneida Motor Truck Co., Green Bay, has completed the transfer of the machinery, equipment and stock from the temporary quarters it has been occupying during the past year into its new and modern works at the southwestern limits of Green Bay, and the capacity is being increased to 100 Oneida trucks per month. The new factory is 150 x 476 ft. in size, affording 70,000 sq. ft. of floorspace, and is of fireproof construction, one story high, all departments being under one roof. A Pacific coast branch is being opened in San Francisco. Eastern trade is being handled through a New York branch established some time ago.

—

Heil Steel Bodies for Government

MILWAUKEE, Feb. 11—The Heil Co., manufacturer of electrically welded steel dump bodies for motor trucks, has received a second Government contract for a special design of dump body for use on truck chassis used in road building and bridge construction. The company recently completed a large addition to its plant, to be used exclusively for this work.

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Bliss Mfg. Co. Adds Equipment

MILWAUKEE, Feb. 11—The Bliss Bros. Mfg. Co., 208 Manufacturers' Home Building, which established a plant about a year ago to produce tools and dies, is adding equipment and machinery to occupy all of the available area of the present quarters to meet its orders.

United States Trucks for Philadelphia Contractors

CINCINNATI, Feb. 11—The United States Motor Truck Co. has obtained an order for a fleet of 5-ton heavy duty trucks from the Keystone Construction Co., Philadelphia. The contract amounts to $30,000,000.

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Barnhill, Inc., Elects New Officers

NEW YORK, Feb. 10—J. D. Barnhill, Inc., 110 East 34th Street, has elected the following officers: Philip S. Dodd, president; Clayton DuBosque, vice-president and treasurer, and William T. Andrews, secretary and art director.

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DIVIDENDS DECLARED

The Studebaker Corp. has declared a quarterly dividend of 1 per cent on common stock and 1¾ per cent on preferred, payable March 31.

The Jones Motor Car Co., Wichita, Kan., has declared an initial 10 per cent stock dividend, payable to holders of record Jan. 10.

The American Radiator Co., Detroit, has declared the regular quarterly dividend of $3 and an extra dividend of $4 a share on common payable in Second Liberty Loan bonds. The regular quarterly dividend of 1¾ per cent on preferred stock was also declared.

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Autocar Chassis Price Raised

ARDMORE, PA., Feb. 10—The Autocar Co. has increased the price of the Autocar chassis from $1,815 to $2,050. Orders placed prior to Feb. 6 will be accepted at the old price.

Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co.	51	53	—2
*J. I. Case T. M. Co. pfd.	80	90	+9
Chalmers Motor Co. com.	4	5	..
Chalmers Motor Co. pfd.	25	40	..
*Chandler Motor Co.	82½	84	+1
Chevrolet Motor Co.	118	120	—1
*Fisher Body Corp. com.	26	35	..
*Fisher Body Corp. pfd.	75	85	—2
Fisk Rubber Co. com.	50	54	+3
Fisk Rubber Co. 1st pfd.	98	103	..
Fisk Rubber Co. 2nd pfd.	60	70	..
Firestone Tire & Rubber Co. com.	96	98½	+ ½
Firestone Tire & Rubber Co. pfd.	95½	97½	+ ½
*General Motors Co. com.	138	139	+2½
*General Motors Co. pfd.	83	85	—4
*B. F. Goodrich Co. com.	47	48½	— ½
*B. F. Goodrich Co. pfd.	97	100	..
Goodyear Tire & Rubber Co. com.	142	145	+9
Goodyear Tire & Rubber Co. pfd.	99	101	+1
Grant Motor Car Corp.	2	3	..
Hupp Motor Car Corp. com.	2½	3	..
Hupp Motor Car Corp. pfd.	75	80	..
International Motor Co. com.	14	17	..
International Motor Co. 1st pfd.	40	45	..
International Motor Co. 2nd pfd.	17	20	+3
*Kelly-Springfield Tire Co. com.	46	47⅛	+ ⅛
*Kelly-Springfield Tire Co. 1st pfd.	77	85	+4½
*Lee Rubber & Tire Corp.	13	14	+1
*Maxwell Motor Co., Inc., com.	29	30¾	+1¾
*Maxwell Motor Co., Inc., 1st pfd.	62	65¾	+4¾
*Maxwell Motor Co., Inc., 2nd pfd.	25	25	+2
Miller Rubber Co. com.	140	160	+26
Miller Rubber Co. pfd.	95	97	+1
Packard Motor Car Co. com.	105	115	+25
Packard Motor Car Co. pfd.	91	94	..
Paige-Detroit Motor Car Co.	18	19	+1
Peerless Truck & Motor Corp.	19½	20	+3
Portage Rubber Co. com.	109	115	+3
Regal Motor Car Co. pfd.	..	25	+2
Reo Motor Car Co.	17	18	..
*Saxon Motor Car Corp.	9	10½	— ½
Standard Motor Construction Co.	9½	10½	— ½
Standard Parts Co.	69	70	—10
*Stewart-Warner Speed. Corp.	50½	52½	+ ½
*Studebaker Corp. com.	50	51	—3
*Studebaker Corp. pfd.	93	97	..
Swinehart Tire & Rubber Co.	35	39	—1
United Motors Corp.	25⅝	25¾	+ ½
*U. S. Rubber Co. pfd.	56½	57½	— ½
*U. S. Rubber Co. pfd.	99	101	..
*White Motor Co.	41	43	+1
*Willys-Overland Co. com.	18	18⅜	— ⅝
*Willys-Overland Co. pfd.	78	79	— ½

*At close Feb. 9, 1918. Listed N. Y. Stock Exchange.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	Bid	Asked	Net Ch'ge
Auto Body Co.	..	8½	..
Bower Roller Bearing Co.	17⅜	18	+ ⅜
Chevrolet Motor Co.	118	121	+1
Commerce Motor Car Co.	..	..	..
Continental Motor Co. com.	5⅜	5¾	— ¼
Continental Motor Co. pfd.	86	..	—1
Edmunds & Jones com.	..	..	..
Edmunds & Jones pfd.	..	..	..
Ford Motor Co. of Canada	180	185	—7
Hall Lamp Co.	..	..	..
Michigan Stamping Co. com.	12½	..	..
Motor Products	..	..	..
Packard Motor Car Co. com.	100	105	+17¾
Packard Motor Car Co. pfd.	91	92¾	— ½
Paige-Detroit Motor Car Co.	17¾	..	— ½
Prudden Wheel Co.	15	16	..
Reo Motor Car Co.	17½	18	+ ½

INACTIVE STOCKS

Atlas Drop Forge	..	..	..
Kelsey Wheel Co.	..	..	..
Regal Motor Car Co.	..	..	..

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Men of the Industry

Changes in Personnel and Position

Toback Elected President of Redden Motor Truck Co.

CHICAGO, Feb. 10—Samuel S. Toback, who quite recently was appointed general manager of the Redden Motor Truck Co., has been elected to the presidency of the company.

—

A. E. Vinton has been made advertising manager of the National Motor Car & Vehicle Corp., Indianapolis. For more than 8 years, Vinton has been in the sales department, in charge of the company's export trade, and in 1910, when National cars were well-known among racing cars, served in his present capacity of advertising director. He will retain his position as export sales manager.

—

C. E. Pioch has been appointed chief engineer of the Fruehauf Trailer Co., Detroit. He was formerly connected with the Packard Motor Car Co.

—

H. F. Harris has been made industrial engineer of the Republic Motor Truck Co., Alma, Mich. He was formerly assistant branch manager and controller of the New York branch of the Willys-Overland Co.

—

A. W. Russel, president of the Russel Motor Axle Co., has become an assistant secretary of war at Washington with the huge salary of $1 per annum.

—

A. T. Van Scoy, assistant secretary of the International Harvester Corp. of America, in charge of the company's Milwaukee office, has been elected president of the Milwaukee Assn. of Commerce. This is a reorganization of the Merchants' and Manufacturers' Assn.

—

C. W. Owston, formerly purchasing agent of the McCord Mfg. Co., Detroit, has been commissioned a captain in the Ordnance Officers' Reserve Corps. He will have charge of the Detroit district production office for the carriage section.

—

E. C. Grant has been promoted to the position of purchasing agent of the McCord Mfg. Co., Detroit.

—

Earl R. Martin has been appointed employment manager of the Templar Motors Corp., Cleveland. Formerly he held a similar position with the Curtiss Aeroplane & Motors Corp., the Rubay Co. and the Aluminum Castings Co.

—

F. D. Palmer has been appointed used car manager for the Reo Motor Car Co. of New York. He was formerly connected with the New York branch of the Studebaker Corp.

—

Y. E. Stewart has been appointed sales manager of the Economy Motor Co., Tiffin, Ohio. Mr. Stewart has been connected with Cleveland manufacturers heretofore.

—

Frank C. Kip, formerly sales promotion manager of the Packard Motor Car Co., has returned to his previous position as sales manager of the Motor List Co., Des Moines. He will make his headquarters in Detroit.

—

H. W. Biddle and **C. L. Ughetti** have become associated with the sales department of the Silvex Co., South Bethlehem, Pa. Biddle was formerly supervisor of sales with the Champion Spark Plug Co., and Ughetti in charge of the Indiana and Michigan territories of the same concern.

—

INCREASES OF CAPITAL

CADILLAC, MICH., Feb. 11—The Acme Motor Truck Co., formerly styled Cadillac Auto Truck Co., has increased its capital stock to $1,000,000. The company is building a large addition to its plant, and plans to double its output in 1918.

—

INDIANAPOLIS, Feb. 11—The Weidely Motors Co. has increased its preferred stock from $100,000 to $500,000 to provide for enlargement of its plant and purchase of new equipment. The company recently increased its contract with the Cleveland Tractor Co. for airplane and tractor motors from $3,000,000 to $20,000,000. This covers a period of 3 years, and calls for 15,000 engines the first year, 25,000 the second and 30,000 the third.

—

AKRON, OHIO, Feb. 11—The Falls Rubber Co. has increased its capital from $500,000 to $1,000,000.

—

PORT WASHINGTON, WIS., Feb. 11—The Turner Mfg. Co., maker of engines and tractors, has increased its capital from $150,000 to $250,000. Much of the increase will be used for the expansion of the tractor department. An output of from 400 to 500 tractors is planned for 1918 without any reduction of the usual output of gas engines.

—

GREEN BAY, WIS., Feb. 11—The Oneida Motor Truck Co. has increased its capital from $300,000 to $500,000, to provide for increased production. An output of 1200 trucks has been planned for 1918. The company was organized last March.

—

COLUMBUS, OHIO, Feb. 13—The Columbus Varnish Co. has increased its capital to $400,000.

—

CHICAGO, Feb. 13—The Vulcanized Products Co. is now capitalized at $1,000,000, and in future will be styled Curtis Tire & Rubber Co.

New Companies Formed

Latest additions to ranks of Automotive Industries

Noble Trucks to Be Made by New Indiana Company

KENDALVILLE, IND., Feb. 11—The Noble Motor Truck Corp. has been organized with a capital of $1,000,000 to take over the business of the Noble Motor Truck Co., a $30,000 concern formed last February. The Noble truck, which was designed and manufactured by the original company, will now be placed on the market. Plans are under way to enlarge the present output, and to erect a new factory building. The following officers have been elected: President, C. J. Munton; vice-president, J. L. Hauff; secretary, G. M. Patterson; treasurer, H. W. Bradtmiller. The directors include A. M. Jacobs, H. L. Postel, C. J. Munton, G. D. McLeod, J. L. Hauff, G. M. Patterson and W. G. Roberts.

—

TOLEDO, Feb. 11—The Pronovost Wheel Co., a new corporation with a capital of $350,000, has purchased a 60-acre site for a factory. Until this is finished the company will manufacture an automobile wheel, which by means of torsion springs does away with the need for pneumatic tires, at the plant of the Central Machine & Tool Co. Dies have been completed, and quantity production will soon begin. The wheel was invented by Joseph Pronovost, who is president of the company.

—

NEW YORK, Feb. 9—The Commercial Motorbody Corp., organized to systematize the distribution of commercial bodies used by the motor trade, has leased the buildings that were to be occupied by the Essex Motor Corp., as the first unit of its warehouse system. The corporation will carry a large stock of bodies of all kinds to facilitate rapid delivery to commercial car distributers. Owing to the freight congestion, a warehouse system is greatly needed. The Detroit building covers 90,000 sq. ft. of floor space. Warehouse sites in Chicago and New York are now being considered and will be added before April 1.

—

Cygnet Rear Car Reorganized

BUFFALO, Feb. 11—The Cygnet Mfg. Co. has been formed to take over the business of the Cygnet Rear Car Co., which manufactures motorcycles with rear car attachments used for delivery purposes. The business also includes the production of similar vehicles intended for the transport of munitions and for other military purposes. The capital stock of the company is $600,000 and the principals are Otto L., L. J. and E. A. Heintz.

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Industrial Review of the Week

A Summary of Major Developments in Other Fields

Iron and Steel Industries Recover Slowly

Milder weather and a somewhat freer movement of traffic have given a more cheerful tone to iron and steel market reports, but the derangement of the whole machinery of production and shipment was so complete that many days will be required, even with no return of severe winter, for any approach to normal. It is to be remembered that excepting October and November, each month since April of last year has shown a decline in iron and steel output, so that the causes go deeper than the weather.

Steel works operations in the Central West are generally at 60 to 70 per cent of capacity and some steel plants, owing to freight embargoes and the large accumulation of unshipped product, are today doing little better than 50 per cent.

The industry continues to look to Washington for its impulse toward better or worse conditions. Its latest concern is the sharper restriction put upon exports, the War Industries Board having warned producers not to begin rolling such steel until export licenses covering it have been issued by the War Trade Board. Blast furnace, steel works and rolling mill products, the trade is now advised, are on the conservation list and all shipments are subject to the new restriction unless bills of lading had actually issued previous to Feb. 11.

This tightening of export regulations following recent efforts to make Government prices apply to certain iron and steel exports, even though not intended for war purposes, is disconcerting to those that have thrived on foreign trade.

Steel manufacturers are still much at sea as to the amount of steel they can supply apart from war uses, and the new business going on their books is small. It is plain that even in plates a considerable amount will be available for ordinary commercial purposes whenever capacity output can be reached. Both plate mills and fabricating shops have had their operations badly upset by the unreadiness of certain shipyards to take material as scheduled.

It will be some time before a new distribution is made of shell steel, deliveries on the 1,500,000 tons now under contract running to June 15. Meanwhile the British Mission is inquiring for 120,000 tons of plates, but modification of some of the unusual widths and lengths, 46-ft. lengths in many cases, will need to be made, in the same way that was necessary with our own Government's first orders, to insure early rolling.

The Government has divided among eight car builders the 4500 cars long under consideration for France, but the new car program for domestic roads drags unaccountably.

A New Service

Herewith AUTOMOTIVE INDUSTRIES *supplies for the benefit of its readers a general summary of important developments in other fields of business. This is rendered possible by the editorial co-operation of leading industrial publications which are recognized authorities.*

By compressing the general industrial situation into this form we hope to give our readers a clear and comprehensive idea of up-to-the-minute developments which they could otherwise secure only with considerable expenditure of time and effort.

A new ruling of the railroads that special permits for the movement of freight will be granted only on the application of the consignee, indicating need of the material and ability to unload promptly, is expected to help in reducing congestion.—*Iron Age.*

—

Maxwell Dividend in Scrip

NEW YORK, Feb. 14—The Maxwell Motor Co., Inc., has declared a quarterly dividend of 1¾ per cent on the first preferred stock, payable in first preferred dividend certificates, deliverable April 1 to stockholders of record March 15; it will be due April 1, 1920, with interest at 6 per cent payable semi-annually. The dividend certificates are subject to redemption at face value, with accrued interest.

—

Ohio Jobbers Organize

COLUMBUS, OHIO, Feb. 13—The Ohio Automobile Accessories Jobbers' Assn. was organized here recently by representatives of eleven jobbing houses in the Buckeye State, during a special meeting of the Ohio Automobile Trade Assn. The organization has for its object the good of the jobbing trade and the bettering of relations between manufacturer and jobber.

The organization will be affiliated with the National Assn. of Automobile & Accessory Jobbers with which practically all of the members are individually affiliated. A committee on membership and another on constitution and by-laws were named to report at a meeting to be held in Cincinnati March 18. The membership committee consists of H. G. Smith, Cleveland; A. I. Fishbaugh, Columbus, and Victor Moon, Toledo. The constitution and by-laws committee consists of J. C. Hipp, Cleveland; H. H. Brenner, Dayton, and E. C. Deardorff, Toledo.

Officers were elected as follows: President, H. M. Dine, Canton; vice-president, J. C. Hipp, Cleveland; secretary, Victor Moon, Toledo, and treasurer, H. H. Brenner, Dayton.

These firms are represented in the organization: J. I. Cooper Rubber Co., Cincinnati and Columbus; Dine-DeWess Co., Canton; Fen-Far Co., Cleveland; Justus & Parker Co., Columbus; Griswold-Sohl Co., Columbus; Ohio Rubber Co., Cincinnati; Roberts Toledo Auto Co., Toledo Rubber Co., Toledo Tire & Supply Co. and the Union Supply Co., Toledo.

—

Faeh Returns to Baker R. & L.

CLEVELAND, Feb. 10—A. C. Faeh, who resigned as advertising manager of the Baker R. & L. Co. to become sales and advertising manager of the Osgood Lens & Supply Co. of Chicago, has returned to his former position.

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Walsh Joins Randall Agency

DETROIT, Feb. 10—Robert Walsh, former advertising manager of the Maxwell Motor Co., Inc., has joined the Fred M. Randall Co., advertising agents.

—

Mackie Joins Saxon Sales

DETROIT, Feb. 9—J. H. Mackie has been appointed assistant sales manager of the Saxon Motor Car Corp. He formerly was president of the Mackie Motors Co. of Des Moines.

—

Detroit S. A. E. to Hear Schipper

DETROIT, Feb. 12—At the meeting of the Detroit Section of the Society of Automotive Engineers to be held at the Hotel Pontchartrain Thursday, Feb. 21, J. Edward Schipper, Detroit editor of The Class Journal Co., will deliver a paper entitled "Automotive Design and Transportation as Developed by the War." The paper will deal with efficiency in transportation, the influence of war time on the buying public, and improvements in design during the past year with reference to future trends.

—

Madden and Andrews Back from France

WASHINGTON, D. C., Feb. 11—Col. John F. Madden and Major Joseph Andrews, both of the American Expeditionary forces, have returned to Washington from France, where they have been engaged in motor transportation work under General Pershing. They are at present conferring with Col. Chauncey B. Baker, giving him messages from General Pershing, dealing with the motor truck experiences he has had in France.

—

Hupp Production 1250 a Month

DETROIT, Feb. 12—Since November the average production of the Hupp Motor Car Co. has been at the rate of 1250 cars per month, or between 40 and 50 per day.

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Working Standards Set by Sharpe

Major-General Says Good Hours and Wages Essential to High Wartime Production

WASHINGTON, Feb. 13—"Industrial history proves that reasonable hours, fair working conditions, and a proper wage scale are essential to high production," says Major-General Henry G. Sharpe in a pamphlet which is being circulated under the title "Standards of Employment in War Work." The principal recommendations are:

1. A day's work should not exceed the customary hours in the establishment and should not be longer than 10 hours for an adult workman. For women, an effort should be made to restrict the hours to eight. Eight hours should be the limit for a shift.
2. Overtime is tacitly recognized as unnecessary and undesirable and should be discouraged. The employment of women on night shifts should be avoided as a necessary protection.
3. There should always be one day of rest in seven and the half-holiday on Saturday is advantageous throughout the year.
4. An effort should be made to maintain temperatures in workrooms and factories as nearly normal as possible.
5. Wages should not be lowered beneath an established standard and should be increased in relation to increases in the cost of living.
6. At least 30 minutes should be allowed for meals and this should be increased to 45 or 60 minutes if the working day exceeds eight hours.
7. No children under 14 should be employed under any conditions and children between 14 and 16 should not be employed more than eight hours a day and night work is prohibited.

—

Garford Overland Deliveries

LIMA, OHIO, Feb. 11—The Garford Motor Truck Co. is making one of the largest overland deliveries of trucks ever attempted at one time. A fleet comprising thirty-eight trucks of all the various models from 1½ to 7 tons capacity left the plant at Lima last Wednesday in the face of the most severe weather conditions imaginable. Battling with snow drifts mountain high over roads that had become well nigh impassable, these freight haulers are bucking their way over a long haul to New York City. The itinerary for this run includes Findlay, Fremont, Oberlin, Cleveland, Warren, Beaver Falls, Pittsburgh, Philadelphia, and over the Lincoln Highway to New York City.

—

Gier Steel Re-elects Officers

LANSING, MICH., Feb. 11—At the recent annual meeting of Gier Pressed Steel Co. stockholders all the old officers of the company were re-elected. These are: President, W. K. Prudden; vice-president, Harry E. Bradner; secretary and general manager, Burton S. Gier; treasurer, D. F. Edwards. These officers constitute the board of directors. A stock dividend of 25 cents per share was declared. Since its last annual meeting the Gier Pressed Steel Co. has completed and equipped its new factory home on North Larch Street, at an expenditure of $650,000. The company has an authorized capitalization of $1,000,000 and has a substantial business in its regular lines in addition to government work.

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Farm Tractors Follow Automobile Design

(*Continued from page* 379)

cut out of the engine and there has not been any added cost by the weight reduction; but the company further states that nearly 600 lb. more could be cut out of the weight if the maker would accept a $50 increase in the manufacturing cost.

Other makers have changed the rear wheel designs with a cut in weight into the bargain. Parrett has a new tractor; similar in design to the present one but with a new design of gearbox giving three forward speeds instead of two. It has enclosed internal gear drive to the rear wheels which gives a lighter construction. In this new model a new type of Buda engine is used which has forced feed oiling to all of the engine bearings and also has detachable cylinder heads. The price is $125 more than the old model.

Each year sees the average tractor tend to the three-plow machine, although the four- and six-plow machines still have a following. The three-plow job is the one with the greatest field.

There are fewer of the huge traction engine types pulling ten or twelve plows than there were a year ago.

The use of the four-cylinder engine has made much greater progress in the last year than was expected. It is now the recognized type of tractor engine, and the two-cylinder opposed design and the two-cylinder twin design are not so strong in totals as a year ago.

Remy is another example of how the automobile industry is working in the tractor field and is showing for the first time a special electric motor governor and also a water- and dust-proof magneto, which is exhibited operating in a bell jar through which passes a veritable cloud of dust and also in a basin of water with a spray constantly playing over the magneto. Remy shows a complete tractor electrical system, including the electric governor, a generator and combined ignition and also a special starter, which is soon to be equipment on a new tractor design.

This indicates the entry of the thin edge of the wedge in the extended use of electric equipment on tractors, the possibility of women and perhaps maimed soldiers having to operate tractors lends importance to the desirability of having tractors as easily operated and controlled as possible.

A subject generally discussed with tractor makers is that the efficiency of the machine is cut down by the slow speed at which it must operate due to plow design and it is generally elieved that the design of plows must be changed to permit speeds of 3 and 4 m.p.h. and maybe higher speeds can be made when the ground is suitable.

Official Sanction for Army Sales

Before Selling Supplies to Officers, Dealers Must See Proper Authority

WASHINGTON, Feb. 11—Purchasers of supplies for government-owned cars and trucks must have official sanction, and dealers must insist on seeing proper authority before selling supplies to uniformed soldiers or officers.

When an officer or private requires supplies for a car or truck owned by the government, he must first obtain from the officer in charge of his division, written permission to make the purchase. This officer obtains the authority from the highest officer in charge.

A dealer selling supplies to an officer or private, should ask to see this written authority, and make a note immediately of the organization number, the name of the officer who signed the purchase order, and the name of the purchaser. The bill should be sent by the dealer to the Depot Quartermaster in charge of that section of the country where the purchase is made. The bill should be an itemized account of all articles bought, and to get recognition, should give the organization number, the name of the officer who signed the purchase order, and the name of the purchaser.

Each dealer should be sure, in every transaction of this sort, to obtain a written receipt from the purchaser.

—

Teetor-Hartley Plant Closed by Coal Shortage

INDIANAPOLIS, Feb. 13—The plant of the Teetor-Hartley Motor Co. at Hagerstown, Ind., has been closed for one week because of a lack of coal. Industrial coal consigned to the company was confiscated before its arrival for other purposes. About 200 men were thrown out of employment.

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Fuel Tanks and Other Sheet Metal Parts

(*Continued from page* 365)

selves. These shells are usually made of No. 18 and No. 20 gauge material. The shell, of course, carries the hood lacing and the hood rod support. Formerly the shells were made with the regular offset hood ledge, but this is now being done away with, the hood being designed to rest directly on top of the shell.

In truck radiators it has been customary to use cast tanks and cast spacers or side members, but pressed steel is now coming in, as the makers are glad of a chance to reduce the weight on the front wheels. The pressed steel shell may be a little more expensive than cast iron, but it affords a better finish and it eliminates danger from frosts. Such a shell can be made just as rigid as required.

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Utah-Nevada Highway Bill Passed by Senate

WASHINGTON, Feb. 11—The Senate has passed a bill granting to the Lincoln Highway Assn. a right of way 500 ft. wide, passing through the public lands of the United States from Tooele County, Utah, to Granite, Mo. and thence west through Nevada to Overland Canyon and 10 miles into the canyon, a total distance of between 400 and 500 miles. The bill also gives the association the right to take materials on adjacent public lands for the construction of the highway.

Before the bill becomes effective, a map of location and an outline of rules and regulations by which the association will govern the highway must be filed with and approved by the Secretary of the Interior. The association must construct the highway within 5 years after the Secretary of the Interior has given his approval.

It is understood that F. A. Seiberling has contributed $100,000 for this work, John N. Willys $50,000 and Carl Fisher $25,000.

—

Boston A. A. Recruits Mechanics

BOSTON, Feb. 9—Through the efforts of the Bay State A. A. the Federal government obtained 100 skilled motor mechanics for the ordnance and aviation forces last week. When the notification came, Secretary J. Franklin Brown called up members of the club, visited motor dealers, and secured the co-operation of the newspapers in a campaign to enlist the men. His efforts were more successful than the army officials expected, and he has received a letter of thanks from Secretary Baker.

—

Cincinnati Speedway to Be Preserved

CINCINNATI, Feb. 13—The Cincinnati Speedway Co. has been placed in the hands of Harry S. Leyman, former president of the company, as receiver. This action was taken to preserve the plant, which would have cost $20,000 per year to maintain and on which the directors had previously decided there would be no racing during the period of the war.

—

Oil Situation Improves

HOUSTON, TEX., Feb. 10—With the end of labor troubles in the Gulf States oil production is increasing and many new wells are being drilled. The number of completions during January is the greatest in several months. The original discovery field at Spindle Top is showing evidences of revival and last week a well of 200 barrels daily flow was brought in at a depth of 800 ft. Oil operations continue to center around Goose Creek, which is the largest producing area in the Gulf territory.

—

2000 Mechanics Trained Each Month

KELLY FIELD, SAN ANTONIO, Feb. 13—The training school for enlisted mechanics at Kelly Field is turning out graduates at the rate of 2000 a month and assigning them to squadrons for the care of engines and airplanes. New students come in and a class is formed every two weeks. The school is under the command of Major George E. Stratemeyer, who came here from Columbus, Ohio, recently. The mechanics' school here has been completely organized on a war basis and has three departments of instruction. They include a department of aeronautical instruction, a department of trades, and a department of motor instruction.

—

Rockford Dealers on Cash Basis

ROCKFORD, ILL., Feb. 13—At a recent meeting some of the principal members of the Rockford Automobile Dealers' Assn. voted to go on a cash basis and also to use the trade acceptance system. The Joslyn Automobile Co. has cut down the number of its charge accounts from 1250 to 207, and will do all other business for cash or acceptance, the latter being due on the 10th of the month following the date of purchase.

Calendar

ASSOCIATIONS

April 18-20 — Cincinnati, Fifth National Foreign Trade Convention.

June 5-12—Hot Springs, Va. National Assn. Automobile & Accessory Jobbers.

SHOWS

Feb. 9-16 — Bronx, N. Y., 2d Battery Armory, Bronx Automobile Dealers' Assn. D. J. Barrett, Mgr.

Feb. 11-16—Elmira, N. Y., Elmira Automobile Club. State Armory.

Feb. 11-16 — Kansas City, Mo., Kansas City Motor Car Dealers' Assn., Convention Hall. E. E. Peake, Mgr.

Feb. 11-16—Kansas City, Mo., Third Annual National Tractor Show.

Feb. 11-17 — Toledo, Terminal Auditorium. Toledo Auto Show Co.

Feb. 13-16 — Ft. Wayne, Ind., Automobile Trade Assn., Concordia Gymnasium.

Feb. 16-23—St. Louis, Mo., St. Louis Auto Mfrs. & Dealers' Assn. Robert E. Lee, Mgr.

Feb. 16-23—Albany, N. Y., Albany Auto Dealers' Assn., State Armory.

Feb. 16-24—San Francisco, Cal., San Francisco Dealers' Assn., Exposition Auditorium. G. A. Wahlgreen, Mgr.

Feb. 18-23—Syracuse, N. Y. Syracuse, Automobile Dealers' Assn., State Armory. Harry T. Gardner, Mgr.

Feb. 18-23 — Nashville, Tenn., Nashville Auto Trade Assn., Hippodrome. Henry B. Marks, Mgr.

Feb. 18-23—Grand Rapids, Mich., Automobile Business Assn., Klingman Building. Ernest T. Conlon, Mgr.

Feb. 18-23—Newark, N. J., N. J. Auto Exhibition, Co. G. First Regiment Armory Claude E. Holgate, Mgr.

Feb. 18-23 — Springfield, Ohio, Springfield Auto Trades Assn., Memorial Hall. C. S. Burke, Mgr.

Feb. 18-23 — Waterbury, Conn., United Shows Co.

Feb. 18-23—Duluth, Minn., Duluth Automobile Trade Association. John J. Lane, Mgr.

Feb. 18-23 — Pittsfield, Mass., State Guard, State Armory. James J. Callaghan, Mgr.

Feb. 18-27—So. Bethlehem, Pa., Fourth Annual (cars 18-23; trucks 25-27), Coliseum, J. L. Elliott, Mgr.

Feb. 20-23—Quincy, Ill., First Annual. Armory. L. B. Bartlett, Mgr.

Feb. 23-Mar. 2—Brooklyn, N. Y., Brooklyn Motor Vehicle Dealers' Assn., 23d Regiment Armory. I. C. Kirkham, Mgr. Passenger cars Feb. 23-Mar. 2; Trucks, Mar. 5-9.

Feb. 23-Mar. 2—Omaha, Neb., Omaha Auto. Trade Assn. Auditorium. Clarke G. Powell, Mgr.

Feb. 25 - Mar. 2—Indianapolis, Indianapolis Automobile Trade Assn., Diamond Chain Work Bldg. John B. Orman, Mgr.

Feb. 25-Mar. 2—Muskegon, Mich. Second Annual, Merrill Auditorium. John C. Fowler, Mgr.

Feb. 27-Mar. 2—Columbus, O., Auto Exhibitors' Co. W. W. Freeman, Mgr.

Feb. 27-Mar. 2 — Burlington, Iowa. Cars, Trucks & Accessories.

Feb. 27-Mar. 6—Boston, Mass., Salon, Boston Automobile Dealers' Assn., Copley Plaza Hotel. Chester I. Campbell, Mgr.

Mar. 1-15—Lyons, France, Third Sample Fair.

Mar. 2-9—Boston, Mass., Boston Auto Dealers' Assn., Mechanics' Bldg. Chester I. Campbell, Mgr.

Mar. 2-9—Pittsburgh, Pa., Automobile Dealers' Assn. of Pittsburgh, Motor Square Garden. John J. Bell, Mgr.

Mar. 4-9—Utica, N. Y., Utica Motor Dealers' Association, Inc., State Armory.

Mar. 6-9—Clinton, Ia., Clinton Automobile Dealers' Assn., Coliseum.

Mar. 6-9—Raleigh, N. C., Auditorium. John Kelley, Mgr.

Mar. 6-9—Watertown, N. Y., Automobile Dealers, Inc., State Armory. Arthur E. Sherwood, Mgr.

Mar. 6-9—Mason City, Iowa, Annual Car and Truck. Automobile Dealers' Assn.

Mar. 6-9—St. Joseph, Mo., St. Joseph Automobile Dealers' Assn., Auditorium. John Albus, Mgr.

Mar. 6-9—Sioux Falls, S. D., S. D. Automobile Dealers' Assn.

Mar. 11-16—Cedar Rapids, Ia., Cedar Rapids Auto Trade Assn., Auditorium.

Mar. 12-15—Fargo, N. D., Gate City Auto. Show Co., Auditorium. J. W. Murphy, Mgr.

Mar. 13-16—Warren, Pa., Warren Automobile Dealers Assn., Russell Garage.

Mar. 14-16—Fort Fairfield, Me., Reed's Garage. R. F. Reed, Mgr.

Mar. 15-20—Great Falls, Mont., Montana Automobile Distributors' Association, Lexington Garage. A. J. Breitenstein, Mgr.

Mar. 19-23—Vancouver, B. C., Western Canada Automobile Show Assn., Horse Show Bldg. D. A. Hamilton, Mgr.

Mar. 20-22—Houlton, Me., Second Annual, Houlton, Motor Car Dealers' Assn., Bangor St. Exhibition Hall. J. D. Luth, Mgr.

Mar. 20-23 — Holdredge, Neb., Second Annual of Southwest Nebraska.

Mar. 20-23 — Trenton, N. J., Trenton Auto Trade Assn., Second Regiment Armory. John L. Brock, Mgr.

Mar. 25-30—Bridgeport, Conn., Fourth Regiment Conn. Home Guard State Armory and Casino. B. B. Steiber, Mgr.

Mar. 30-Apr. 6—Hartford, Conn., Eleventh Annual, Hartford Automobile Dealers' Assn., Inc. State Armory. B. F. Smith, Mgr.

Mar. 30-Apr. 6 — Atlantic City, N. J. Second Annual, Garden Pier. S. W. Megill. Mgr.

Apr. 6-13 — Red Bank, N. J., Monmouth County Auto. Dealers' Assn., Armory. E. C. Von Kattengell. Mgr.

Apr. 9-13—Stockton, Cal., Third Annual San Joaquin Auto Trade Assn. Samuel S. Cohn, Mgr.

Apr. 17-20—Calumet, Mich., Upper Peninsular Show, Copper County Automobile Dealers & Garage Owners' Assn., Coliseum.

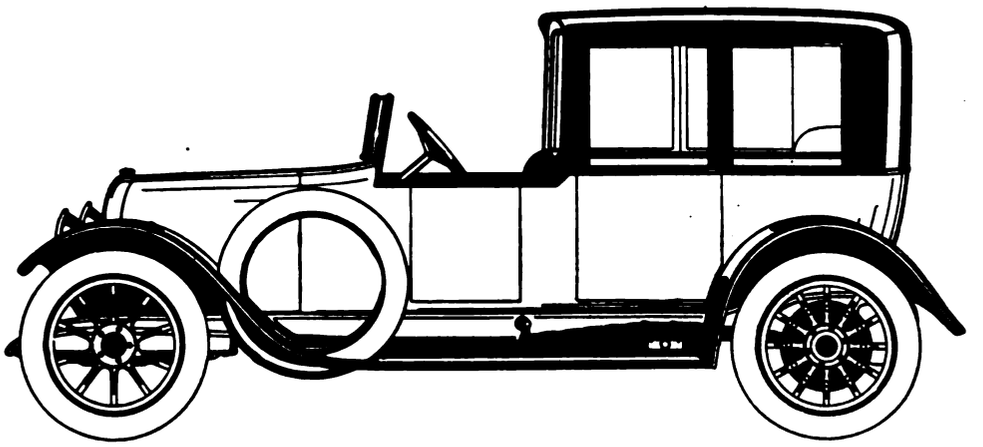
Sept. 23-28 — Chicago, National Accessory Show for Fords. Coliseum.

ENGINEERING

American Society of Heating and Ventilating Engineers.

Mining and Metallurgical Society of America.

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Brewster Country Brougham

Price $8300

This splendid car is typical of the many whose manufacturers demand an automobile clock qualified to harmonize with their other superior equipment. That is why Brewster & Company have chosen

The Waltham Automobile Clock

Over 250,000 Now in Use as Standard Equipment

Here is a clock so constructed that it will keep perfect time no matter how changeable the temperature or how rough the road. A red signal on the dial shows you when it needs winding. Has two main springs and is splendidly durable. In appearance it conforms perfectly with the luxurious furnishings of the finest cars.

THESE CARS ARE EQUIPPED WITH THE WALTHAM AUTOMOBILE CLOCK

Anderson 6-40	Jordon
Apperson	Kissel
Brewster	Locomobile
Cadillac	Marmon
Chalmers	Mercer
Cole	Murray
Crane	Owen-Magnetic
Cunningham	Packard
Detroit-Electric	Pierce-Arrow
Doble	Rauch & Lang
Fergus	Rolls-Royce
Franklin	Simplex
Haynes	Stearns
Hal	Studebaker
Hudson Super-Six	Willys-Overland
	Winton



WALTHAM WATCH COMPANY
WALTHAM, MASS.

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AC Carbon Proof
For Fords
Overlands and Studebakers



⅞ in.
Regular for
Maxwells
AC Titan

WHEN you're 25 miles from anywhere and Old Demon Trouble gets busy with the spark plug—*then* is the time you're sorry you depended on a paper guarantee! *Then* is the time you say "never again" and resolve to get a set of AC Spark Plugs from the first dealer you strike. And you, Mr. Dealer, should advise every motorist to get them in the *first* place! Because—

AC SPARK PLUGS

The Standard Spark Plug of America

are dependable in the highest degree; they increase the efficiency of any motor and—chief testimony of all—they are used as standard equipment by 88 leading manufacturers.

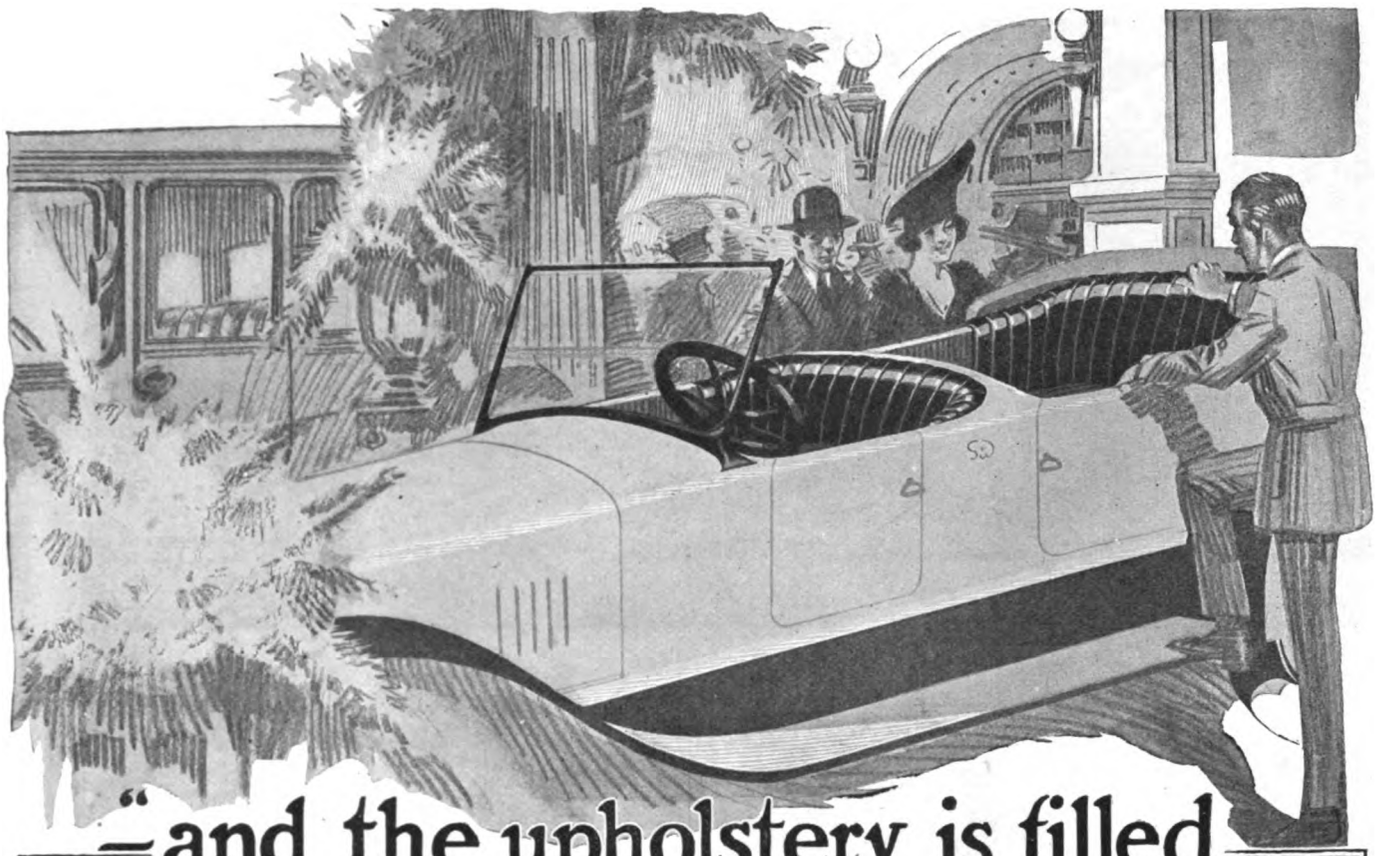
These Manufacturers Use AC As Standard Equipment

Cadillac	Buick	Lexington-Howard	Locomobile	Old Reliable Trucks	Signal Trucks
Pierce-Arrow	Oakland	Scripps-Booth	Disbrow	Case Tractors	Brockway Trucks
Packard	Oldsmobile	Crane-Simplex	Daniels	Gabriel Trucks	Samson Tractor
Marmon	Nash	Stearns-Knight	Westcott	Gramm-Bernstein Trucks	Acme Trucks
Hudson	Kissel Kar	Saxon	Monroe	Moreland Trucks	Maxim Trucks
Chalmers	Premier	Stutz	Singer	Wilcox Trux	Menominee Trucks
Hupmobile	Knox	National	Stephens	Sterling Trucks	Riker Trucks
Chandler	White	Velie	Dodge Brothers	Republic Trucks	Stewart Trucks
Haynes	Delco-Light	Jackson	McLaughlin (Canada)	Diamond T Trucks	Wisconsin Trucks
Chevrolet	Murray	Apperson	Dorris	Four Wheel Drive	Titan Trucks
Dort	Case	Anderson	Duesenberg	Federal Trucks	Robinson Fire Truck
Cole	Economy	Phianna	Hatfield	G. M. C. Trucks	La Crosse Tractor
Reo	Jordan		American-La France	Netco Trucks	Advance-Rumely Tractor
Paige	Liberty		Henderson Bros.	Sandow Trucks	Lombard Tractors
Peerless	McFarlan				
Pilot	Paterson				

Champion Ignition Company

Sole Manufacturers **Flint, Michigan**

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"and the upholstery is filled *with* Wilson Woven Curled Hair"

THE upholstery is an important point in the sale of a car. The salesman, as well as the purchaser, is greatly interested. If the upholstery is really good the salesman will take particular pains to point out its goodness.

Motorists have found from experience that a car with poor upholstery is not satisfactory.

Wilson's Woven Curled Hair in the cushions of a car is an assurance that those cushions are the best that can be obtained, and that the upholstery will prove more satisfactory in every way.

MADE by an exclusive, patented process, Wilson's Woven Curled Hair will not shift, mat down or become bunchy. Yet this process, which firmly imbeds the curled hair into a fabric base, does not impare its resilience in the slightest degree.

Wilson's Woven Curled Hair is more economical to the automobile manufacturer for it reduces labor costs and is more easily applied.

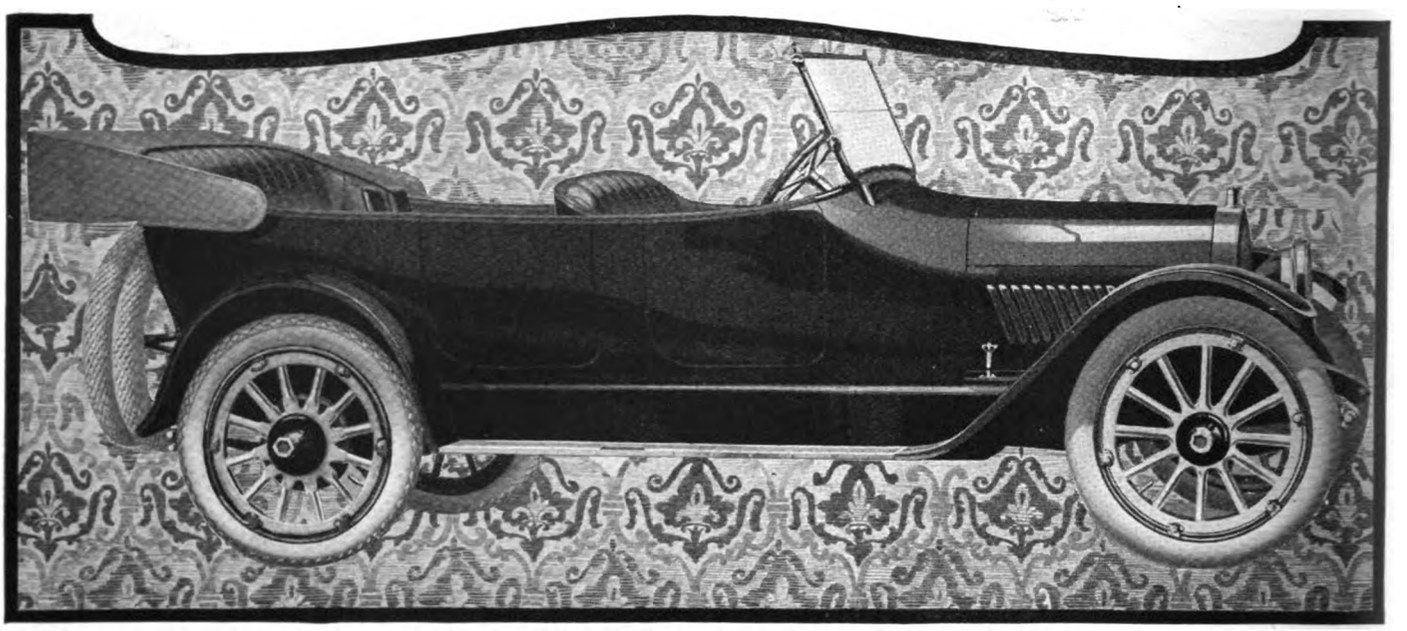
Many car manufacturers send us blue prints of their seats and backs and have Wilson's Woven Curled Hair cut to fit exactly.

We make a specialty of cutting plaits, or pipe fillers. Write us stating your requirements or send blue prints, and we will submit prices and samples.

"This mark WILSON & CO. your guarantee"

41st and Ashland Avenue, Chicago, Ill.

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Oldsmobile

Sets the Pace
20th Year

The one tremendous success in a light weight Eight at a moderate price

Today's demands for action, efficiency, thrift, conservation, find their true answer in the Oldsmobile Eight. Its instant response, power, speed and extreme flexibility command the admiration of active men and women who accomplish things.

An Idling Pace—A Thrilling Speed

Wrought into the high-speed, 58-H. P., 8-cylinder motor is a new feature, giving two distinct power phases. Idle along at a modest pace from one or two to twenty miles an hour on a lean, gas-conserving mixture. *Gentleness, economy!* Then when the need arises, open up! A complete change comes over your car. *Power, speed* in untold reserve.

In addition, distinctive beauty of line and choice coach finish contribute to the complete desirability which makes the Oldsmobile the *efficient* and *successful* selling proposition for the dealer. Write, wire or phone the factory today.

OLDS MOTOR WORKS, LANSING, MICHIGAN

BEAUTY-POWER

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ATWATER KENT

SCIENTIFIC IGNITION

The Atwater Kent Equipped King "8" Is Doing War-Time Service

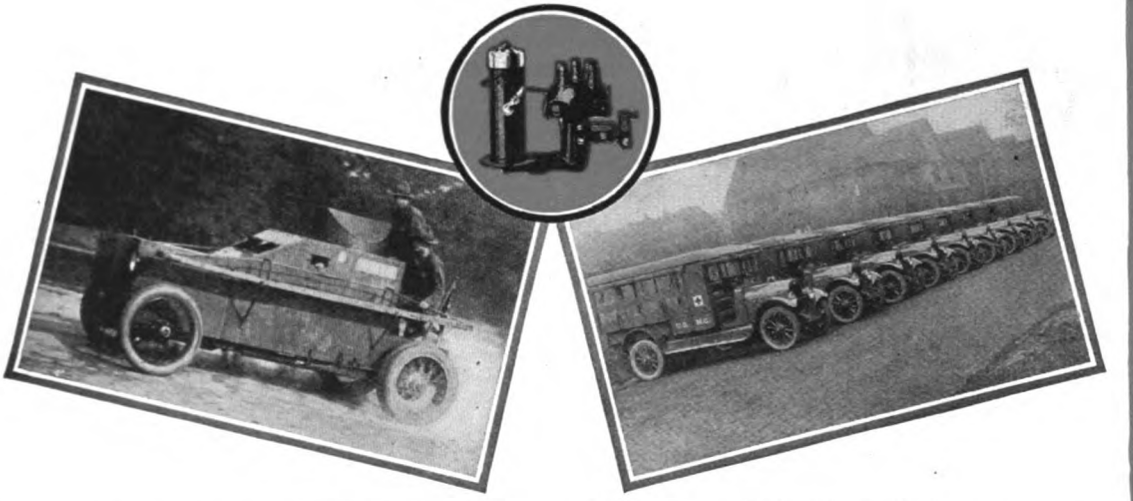
THE standard King "8" Chassis, Atwater Kent equipped, after passing rigid government tests is now serving the colors as armored car and motor ambulance.

Atwater Kent Ignition has helped this pioneer eight live up to its name of "The Car of No Regrets."

The uniform, hot, fat spark furnished by Atwater Kent Ignition plus its simplicity of construction and unfailing performance has contributed in a large measure to such notable feats as the recent 7-day non-motor-stop run, the high-gear climb of Mt. Wilson, and the "sealed-in-high" non-stop and fuel economy tests in various states.

To be the Atwater Kent dealer in your community is to tie up with a liberally advertised line that has received the approval of over 400,000 motorists and over thirty manufacturers of cars, trucks, motors and tractors.

Write to 4938 Stenton Avenue for booklet "Selling Atwater Kent Ignition"



ATWATER KENT MFG. WORKS *Philadelphia*

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Drift with the Zephyr and keep the breeze at your back

Race with the Gale and put the wind in your face

The Peerless Dealer's Big Advantage

Like a feather on a fitful summer zephyr the Peerless Eight will pause and drift or dart this way or that with the changing current of congested city traffic.

But at will, you can utterly change its character. You can transform that delectable softness into resistless power and speed.

The "Loafing" Range

For every need in ordinary driving you will find response, entirely within its "loafing" range, that will completely answer your every demand for ultra soft, smooth, lively, performance.

Yet in its "loafing" range the Peerless Eight is on half rations —consuming fuel so sparingly as to shame many a lesser powered six, even many a four.

For the Peerless Eight with its two separate and distinct power ranges is capable of exactly opposite kinds of performance.

You have eighty horsepower under the most remarkable control. You may drift with an idle zephyr and hold it back, or, in a flash, you may race with the gale and keep the wind in your face.

The new Two Power Ranger accentuates those delightful contrasts of performance that distinguish the Peerless Eight among even the master cars of the day.

The Peerless dealer has a big advantage in being able to show his prospects motoring thrills which no other car can duplicate.

TWO POWER RANGE **Eight** 7-PASSENGER TOURING **$2340**



Roadster $2340 Sporting Roadster $2490 Coupé $2850
Sedan $2990 Limousine $3690

All prices f. o. b. Cleveland—Subject to change without notice

The "Sporting" Range

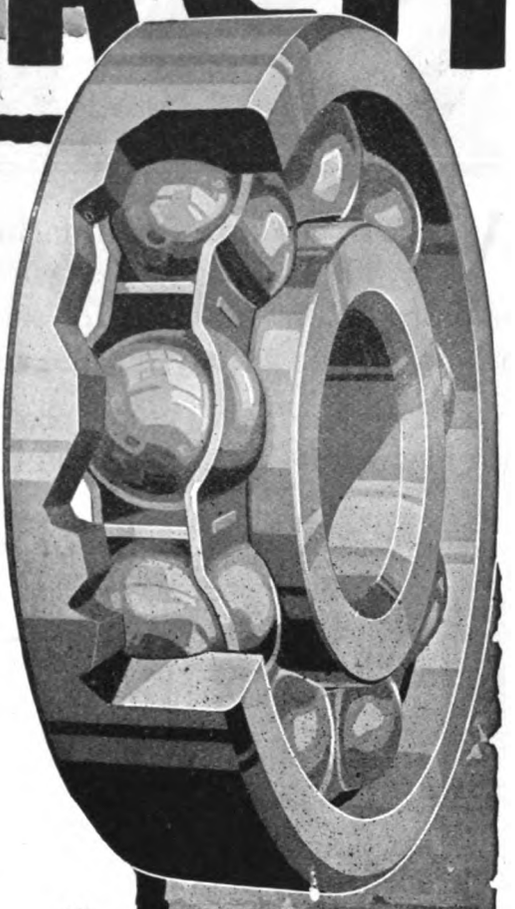
To reach its "sporting" range and utterly change its character, you have only to open the throttle wider and release its double poppets.

Now you have eighty horsepower, full fed and eager for conquest. You need fear no contender, no matter what its class —in a test of speed or prowess.

The Peerless Motor Car Company, Cleveland, Ohio

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RESEARCH



NEW DEPARTURE BALL BEARINGS are the result of continuous and intensive study by *experts* — metallurgists, chemists and engineers — for many years.

It has called for the best that is in these experts to bring the New Departure quality up to the present New Departure standard.

Having obtained knowledge of fundamental essentials, we do not rest in our research work. A considerable engineering force is constantly employed, applying irresistible tests of science to New Departure materials, processes and the finished product. Thus we maintain day in and day out, what we have attained.

"New Departure Engineering Bulletins" show practical and progressive applications of ball bearings to all types of machinery. Engineering consultation service free and confidential.

THE NEW DEPARTURE MANUFACTURING CO.,
Bristol, Conn. Detroit, Mich.

Conrad Patent Licensee.

299

NEW DEPARTURE BALL BEARINGS



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Stan

WITH resources and facilities of a vast and varied nature we are equipped to serve the motor car industry in many ways, usual and unusual.

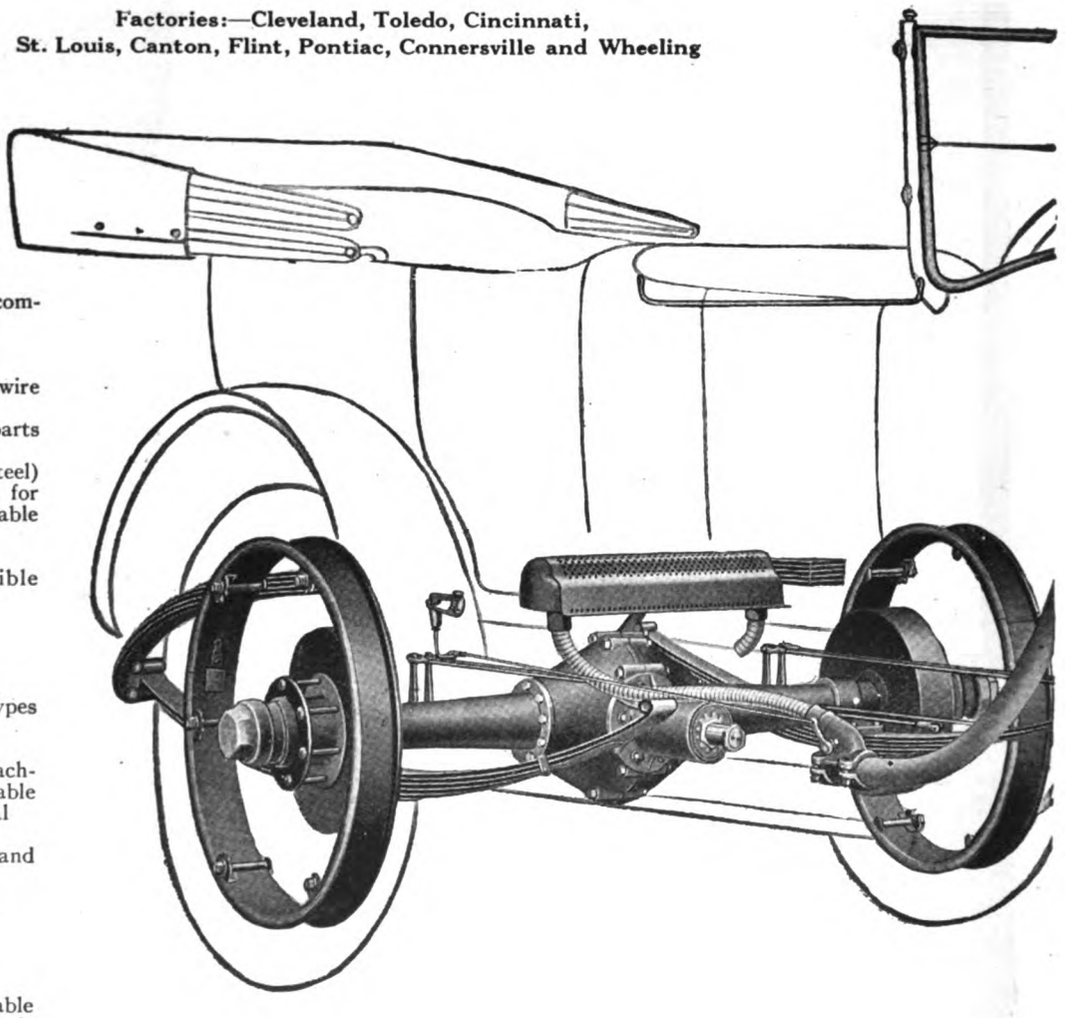
We seek to make your problems our problems and to evolve the solution thereof in a manner so distinctively successful as to establish mutually profitable relations that will prove enduring.

Tell us what problem you have that will put us to the test—now? Let us demonstrate our equipment to serve you.

Factories:—Cleveland, Toledo, Cincinnati,
St. Louis, Canton, Flint, Pontiac, Connersville and Wheeling

For Motor Vehicles

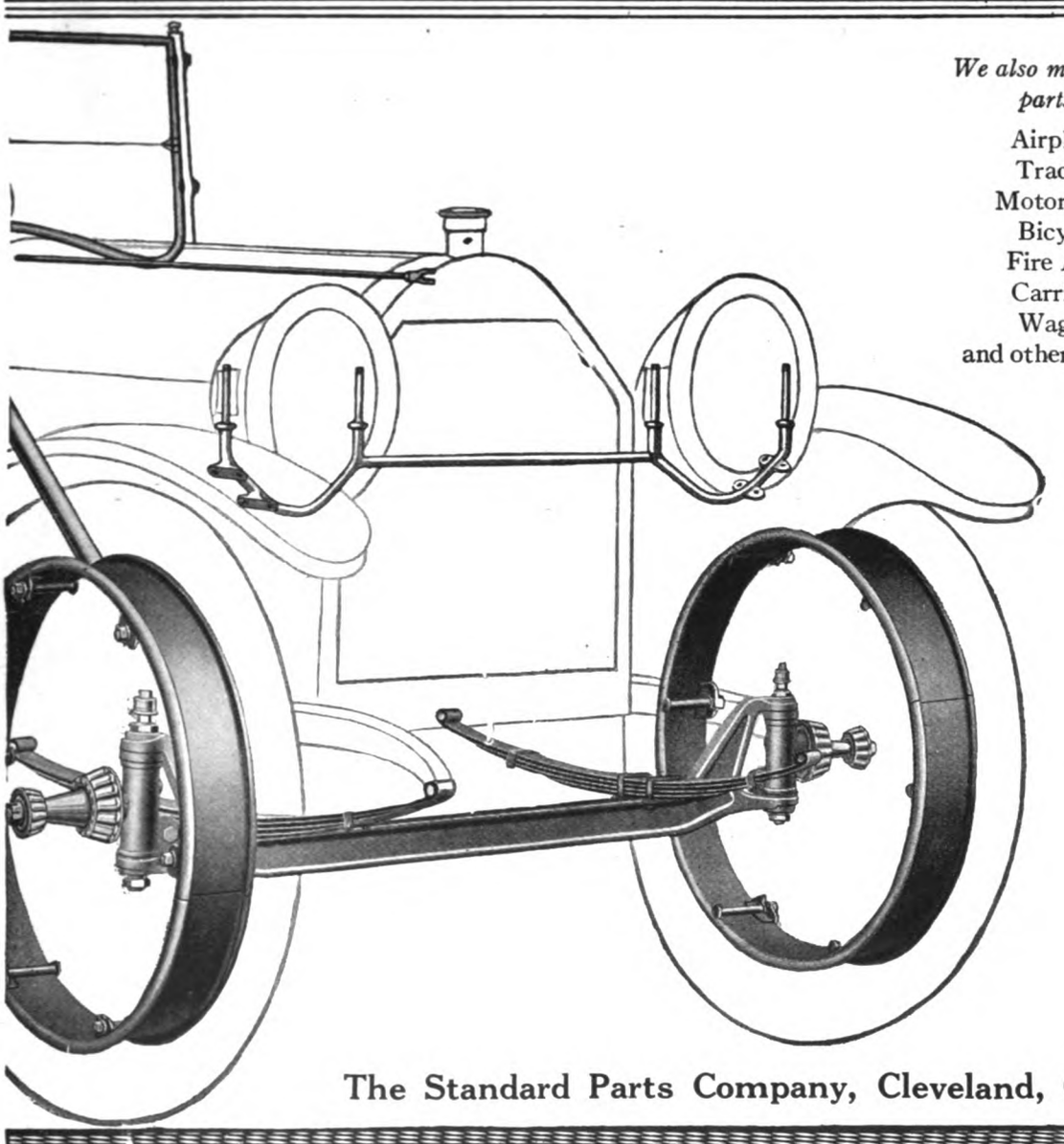
- Axles
- Axles (dead rear)
- Bearings
- Brake rod assemblies complete
- Clincher rims
- Cranks (starting)
- Detachable rims for wire wheels, special
- Electric welding of parts
- Exhaust tubes
- Felloe bands (S.A.E. Steel)
- Flanges and fittings for attaching demountable rims
- Formed Tubing
- Forgings for convertible trucks
- Heaters
- Hubs
- Ignition wiring tubes
- Mast sleeves
- Millimeter rims, all types
- Oil tubes
- Radiator rods
- Rims—clincher, detachable and demountable for single and dual equipment
- Starting gear rings and boxes
- Straight steel tubing
- Steering gear tubing
- Springs (regular)
- Springs (thin leaf)
- Tail pipes
- Tire bases in demountable and pressed on channels
- Torsion tubes
- Truss rods
- Tubing (straight and formed)



The Standard Parts Company, Cleveland, Ohio

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dard parts



We also manufacture parts for

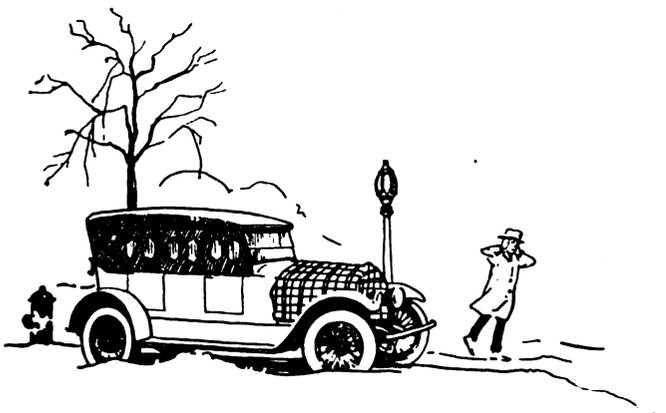
Airplanes
Tractors
Motorcycles
Bicycles
Fire Arms
Carriages
Wagons
and other vehicles

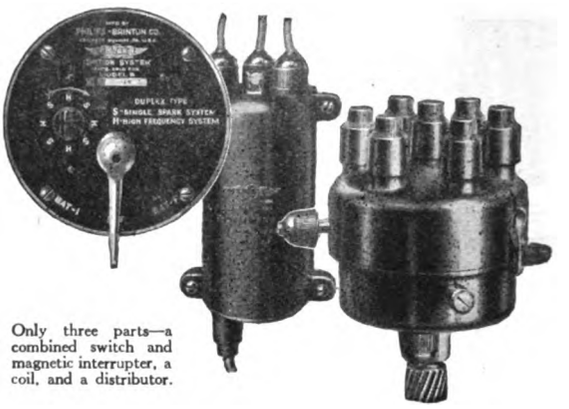
The Standard Parts Company, Cleveland, Ohio

Please mention Automotive Industries when writing to Advertisers

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"—getting started in cold weather used to be a drain on my battery and patience but not since I put Philbrin Duplex Ignition on my car"





Only three parts—a combined switch and magnetic interrupter, a coil, and a distributor.

WITH the thermometer down to zero I can now leave her standing at the curb for hours at a time, but when I throw the switch to "H" she starts without a single protest.

For with the switch on "H" the Philbrin High Frequency System shoots a steady stream of hot, dynamic sparks into each cylinder in its regular firing order. No mixture, no matter how poor, can resist under persuasion as powerful as that.

That's the purpose of the Philbrin High Frequency System—to overcome abnormal motor conditions such as faulty carburetion, foul spark plugs, inferior gas and excessive carbonization—conditions that no single system alone could be expected to meet.

The Philbrin Single Spark System likewise deserves special notice because of its many unique points of superiority over any other single spark system. Its patented Contact Maker provides for an extremely hot, full-bodied spark from astonishingly little current and fires lean mixtures successfully. And it is a well-known fact that lean mixtures, though more difficult to ignite, are more powerful when fired. Actual, appreciable economies of fuel are assured together with greatly improved flexibility since, unlike others, the Philbrin Single Spark System provides its hottest spark at low speeds.

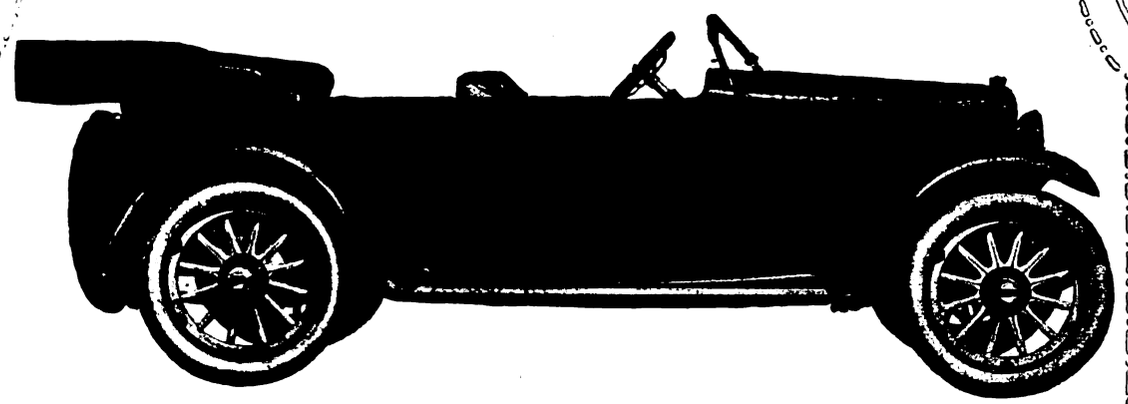
While combining two separate and distinct ignition systems, the entire Philbrin Duplex System is no larger than the average single unit system and may be installed with equal facility. Made in sizes for all cars with special mountings for magneto replacement. We make a specially designed system for Fords.

Jobbers and dealers will find unusual possibilities for profit in this new and better system of automobile ignition. Write at once for unassigned territories.

PHILIPS-BRINTON COMPANY
501 So. Broad Street Kennett Square, Pa.

PHILBRIN
DUPLEX IGNITION
—with a second system to spur the motor to super-service.

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When Price Talks

Judged by Values, the New Case Six Commands the Keenest Buyers' Interest

FORTUNATE is the man, when he comes to buy a car, who lets Case standards guide him. At its present price, the New Case Six is a rare find. Compared with like cars, its price is below the usual. That is evident. Cars built in the Case way command several hundred dollars more. Yet none have all the Case attractions.

This means double value. A lower cost with high-price features.

The All-Feature Car

Combined in the Case Six, as never before, are all the best known and most desired features. Features known as standardized and best. Known to all makers, to all owners, to all garage-men, everywhere.

All these features, from the Continental Engine to the tiniest detail, are selected especially for the Case Six. And meet the standards set by Case Engineers.

All features are harmonized into a satisfying unit. Such as set by today's requirements. And these are the statements, remember, of a 76 year old concern, jealous of its good name.

A Timely Car

Up-to-the-minute in design and comforts, yet free from extravagances, this New Case Six is indeed timely. Especially at its price.

The New Case Six comes in three models, each a beauty. Each expresses individuality. Their riding comfort is unequalled.

And there is plenty of power, developed smoothly and noiselessly, and transmitted completely into driving force. There is more power than any driver needs. All with real fuel economy.

Before You Buy

See the wonderful New Case Six now. Go over its specifications; examine it minutely. Make comparisons. Ride in it. Give it every test you wish.

Then see if you agree with us—that here is a car of unusual merit at an unusual saving.

A Case dealer will be glad to show you the Case Six. Or write direct to us for a descriptive catalog with pictures.

J. I. CASE T. M. COMPANY, Inc. Founded 1842. 227 Liberty Street, Racine, Wis.

TO DEALERS: A few fine opportunities exist in certain localities. Write for information.

Family Touring car for 7 or 5 people, color dark blue, $1875; Sport Model for four people, color periscope green, $1875.

All-Seasons Model, Springfield Type, for 7 or 5 people, color dark blue, $2375.

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SERVICE

Service is the watchword of the times.

The war can be won only by unstinted service.

The outcome depends as much on the machine as on the soldier.

In every field of mechanical design, nothing is or can be neglected that will directly or indirectly give increased service.

Thus it has been proved anew, and in every field in which steel is used, that

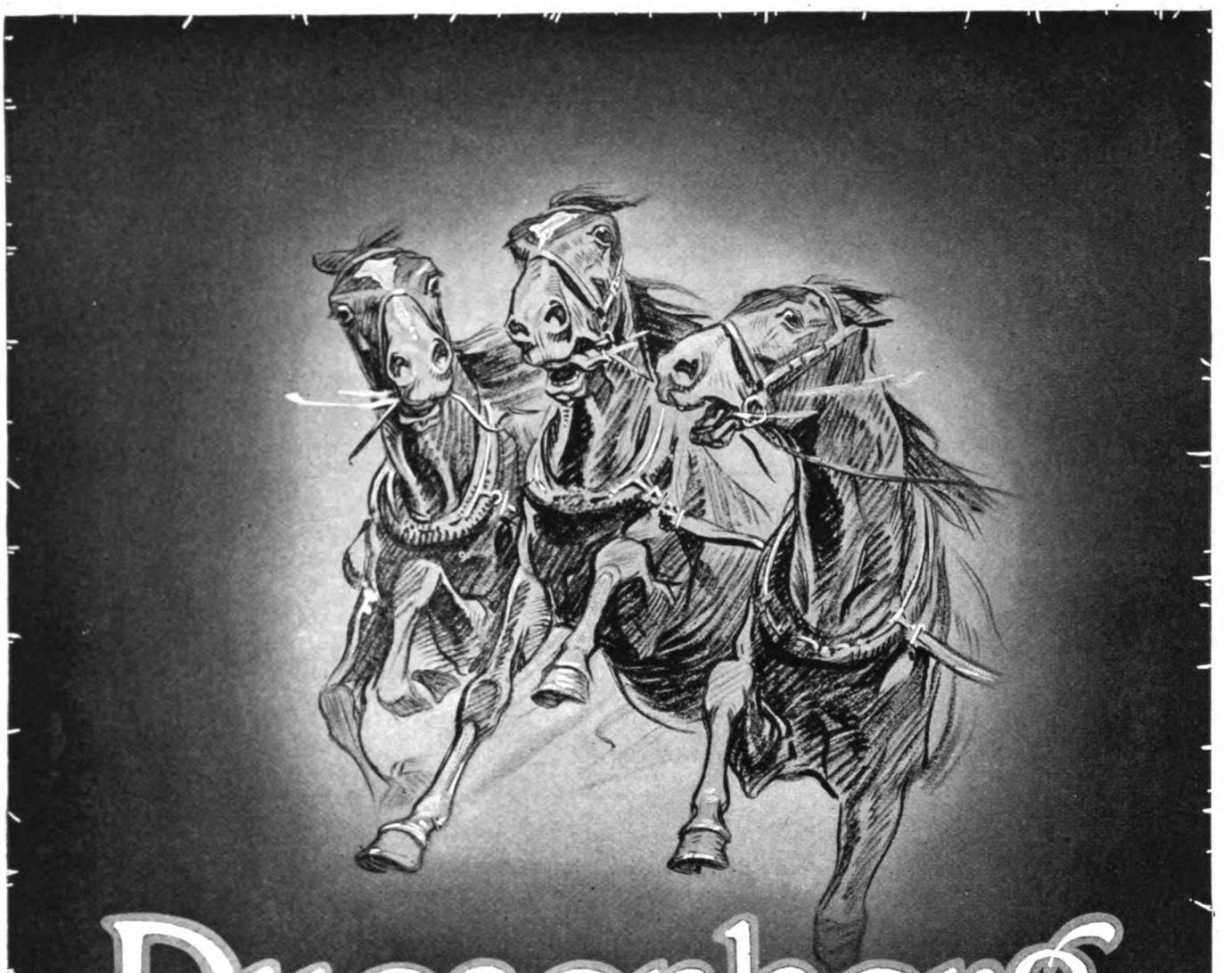
VANADIUM STEEL

means service. In aeroplane, submarine, gun, army truck, light and heavy armor, automobile, locomotive, machine and cutting tool, the greater strength of vanadium steel is utilized to the one end—increased service.

American Vanadium Company

NEW YORK PITTSBURGH LONDON

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Duesenberg

The Power of the Hour

Aeroplane Automobile Marine Engines

THE entire productive ability of the Duesenberg Organization is concentrated on work for the United States Government. We will again be at your service After the War is Won.

DUESENBERG MOTORS CORPORATION, 120 BROADWAY, NEW YORK CITY
Contractors to the United States Government

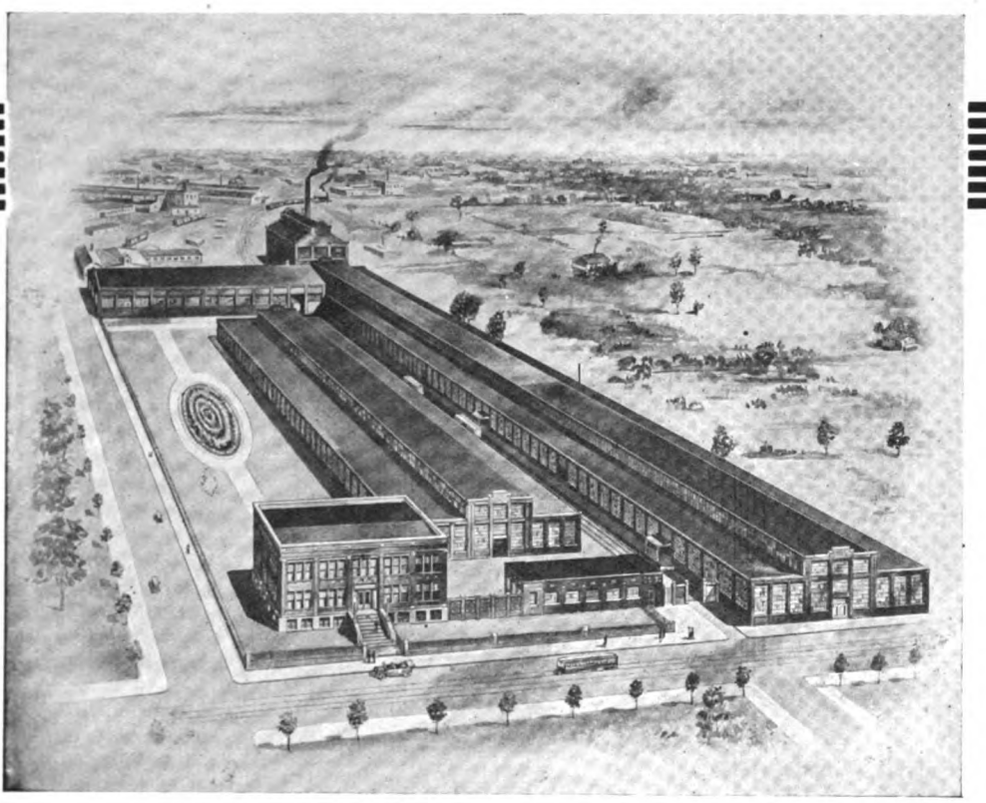
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The Factory that Serves You Better

The

PARISH & BINGHAM CO.

CLEVELAND, OHIO



An unusual plant thoroughly equipped for the manufacturing of trucks and pleasure car frames and the making of brake drums and large steel stampings of every kind.

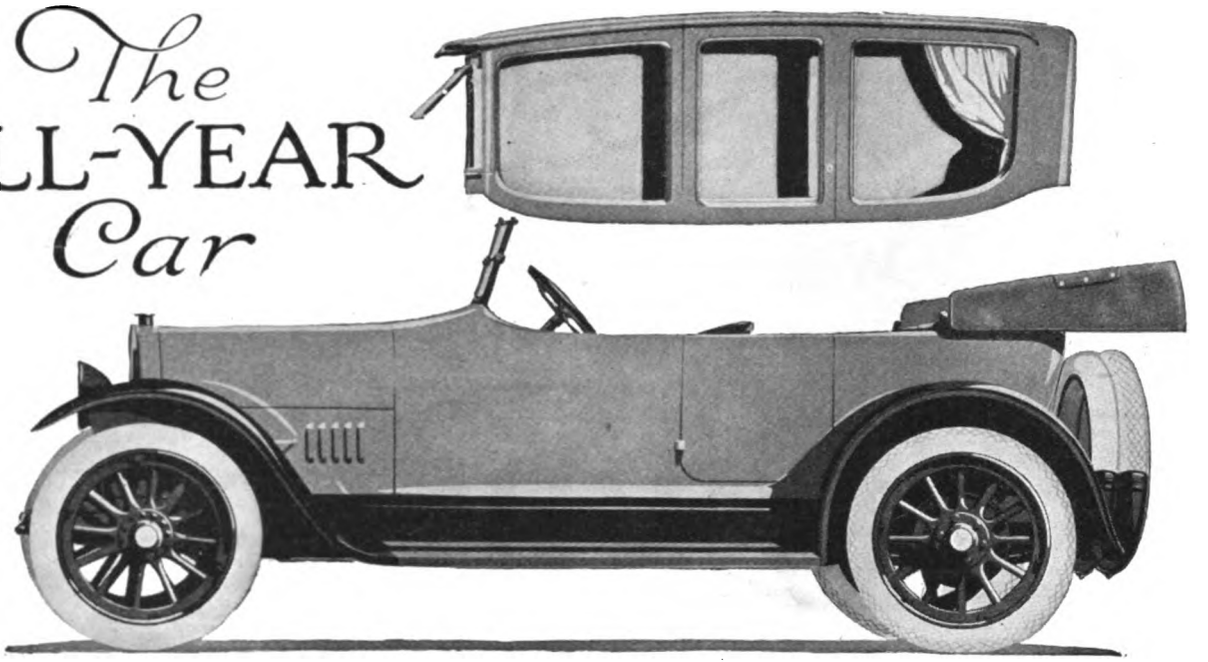
The best modern shop practice, complete co-ordination in every part and a prevailing spirit of co-operation—these features make possible a certainty of the maximum of quality and service.

Our Engineering Force is at your disposal.

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KISSELKAR

The ALL-YEAR Car



Motoring Efficiency and Economy

When motoring efficiency and economy are absolutely necessary—never has Kissel leadership in his ALL-YEAR Car been so apparent.

The reason—**the exclusive ALL-YEAR Top,** built **in,** not **on,** no visible fastenings, no rattles or draughts, and entirely removable, giving the utility, style and efficiency of two cars for the price of one.

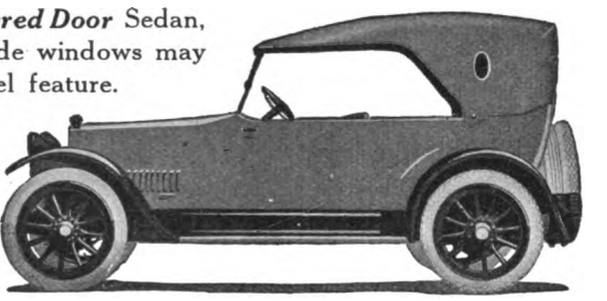
In the 4-passenger ***Sedané*** and 5-passenger ***Staggered Door*** Sedan, the ALL-YEAR Top is entirely removable or all side windows may be lowered or raised full length—an exclusive Kissel feature.

A year's test has proven the efficiency of the HUNDRED POINT SIX—the car of a Hundred Quality Features, including the sturdy Kissel built power-plant, dependable brakes and reliable axles.

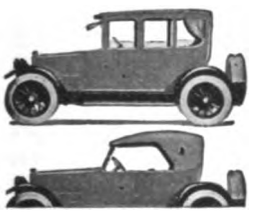
DEALERS—Cash in on these War Time Sales Features by wiring or writing us for agency details.

Kissel Motor Car Company

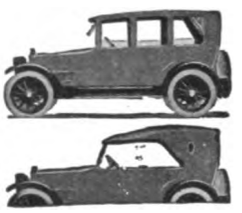
Hartford, Wis., U. S. A.



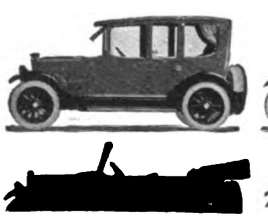
New Semi-Victoria Style SummerTop—made of Pantasote, having one plate glass "port hole" on either side and two in rear. The most distinctive and original summer top made.



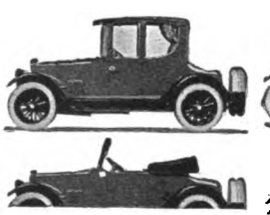
THE ALL-YEAR CAR—detachable Sedané top mounted on Hundred Point Six 4-passenger Gibraltar Sedané body and same car with new Semi-Victoria Style Summer Top.



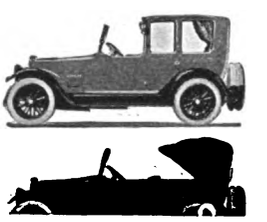
THE ALL-YEAR CAR—detachable Sedan top mounted on Hundred Point Six 5-passenger Staggered Door Gibraltar touring body and same car with new Semi-Victoria Style Summer Top.



THE ALL-YEAR CAR—detachable Sedan top mounted on Hundred Point Six 5-passenger Gibraltar touring body and same car with top detached.



THE ALL-YEAR CAR—detachable Coupé top mounted on Hundred Point Six 4-passenger Gibraltar roadster body and same car with top detached.



THE ALL-YEAR CAR—detachable Town Car top mounted on Hundred Point Six 5-passenger Gibraltar Victoria body and same car with Victoria top.

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DRIDEK—

With the Leather Finish

TRADE DRIDEK MARK REG.

DrideK with its leather finish, is an entirely new creation, based on many years' experience in furnishing tops and upholstery for the majority of the cars that have been put on the market.

DrideK looks as well as the best of leather. The distinguishing features in the wear of DrideK are: that you cannot scratch the finish; that it retains its color until entirely worn out; and that it is absolutely waterproof.

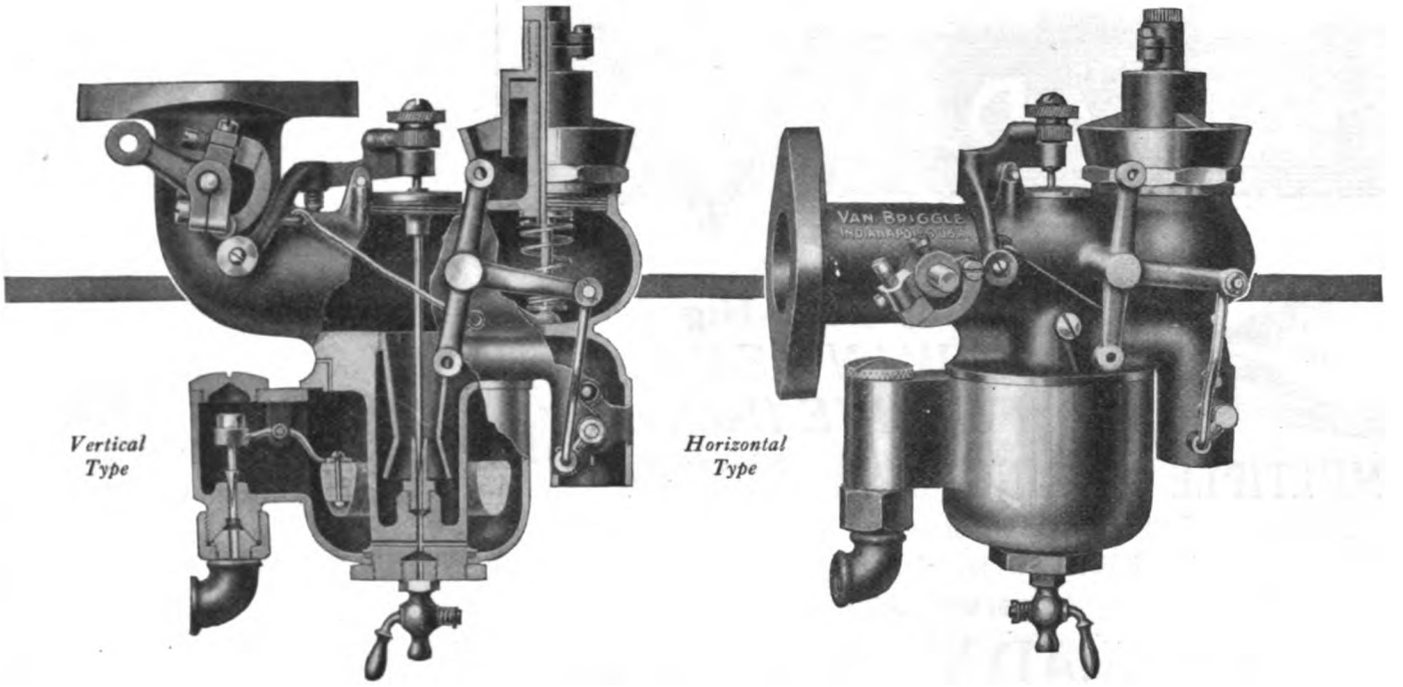
The product is unquestionably superior, and the price is within reach of your specifications. Made in black and many attractive colors.

Send for Samples and Price List

L. J. MUTTY COMPANY

Boston, Mass.

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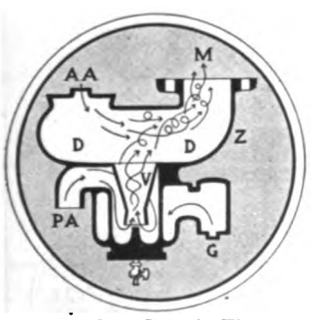


VAN BRIGGLE CARBURETOR

Just One Principle for all Motors

THE principle of carburetion is *always* the same in every Van Briggle Carburetor—regardless of the make, number of cylinders, or type of motor on which it is used. Thus, uniformly good results are always secured. The Van Briggle delivers more power—more speed—with less fuel—and gives *instant* starting in coldest weather. There's a Van Briggle for almost every make of motor. Illustrated descriptive booklet sent free on request. Send for it. ¶DEALERS AND JOBBERS: The Van Briggle is as easily handled as tires. New opportunity for profit and service. Write for proposition.

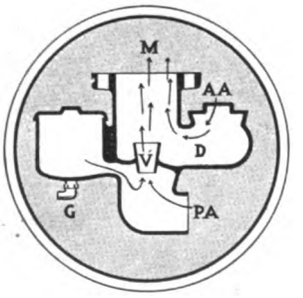
KEY TO DIAGRAMS: PRIMARY AIR (P. A.); AUXILIARY AIR (A. A.); GASOLINE (G.); MANIFOLD (M.); MIXING CHAMBER (D.); VENTURI TUBE (V.); LOCATION OF MANIFOLD ON HORIZONTAL TYPE (Z.).



The Van Briggle Way

EXPLANATION OF DIAGRAMS

Because of the peculiar construction of the Van Briggle's primary air chambers, the primary air enters the venturi tube in a whirling, swirling movement, breaking even the poorest gasoline into the most minute particles. The primary mixture then enters the mixing chamber. The auxiliary air, traveling across to the manifold MUST PASS THROUGH THE PRIMARY MIXTURE. Two mixtures are thus assured in the Van Briggle Carburetor—each thorough and absolute. A thorough mixture and complete vaporization mean EVERYTHING to your motor. Compare the Van Briggle Way with The Other Way. There *is* a difference!

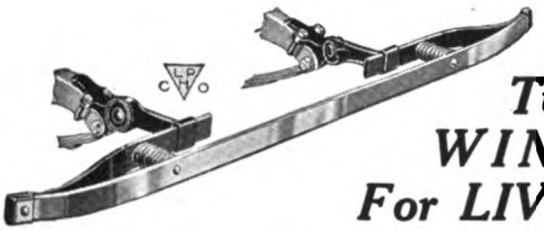


The Other Way

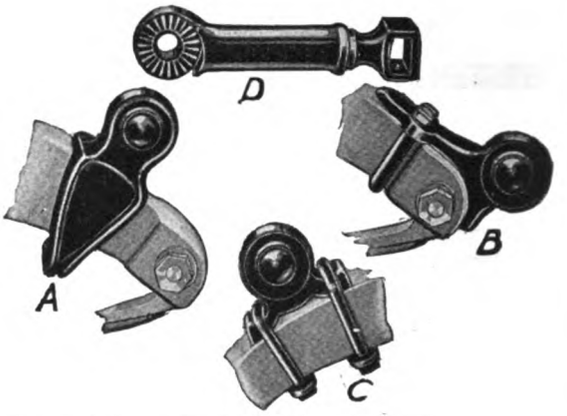
VAN BRIGGLE MOTOR DEVICE CO.
431 North Capitol Avenue INDIANAPOLIS, INDIANA

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HALLADAY BUMPERS



Two Big WINNERS For LIVE Dealers



MULTIPLE SPRING BAR BUMPER

The last word in bumper efficiency.
Supplied with all HALLADAY fittings for all cars.
Shock absorbing, noiseless, unbreakable.

HALLADAY STANDARDIZED UNIT

Solves the bumper problem by enabling the dealer to fit practically all cars with a stock of only four parts.

Write for new catalog fully describing the HALLADAY line

L. P. HALLADAY COMPANY, Streator, Illinois

DISTRIBUTORS: Asch & Co., 16-24 W. 61st St., New York City; E. L. Thompson Co., 817 Boylston St., Boston, Mass.; Gray-Heath Co., 1440 Michigan Ave., Chicago, Ill.; Sanford Brothers, Chattanooga, Tenn., Southern Distributors; Hughson & Merton, Inc., San Francisco, Los Angeles, Portland and Seattle, Pacific Coast Distributors.

AEROPLANES—

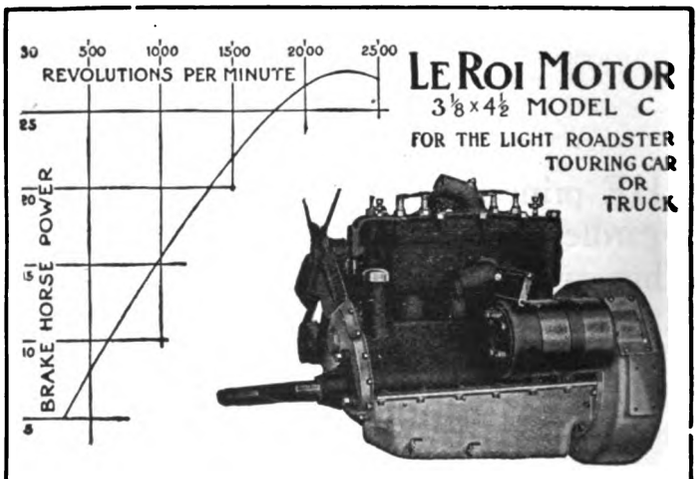
require the most trustworthy materials.

United Alloy Steels are being used for

CRANKSHAFTS
GEARS
CONNECTING RODS
CAMS
BOLTS
STUDS

and all parts where steel quality is an absolute essential.

United Alloy Steel Corporation
Canton, Ohio



Used by leading manufacturers of best-known American-made light trucks.
The business of manufacturing Le Roi Engines, formerly conducted by Milwaukee Machine Tool Co., is now carried on by

LE ROI COMPANY

Mitchell St. and 60th Ave.
MILWAUKEE, WIS.

Write for Complete Information

CABLE LE ROI MILWAUKEE

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DILLON MULTI VISION LENS

Motorists!

Here is a Lens that *does* what others *claim* to do

THE Dillon Multi-Vision Lens has no prismatic surface, no colored glass, no obstructions of any kind, to obstruct the light you need at night.

Instead, this marvelous lens embodies a new method of light distribution, which enables you to secure the fullest possible road illumination, and yet the lens itself is glare-free.

So scientific is its design that you actually secure TWICE the lighted area. Because of its projecting face you get a greater degree of side light, and its central bull's eye (which concentrates and magnifies the light) gives you a brilliant though glareless long-range shaft of light.

Dealers!

This, at last, is the Lens your trade will want — and *boost*

A SATISFIED customer is your best asset. Your whole stock moves more quickly, your profits increase as well, if your patrons find your products satisfactory.

The Dillon Multi-Vision Lens proves not only the ideal lens to buy but the most profitable lens to sell. The Dillon serves as a nucleus for a fast-growing, high-class trade, because it justifies the claims of both maker and seller.

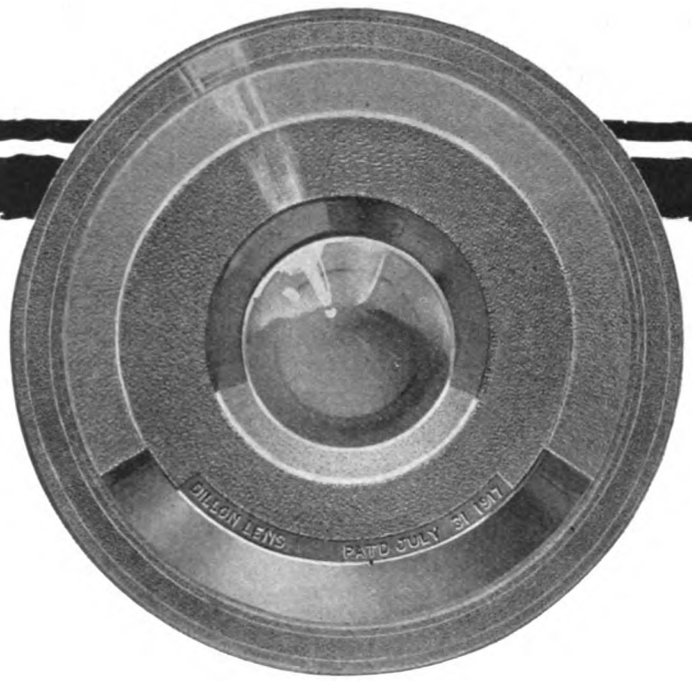
Don't forget to mail the coupon below and secure full information on the Dillon Lens sales proposition, as well as particulars regarding the co-operation offered Dillion dealers. Send the coupon at once.

Motorists—Dealers—Send for literature on the Dillon Multi-Vision Lens

NATIONAL DISTRIBUTING BUREAU INC.

Oliver Building, Pittsburgh, Pa.

Exclusive Distributors of the Dillon Lens



$3.50 Pair

Any Size Same Price Anywhere in U. S. A.

Pittsburgh

MAIL THIS COUPON

National Distributing Bureau,
Oliver Bldg., Pittsburgh, Pa.

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Address ..... A I 2-14

Jobber .....

Just Sign and We'll Send You Full Particulars

Please mention Automotive Industries when writing to Advertisers

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ZAPON

NECESSITY

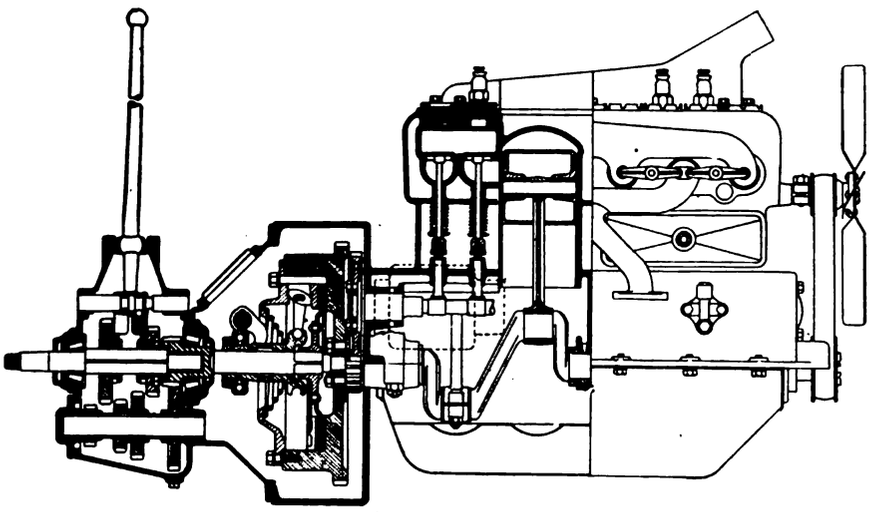
"The mother of invention, so 'tis said"

We recognized the necessity for a good leather substitute over a score of years ago. ZAPON LEATHER CLOTH, today, as then, is still a necessity. Necessary, now, to the final finishing touch of the modern automobile.

The test of time alone tells the story!

ZAPON LEATHER CLOTH CO.

New York **Detroit**



Motordom's Latest —the A. B. R. Unit Power Plant

A new but highly efficient power plant that is bound to become one of the most popular in the motor truck industry. Read over a part of the startling specifications:

30 H. P. (4 cylinders cast en bloc)

3¾ bore x 4" stroke

3 speeds forward—1 reverse

Non-adjustable Disc Clutch (own make)

Wright tapered Roller Bearings

Splash and Pump lubrication System

The complete A. B. R. Unit Power Plant includes spark plugs, wiring, generator and carburetor. Capacity production for 1918 20,000 units. Write today for complete specifications and literature.

A. B. R. Motor & Engineering Co.

Stamford, Connecticut

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PARK INTEGRALLY

COUNTER BALANCED CRANK SHAFTS

Patented July 10th, 1917



Quick Get-a-way
Higher R. P. M.
Reduced vibration
Smoother running motor
Eliminated bearing troubles

We have shipped 60,532 Counterbalanced Crankshafts to Feb. 7th, 1918

The Park Drop Forge Co.
Cleveland

SRB Annular Ball Bearings (Single and Double Row)

SRB Improved Type Taper Roller Bearings

Standard SRB Taper Roller Bearings (Special for Fords)

STANDARD ALLOY STEEL BALLS

Rudge-Whitworth Wire Wheels

MAYO Radiators

Factory resources and service go hand in hand with
STANDARD ROLLER BEARING PRODUCTS

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SAN FRANCISCO	41 Spear Street

STANDARD ROLLER BEARING CO.

Philadelphia, U.S.A.

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GALVANIZE RIMS AUTOMATICALLY IN MEAKER UNITS

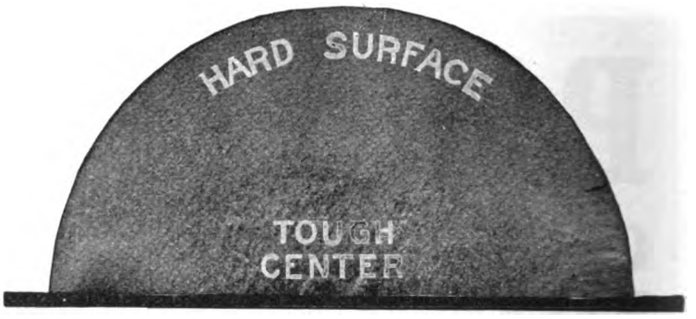
Deposit a heavy, bright, uniform coating of pure zinc on all rims for your cars—the galvanized finish that looks good and is good.

Well galvanized rims are bright when they come from our machines and just as bright after they have made many thousand miles on your machines.

Superior Meaker Galvanizing will not cost you as much to produce as out-of-date, inferior, dark-colored, thin zinc coatings that do not even protect rims from rusting while they lie in storage.

Forward us a set of rims and felloe bands and we will give you some interesting figures.

MEAKER GALVANIZING COMPANY
1249 Fulton Street **Chicago, Illinois**



Steel balls look alike

TWO steel balls may look alike as two peas; the finish and size may be the same. It is the **internal construction** that counts. Until the Hoover Steel Ball was developed, you could not buy a ball with practically a **guarantee against breakage.** Yet with 25,000,000 daily capacity, **in four years we have not had a single case of breakage reported in service.** Easy to understand—the Hoover Ball is of chrome steel, hard surface, tough center, **eliminating breakage** by providing for steel contraction and expansion and allowing for fatigue in service.

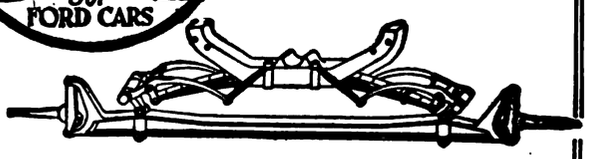
We maintain a special research laboratory to make the ball to order for your service. May we send our booklet?

Hoover Steel Ball Company, Ann Arbor, Mich.

HOOVER Steel Balls

The Original Double Arm SHOCK ABSORBER W & C For FORD CARS

$10 Per Set of 4



W & C

The Original Double-Arm Shock Absorber Makes As Much Difference As Pneumatic Tires on Fords

Installing a set of W & C double-Arm Shock Absorbers is as good as substituting pneumatics for a set of hard rubber tires. Their resiliency reacts to the immediate advantage of both passengers and mechanism.

They are as desirable on Ford cars as air-filled tires. You *know* how desirable *that* is.

Ask your dealer to-day—and say "W & C."

Some territory still open that needs live dealers. WRITE.

P. H. WEBBER COMPANY
HOOPESTON **ILLINOIS**

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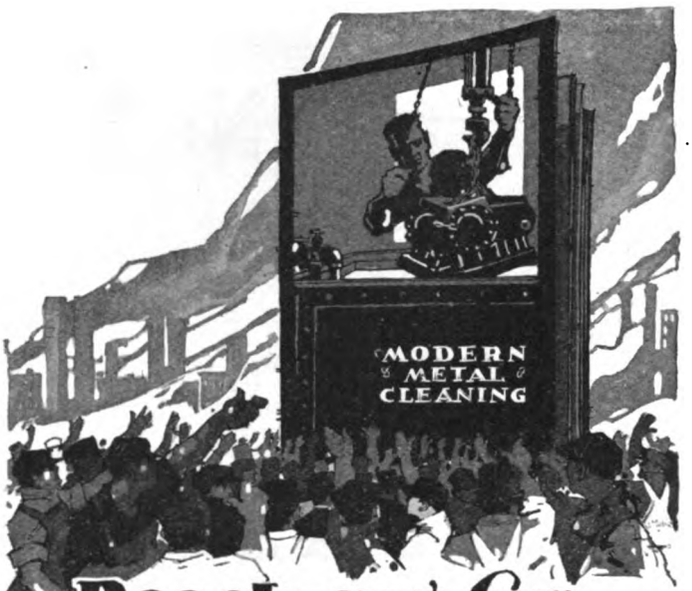
QUALITY

SNAP RINGS

ARE MADE COMPLETE IN OUR OWN FACTORY. NOT ONLY DO WE MAKE OUR OWN CASTINGS BUT ALL IRON IS CAREFULLY ANALYZED & TESTED IN OUR OWN LABORATORY







Reach out for better cleaning

Now's the time for speed, economy and safety. Old time methods are slow and uncertain—wasteful and costly.

Give the men in the shop

OAKITE

Methods and Materials

for cleaning parts and accessories and watch the production sheets increase and the cost sheets decrease.

Our new booklet

"Modern Metal Cleaning"

tells how to replace dangerous benzine, gasoline, potash and caustics with

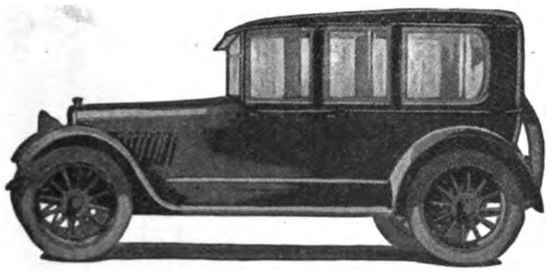
OAKITE

Send for your copy. It's gratis! It's your first step toward better cleaning.

Our guarantee takes OAKITE out of the doubtful class.

OAKLEY CHEMICAL CO.
28 Thames St. New York City

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Save Money Without Sacrificing Appearance

In this time of nation-wide economy, are you finding ways of cutting costs—and still retain quality? One item of saving—and it's no inconsiderable part of motor equipment either—is

GLASS

We have a mighty acceptable substitute for polished plate; and whether you use it on closed cars, windshields, clock faces, oil gauges or what-not, you will find it optically perfect. It looks well, too—and of course it's very moderately priced.

Write us your requirements, and let us tell you why this glass will serve your needs so well, why it costs less—and all about it.

AMERICAN WINDOW GLASS CO.
World's Largest Producer
General Offices, Farmers' Bank Building
Pittsburgh, Pa., U. S. A.

MARVELITE
Alight at Night

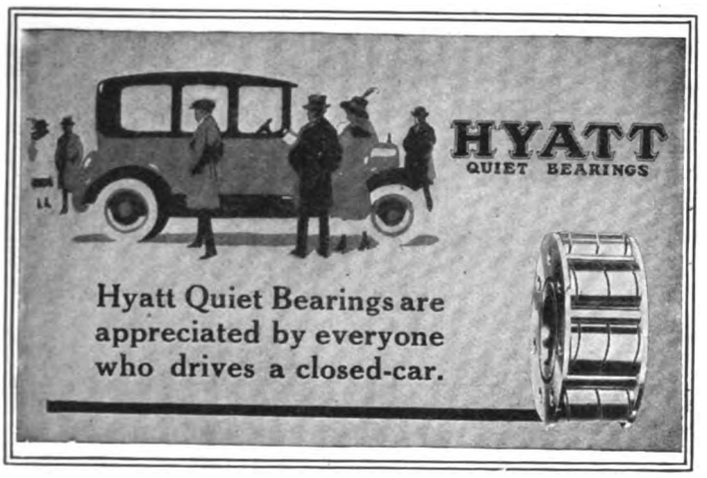
Automobile and Aircraft Dials Made Bright At Night With Marvelite

A Radium compound which is practically permanent. Meets Government requirements.

Marvelite may be applied by the instrument manufacturer or by us. If the manufacturer will send us a dial and hands we will treat them with Marvelite without charge and submit estimates.

Ask for Booklet No. 2, giving valuable information about Marvelite and luminous dials.

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558 West 158th Street New York
Telephone, Aud. 8047



GURNEY



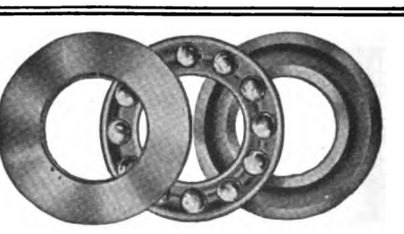
In Gurney Bearings the balls are bigger and there are more of them. This gives bearings a larger factor of safety and longer life.

GURNEY BALL BEARING COMPANY
Conrad Patent Licensee
Chicago, Ill. Jamestown, N. Y. New York City

166

BALL BEARINGS





BALL THRUST BEARINGS

RETAINERS FOR CUP AND CONE, THRUST AND MAGNETO TYPE BALL BEARINGS.

Western Office, FORD BLDG., DETROIT
THE BEARINGS COMPANY OF AMERICA LANCASTER, PA.

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QUALITY COUNTS

YOUR choice of ignition should be governed by the reputation of the system. Get known reliability, and efficient service with your motor. Approximately

3,000,000 BOSCH MAGNETOS

made and sold on a quality basis have made good with owners everywhere.

Let the car you buy or sell have quality ignition.

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USE them in every department, sales, office, and engineering, because they *are the standard of the world!*



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FREE!

This trial box with five VENUS Drawing Pencils and VENUS Eraser sent free!

Please enclose 6c. in stamps to cover postage and packing.

Write for it

American Lead Pencil Co.

245 Fifth Avenue, New York

and Clapton, London, Eng.



Save Extra Auto Tax

Every ounce of energy wasted by leaky cylinders is an *extra* tax on your auto or truck. And that tax grows with advancing gasoline prices.

Stop this costly leakage with Ever-Tight Piston Rings.

Accurately machined from fine-grained, springy grey iron, they hug the cylinder wall closely without binding. Conform exactly to out-of-round cylinders, saving reboring. Gas can't leak through or by them.

Ever-Tight Piston Rings are safeguards against imperfect combustion with resultant carbon deposits; against smoky exhaust resulting from oil leaks. They increase engine efficiency from 15% to 25%, thus reducing running expense.

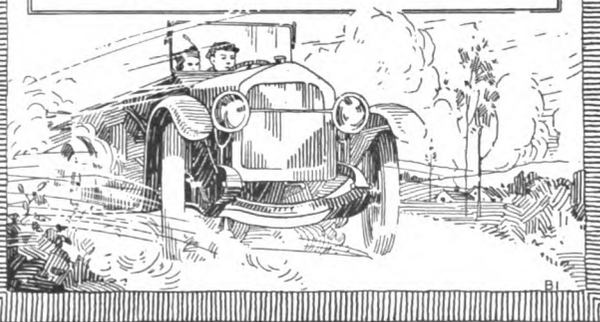
Demand Ever-Tight Piston Rings of your dealer or repair man.

EVER-TIGHT PISTON RING CO.

1428 Chestnut Street :: :: Saint Louis



This perfect three-piece construction justifies the name—EVER-TIGHT. These close fitting right angles are absolutely gas tight.



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Under Nearly Every Hood

ECLIPSE-BENDIX DRIVE

Transmits Starting Power on 153 Makes of Automobiles

ECLIPSE MACHINE CO.
ELMIRA, N. Y.

REMY
STARTING LIGHTING IGNITION SYSTEMS

The patented Thermostat Control of Remy Generators prevents battery starvation in winter and overheating in summer.

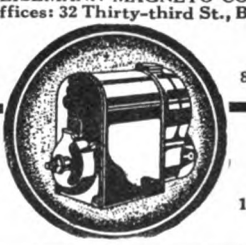
REMY ELECTRIC COMPANY
Sales and Engineering Offices Detroit, Michigan
Factory and General Offices Anderson, Indiana
Service Stations in All Principal Motoring Centers

Electric Auto-Lite
Starting—Lighting—Ignition

Electric Auto-Lite equipment for automobiles is as famous for the service that backs it as for the reliability and economy of its operation.

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New York Detroit Kansas City San Francisco

EISEMANN
MAGNETO
THE EISEMANN MAGNETO CO.
Sales General Offices: 32 Thirty-third St., Brooklyn, N.Y.
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Powerful Durable Dependable
Standard Equipment for 117 Manufacturers

Cored Bars
HIGH SPEED NON-GRAN BEARING BRONZE
For Bushings

AMERICAN BRONZE CORPORATION
BERWYN, PENNSYLVANIA
Sole Manufacturers of Non-Gran and Largest Exclusive Manufacturers of Bearing Bronze in the World

Reduce the Risk of Accident!

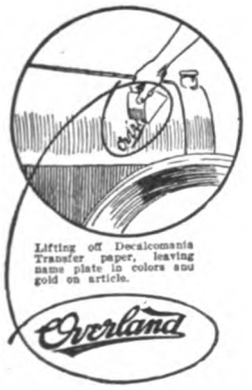
Suppose your lights went out suddenly, without warning, on a black night, with a bad road. Don't chance it. Put a



Weston
MODEL 354 AMMETER
On Your Dashboard or Cowl

It is the reliable means of determining the proper rate of charge or discharge of your battery for various speeds. It enables you to determine that the generator is working and that the storage battery is receiving its proper charge. *Write us.*

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8 Weston Ave., Newark, N. J.
23 *Branch Offices in the Larger Cities*



MEYERCORD
Decalcomania Transfer Name Plates

—will not tarnish, blacken, loosen, rattle or fall off. Unaffected by time, wear, tear, oil, water or grease. Simple to apply, decorative and permanent.
In use by leading automobile and accessory manufacturers, in place of brass name plates.
It will pay you to write today for full particulars. Let us show you how to solve *your* name plate problem at a decided profit to yourself. Send for the information now. There's no cost.

We make agency signs for manufacturers too

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REGISTERED TRADE MARK
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SINGLE UNIT and TWO UNIT Equipments
Booklet on Special Ford Equipment
DYNETO ELECTRIC CO., Syracuse, N. Y.

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MERCER MOTOR CARS

THE Mercer shield is the badge of fastidious taste in automobiles. Mercer means the utmost in substantial smartness, riding comfort, and power. The possessor of a Mercer invariably feels a bit better satisfied than the owner of another car. Correspondence from dealers invited.

Mercer Automobile Company, Trenton, N. J.

KING "8"

"The Car of No Regrets"

In Military Service as Armored Car and War Ambulance. More in use the world over than any other "Eight" save one.

Write for catalog

KING MOTOR CAR CO., Detroit

Good roads everywhere—
for him who uses



"SOLID COMFORT"

*Hartford
SHOCK ABSORBER

No jolts! No jars! No vibration! Just *solid comfort* and longer car life.

Edward V. Hartford, Inc.
144 Morgan Street
JERSEY CITY, N. J.

KIMBALL TIRES

Are Doubling Profits for Some Dealers

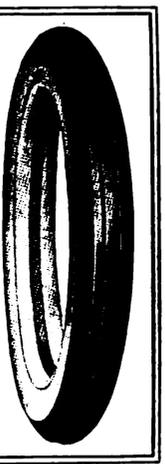
Write for Our Interesting Offer

These tires are sold without a guarantee. Write and ask us how we do it. They are positively **not** seconds, but first-class fresh castings.

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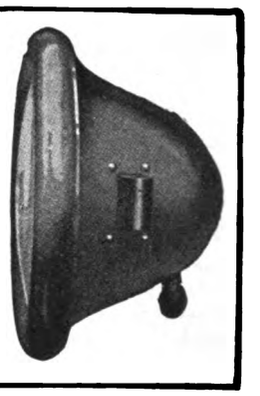
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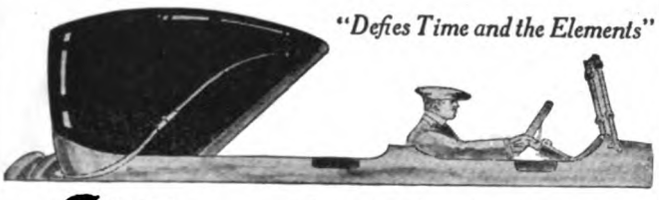
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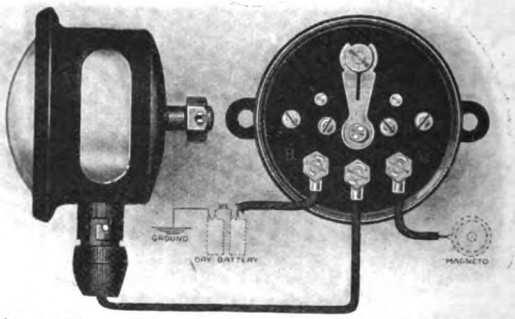


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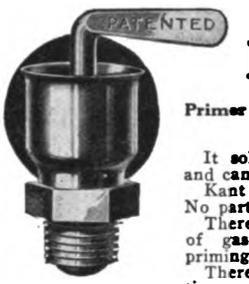

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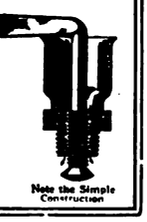


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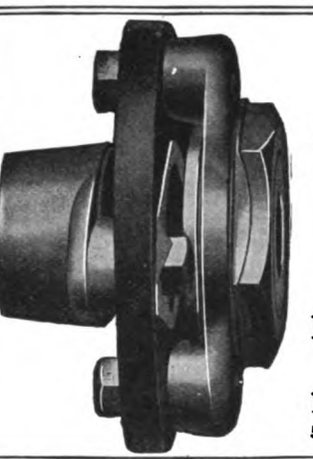

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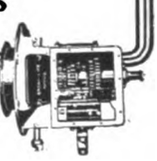
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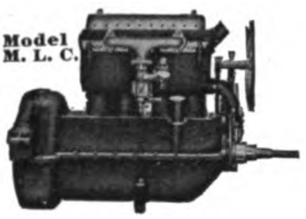
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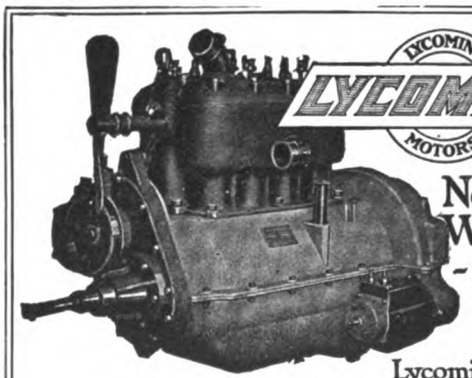
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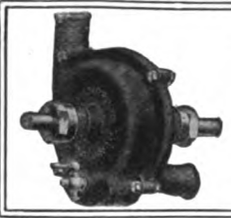
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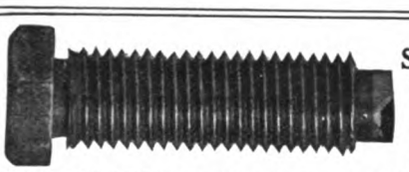
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2200-12 Diamond St., PHILADELPHIA, PA.

Small Metal Stampings
up to about six inches in diameter. Small accessories and ornaments manufactured to order. Prompt deliveries. Send us along your drawings or blue prints.
THE JOSIAH WALSHAM CO.
48 Dudley St. Providence, R. I.

Sheet Metal Parts
FENDERS, HOODS, MUD-PANS, GASOLINE TANKS, BATTERY BOXES, MUFFLERS, RUNNING-BOARD SHIELDS.
York Corrugating Co.
YORK, PA.

MACHINE WORK
GENERAL WORK AND SPECIAL MACHINERY.
TOOLS, DIES and JIGS
Modern Equipment.
Send prints for estimates.
BOEGER-MEYER MACHINE & TOOL CO.
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BRASS, BRONZE and ALUMINUM CASTINGS
Pattern Work. Machine Work
Special Attention Given Automobile Work
INDUSTRIAL FOUNDRY & MACHINE CO.
POTTSTOWN, PENN.

The Empire Manufacturing Co. Inc.
SPECIALISTS IN SMALL MACHINE PARTS and SCREW MACHINE PRODUCTS
ALL WORK GUARANTEED.
Offices: 58 Elm St., NEWARK, N. J.

Castings and Machine Work
GREY IRON, BRASS, BRONZE AND ALUMINUM CASTINGS
IRON UP TO ONE TON. BRASS AND BRONZE UP TO ½ TON
ALSO MACHINE AND PATTERN WORK
J. R. & H. G. UMBERGER
LEBANON, PA.

STAMPING, PRODUCTION WORK
Light manufacturing of all kinds. Designing and Building of Dies, Gauges, Jigs and Fixtures, Machine Tools.
Princeton Machine and Tool Corp.
188 Prince Street New York

MALLEABLE IRON
SEMI-STEEL CASTINGS
Temple Malleable Iron and Steel Co.
FOUNDRY: TEMPLE, PENN.
Office: Phila., Pa.

General Machine Work
I am equipped to do high-grade and accurate machine work.
Send your blue prints and get my prices
Prompt deliveries guaranteed.
EDWIN H. ZACHARIAS
121 Washington St., Reading, Pa.

HIGH GRADE, SOFT
GREY IRON CASTINGS
PROMPT DELIVERIES
Superior Foundry & Machine Co.
HAMILTON, OHIO

MACHINE PARTS
Manufacturers of
SPECIAL MACHINERY
Send us your blue prints for low quotations and quick deliveries. We specialize on experimental work of every description.
HENRY, MILLARD & HENRY CO.
1059-1065 West Market, YORK, PA.

BRASS, BRONZE and ALUMINUM CASTINGS
Prompt service. Low prices. We are serving some of the largest.
BRASS FOUNDRY DEPARTMENT
of F. F. Smith M. W. Hardware Co.
81-85 CLAY ST. NEWARK, N. J.

Automatic Products
Accurate screw machine parts. Lathe, Milling, Drilling and assembling work solicited. Ignition and special Coils; also Jewel Bearings manufactured.
The Eastern Specialty Company
3308 Germantown Ave. PHILADELPHIA, PA.

CONTRACT WORK

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MACHINERY

MACHINERY

Modern Tools

PLANERS

20 x 20 x 5-ft. New Haven, two heads.
36 x 36 x 20-ft. Chandler, four heads.

SHAPERS

Two 16-in. Milwaukee, BRAND NEW, back-geared.
One 20-in. Milwaukee, BRAND NEW, back-geared.
20-in. G. & E. back-geared, used six months.

LATHES

9 x 4 Seneca Falls, with chuck, complete.
11 x 5 Seneca Falls, BRAND NEW, with chuck, complete.
18 x 6-ft. American, used six months.

OUR MOTTO

Lowest Prices

14 x 6 Lodge & Shipley, geared head, single pulley drive, complete with taper attach., quick-change gears and chuck.

RADIAL DRILLS

One 4-ft. Plain Brand New Mueller Gear Box Drive, Heavy Duty.
5-ft. Cincinnati Bickford, S. P. D.

MILLERS

No. 1½ American BRAND NEW miller.
Three No. 3 Kempsmith Universal Brand New, complete.
One No. 2 Cincinnati Universal, used.

MACHINERY

Honest Business

TURRET LATHES

One 2 x 24 J. & L. geared sliding head, single pulley drive, chuck equipment.

AUTOMATICS

Two No. 52 National Acme, single pulley drive.
Two No. 53 National Acme, single pulley drive.
One No. 55 National Acme, single pulley drive.
Two No. 2 Brown & Sharpe automatics.

GRINDERS

No. 1 Wilmarth & Morman Universal, BRAND NEW.
One No. 190 Wells BRAND NEW cutter and reamer grinder.
Two No. 3 Modern Universal, BRAND NEW.

We own and can make delivery immediately from our New York Warehouse of the above list of machines
Send us list of your surplus used machinery. Send for Catalogue

MODERN MACHINERY EXCHANGE, 52-54 Walker Street, New York City

CONTRACT WORK—Continued

Commercial Auto Bodies

All facilities for specialized manufacture. BODIES FOR FORD CHASSIS a specialty. Contract work invited. Estimates given. Also equipped for HIGH GRADE WOOD PATTERN WORK.

J. T. Cantrell & Bro.
Wall Street, HUNTINGTON, N. Y.

PISTON and PISTON RINGS

Any Quantities

GRINDING IN ALL BRANCHES.

Houpert Machine Company
351 W. 52nd St., NEW YORK, N. Y.

Metal Stampings and Spinnings

Of Any Description in All Metals
Good Service

STANDARD METAL SPINNING CO.,
138 Mott St., New York, N. Y.
Phone Canal 8727

Dies, Jigs, Tools, Gauges Fixtures

SPECIAL MACHINERY
Let us know your requirements
GENERAL TOOL CO.
59A Terrace, Buffalo, N. Y.

TOOL AND DIE WORK

Stampings—punch press work, gauges, jigs and fixtures, cutter work, machine parts, complete machines. Send your blue prints. We can give good deliveries if anybody can. Low Overhead.

SCHROEDER BROS. MFG. CO.
Torrington, Conn.

Small Tool and Gauge Makers

Also have facilities for jigs and fixtures, machine parts and special machinery.
Send along your blueprints.
Prompt Deliveries.

WHITING & COMSTOCK
32 Union Place HARTFORD, CONN.

LATHE WORK

We are particularly well equipped to handle LATHE WORK in large or small quantities.
Also SHAPER, MILLING MACHINE and DRILL PRESS WORK.
High Grade Acetylene Welding.

JOHN GREEN & SONS
221-224 N. Market St. HOOPESTON, ILL.

BRASS CASTINGS

Castings of all kinds made to order. Specialist in bronze and brass. Let us figure on your requirements.

George N. Ferguson
Lake and Crown Sts. BLOOMFIELD, N. J.

Dies, Jigs, Gauges and Fixtures

SPECIAL TOOLS OF ALL KINDS
General Machine Work
BREMER & COMPANY
139 No. 7th St., PHILADELPHIA, PA.

DROP FORGINGS

"Quick Deliveries and Accurate Work"
We can also handle some kinds of Machining and Polishing.

Bonney Vise & Tool Works, Inc.
ALLENTOWN, PENN.

SCREW MACHINE PRODUCTS

Work up to 2¼" diameter can be handled with our increased facilities.
Send us your specifications.

Thos. H. Dallett Co.
1301 Federal St., PHILADELPHIA, PA.

PATTERN WORK for AIRPLANES

The Curtis Airplane Co. profits by our Pattern Department. Why not you? Specialists in wood or metal—20 years' experience. Good work done quickly.

THE NEWARK STAMPING AND FOUNDRY CO.
Plant No. 2. NEWARK, OHIO.

If your manufacturing requirements cannot be handled by firms now advertising, we should appreciate the opportunity of locating a firm that can render such special service as your business may demand. Our investigation of the contract situation as it now stands places us in a position in which we can be of valuable service to the manufacturers of the automobile industry. If interested, please communicate with the Contract Work Department, Automotive Industries, 239 W. 39th Street, New York City.

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Schatz "Universal" Annular Ball Bearing

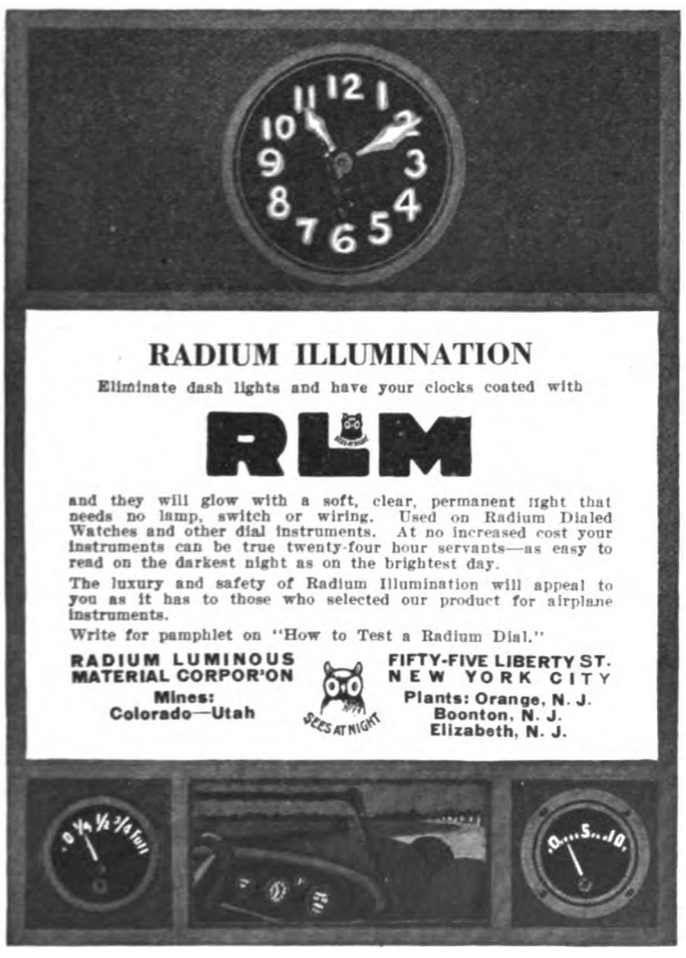
THE "Universal" is the culmination of 20 years of achievement in the manufacture of ball bearings.

It establishes a new standard for combined radial and thrust efficiency.

Our catalog and data sheets should interest all engineers of mechanisms having rotating members.

The "Universal" is made in metric dimensions to interchange with all internationally standardized bearings.

The Federal Bearings Co., Inc.
26 William Street Poughkeepsie, N. Y.



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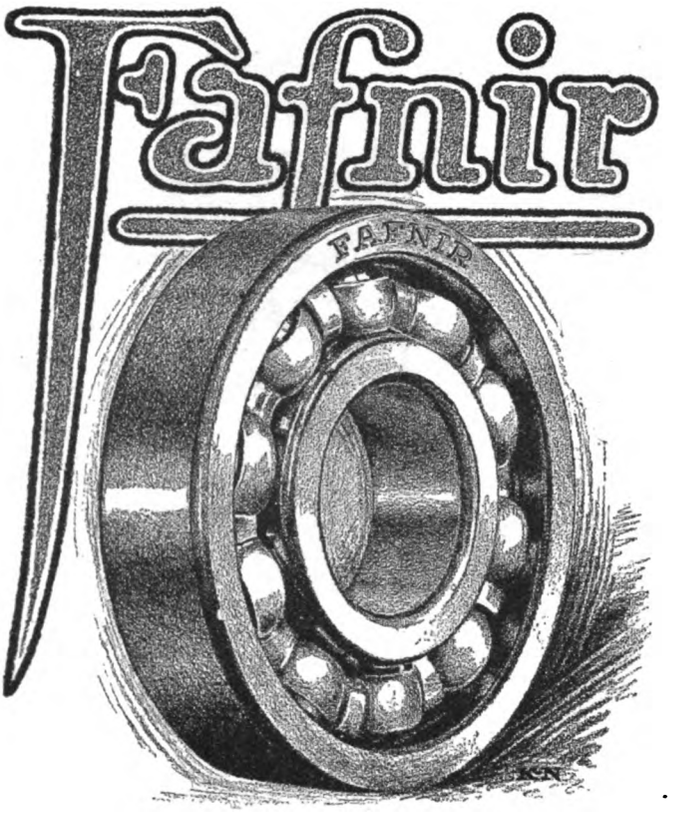
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Fafnir



Dependable Ball Bearings

THE FAFNIR BEARING CO.
CONRAD PATENT LICENSEE
NEW BRITAIN, CONN.



A Good Truck *Must* Have a Good Brake Lining

To the maker, the dealer, the user of trucks — ELEKTRA Asbestos Friction is of vital importance because it is the best Brake Lining that can be made. ¶With its inherent friction power, its ability to stand up under the stress of hard, constant usage and its entire dependability in emergencies—it is a protection against accident which adds mightily to the sum total of truck performance

ELEKTRA Asbestos Friction is made of the best selected materials and to exacting specifications. It is an interwoven fabric of asbestos and metal which is chemically treated to combine the heat-proof qualities of asbestos with the high friction of an indestructible material.

In spite of its unquestioned quality ELEKTRA is low in price. Our figures will prove extremely interesting to manufacturers.

Write us to-day

F. L. HORTON MANUFACTURING CO.
36 Whittier St., Boston, Mass.

ELEKTRA
ASBESTOS FRICTION

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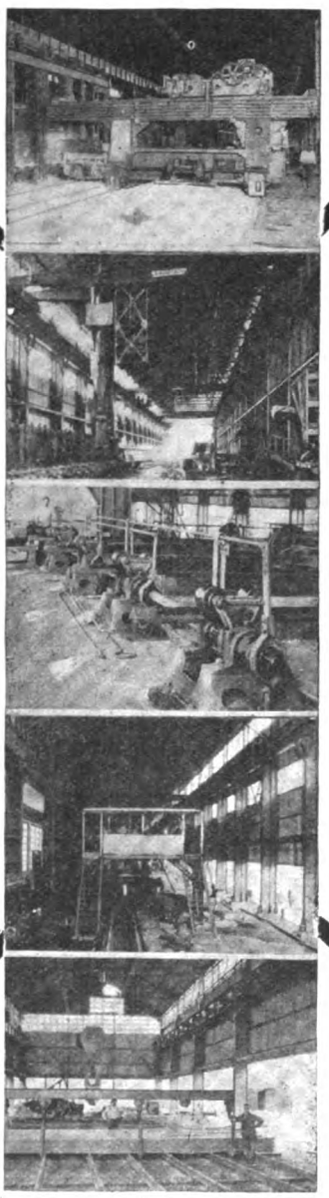
AGATHON
ALLOY STEELS

in the Plant

The plant of the Central Steel Company has been pronounced by steel experts and engineers to be the most modern and complete steel plant in the world. Here is to be found every appurtenance pertinent to the production of alloy steels of highest quality.

It is also the *first* plant ever designed in which every mechanical operation is carried out by electricity.

Exactness has played an important part in the upbuilding and maintenance of the superlative AGATHON quality standard; the complete electrification of our plant has made possible exactness never before known to the steel industry.



The CENTRAL STEEL Co.
MASSILLON, OHIO

SALES OFFICES:

Detroit Office: 326-27-28 Ford Bldg. F. Walter Guibert, District Representative

Cleveland Office: Hickox Bldg. The Hamill-Hickox Company, District Representatives

Chicago Office: 1370 People's Gas Bldg., 122 So. Michigan Blvd. C. H. Beach, District Sales Manager

Philadelphia Office: 603 Widener Bldg. Frank Wallace, District Sales Manager.

Syracuse Office: 601 University Block. T. B. Davies, District Sales Manager.

J. E. Dockendorff & Co., 20 Broad St., New York, General Export Agents.



AGATHON STEELS

AGATHON Chrome Steel
AGATHON Nickel Steels
AGATHON Chrome Nickel
AGATHON Vanadium
AGATHON Chrome Vanadium
AGATHON High Carbon
AGATHON Special Analysis

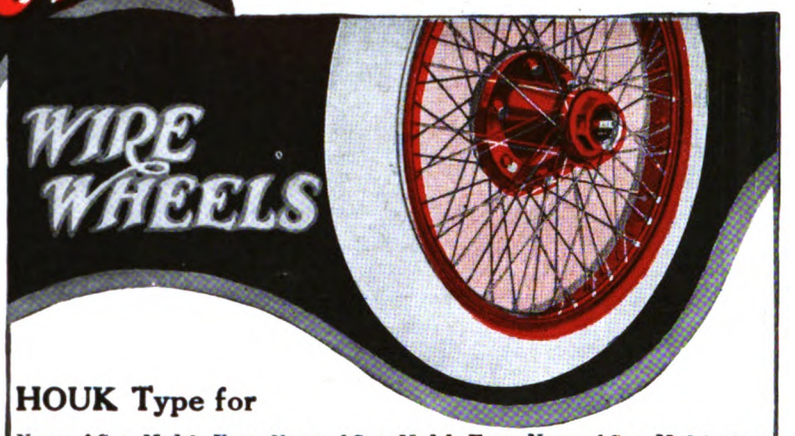
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2 Big Opportunities-



THERE'S a real profit opportunity in the sale of HOUSE type wire wheels for *Ford* Cars.

Ford distributors and dealers in *Ford* accessories need these wire wheels to round out their line. They should write or wire at once for our special service and sales proposition for HOUSE type wire wheels for *Ford* Cars.



HOUK Type for

Name of Car	Model	Year
Abbott	6-44, 6-60	1917
Anderson	6-60	1917
Anderson	Elec.	1917-8
Ap'rs'n R'dapl.	6-60	1917
Apperson	6 & 8	1917
Auburn		1917
Baker R&L.	G-A	1917
Barley	Roamer	1917
Biddle	D	1917
Bour Davis	17	1917
Briscoe	B-24	1917
Briscoe	4-48	1917
Buick	D-34-35	1917
Buick	D-44-45	1916
Buick	D-46-47	1917
Buick	E-44-45	1918
Buick	E-49	1918
Cadillac	55	1917
Case	40	1917
Chalmers	35C	1917
Chalmers	6-40or32B	1917
Chandler		1917
Chevrolet	8 cyl.	1917
Cole	8 cyl.	1917
Columbia	D	1917
Crow Elkhart	C-E-35	1917
Cunningham	V	1917
Daniels	A	1917
Darling		1917
Davis	Light 6	1917
Disbrow	Special	1917
Dixie Flyer		1917
Dodge		1917
Dorris	6 cyl.	1917
Dort	9 & 6	1917
Economy	4 cyl.	1917
Economy	8 cyl.	1917
Elcar	D. E. F.	1917
Elgin		1917
Empire	50	1917
Empire	70-70A	1917
Enger	Twin Unit	1917
Erie	33 & 34	1917
F. I. A. T.	55	1917
Franklin	Series 9	1917
Grant	K	1917
H. A. L.	21	1917
Harroun		1917
Haynes	6 cyl. 36	1917
Haynes	12 cyl. 40	1917
Hallier	186	1917
Hudson	Super Six	1917
Hupp	N	1917
Interstate		1917
Jackson	349	1917
Jeffery	472 & 671	1917
Jordan	60	1917
King	EE	1917
Kissel	100 point 6	1917
Kissel	12	1917
Kline	6-38	1917
Lexington	6-O	1917
Liberty	10-A	1917
Locomobile	R7&M7	1917
Lozier	84	1917
Lozier	82	1914
Madison	6-40	1917
McFarlan	127	1917
Mar. Handley	6-60	1917
Marmon	34	1917
Maxwell	25	1917
Mercer	22-73	1917
Milburn		1917
Mitchell	C-42, D-40	1917
Moline	Knight	1917
Moon	6-66	1917
Moon	6-43	1917
Murray	70-T	1917
National	6 & 12 cyl.	1917
Oakland	34	1917
Oakland	50	1917
Olds	37	1917
Olds	45	1917
Overland	75-75B } 90CC-90T }	1917
Overland	85-A85-6-89	1917
Ov'l'd	86-B-88-4-88-8	1917
Owen Magnetic	O-36	1917
Packard	225 & 235	1917
Paige	H-6 & K-6	1917
Paige	G-6 & J-6	1917
Pathfinder	3-B	1917
Patterson	6-45	1917
Peerless		1917
Pierce	6-48, 6-66	1917
Pilot	6-45	1917
Premier	6-B	1917
Pullman	4-24	1917
Regal	J. F	1917
Reo	R	1917
Roamer		1917
Ross	C	1917
Saxon	S-4	1917
Scripps	4 cyl., 8 cyl.	1917
Singer		1917
Standard	E & E	1917
Stanley	Steamer	1917
Stearns	32-33-Sk-8	1917
Studebaker	SF&ED	1917
Stutz	R	1917
Velie	28	1917
Vim		1917
Westcott	S-17, U-50	1917
White 16 valve	4 cyl.	1917
Winton	22-A	1917

Additional Models

In addition to this list we can supply sets of wire wheels for the majority of these makes of cars of older models.

Service and Sales Agency

Established dealers can secure the Wire Wheel Service and Sales Agency where territory is vacant.

The large demand for wire wheels is rapidly growing larger. Owners of cars of all makes are realizing the safety, comfort, easy handling and-tire-and-fuel-saving, in addition to the familiar advantages of attractive appearance and quick tire change.

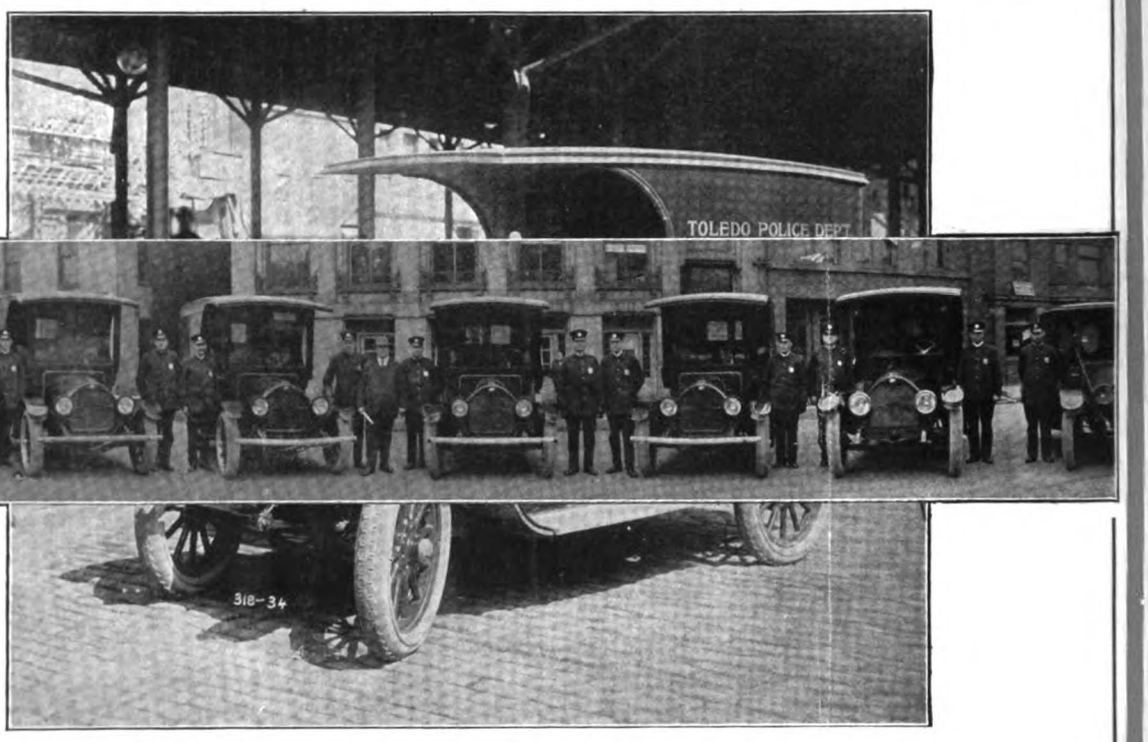
For dealer proposition address

Wire Wheel Corporation of America
(Successors to Houk Mfg. Co.)
835 Eleventh Avenue, at 57th Street, New York

In Ordering Wheels or Parts

Always specify make, model and year of car. Also size and type of tire, whether straight side or clincher, with diameter of hub cap at threads. This information should accompany every order for any part.

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PROTECTION

TOLEDO Police Department Cars see real service—not because Toledo is more wicked than other cities, but rather because Toledo ideas of efficiency permit few cars to do silent duty in a station garage.

The emergency cars of the Toledo fleet are Overlands. They weigh 3950 pounds, light. The overhang is 3½ feet. There are always two people in the driving seat when the car is on the road, and frequently as many as ten in the car.

McNaull 33x4½ tires are the equipment on all four wheels of every car. With sixty pounds of air to the tire, McNaulls are averaging more than 8000 miles in this severe service.

The work of a police department demands action that is quick and positive, and to obtain that kind of service city governments can well afford to pay more. Actual figures prove, however, that McNaull Tires cost the city of Toledo far less per mile than any other tire, and assure an almost faultless service. The Chief has the figures. For additional information write The McNaull Tire Company, Toledo, Ohio.

McNaull

"The Name of a Good Tire"

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Stanford Library
SEP 17 1938

AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Vol. XXX[illegible] No. 8 NEW YORK, FE[illegible] a year

Dealers Who Delay Taking Cars Now

Will Face a Shortage When the Active Selling Season Starts Shortly

This not being an active selling season, it is quite probable that many dealers do not realize the seriousness of their position as it concerns the future. Every year at this time it is the custom of many dealers to refuse to make any definite arrangements for cars. They have been in the habit of waiting until the demand develops, and then going to their distributors for such cars as they need. They have not been taking any cars lately, and therefore probably do not realize what effect freight embargoes and other influences have had in curtailing production.

It has been impossible to make the usual overland drive-aways from the factories this winter. No dealer has any stock of Hudson Super-Sixes. The production of the new series was started in December. For days, in common with all other manufacturers, we were unable to ship a single car either by freight or by express. Several days have been taken out of production because of the coal situation. It is time taken out of a period when advanced stock is being produced for the spring demand.

With production cut forty per cent. and no one able to guess what further curtailments may be necessary because of freight, labor, coal, the war and other influences, and with the country just getting under way in the greatest distribution of money it has ever known, the prosperity is going to those automobile dealers who have the foresight to get cars just as soon as they can.

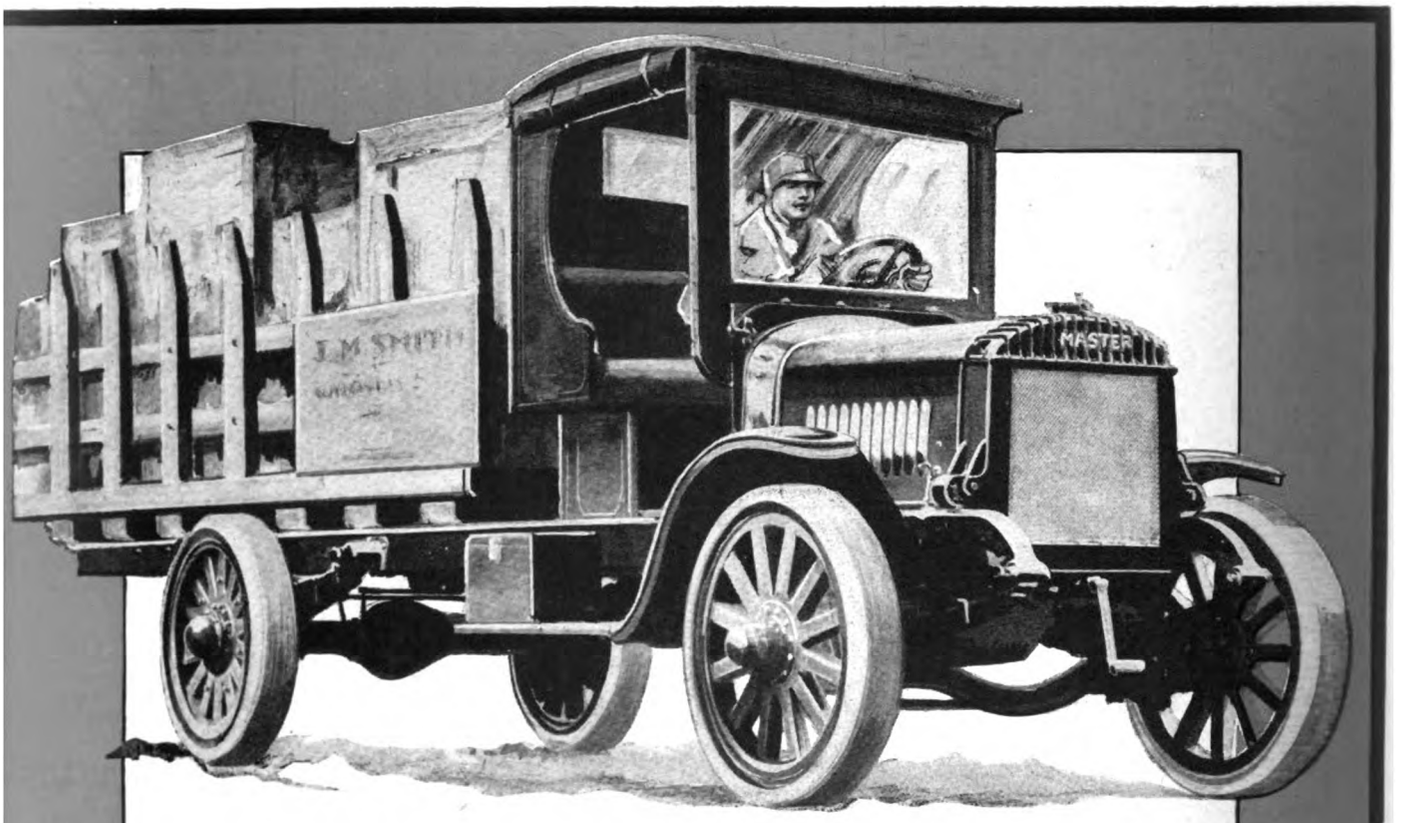
Hudsons in stock are like wheat in the bin.

HUDSON SUPER SIX

HUDSON MOTOR CAR CO.
Detroit, Michigan

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The Master

Master in power, Master in strength, Master in economy and Master in performance. Those are the qualities that make Master Trucks the leaders of the Motor Truck field.

MASTER of the Load on Any Road

Trucks hold the big future of the motor car industry. Don't risk your reputation or your profits by selling a truck your factory cannot deliver. Sell the MASTER, the truck that is *delivered on time.* Write for dealer proposition.

2 Ton . .	$2190	5 Ton . .	$4490
3½ Ton . .	$3590	Tractor . .	$2450

MASTER TRUCKS, Inc.
3141 S. Wabash Ave. **CHICAGO**

MASTER TRUCKS

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BOYCE MOTO METER



STANDARD MODEL
In beautiful black gloss enamel with heavy beveled glass crystals protecting the instrument. Price $10



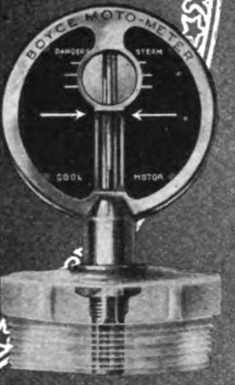
OVERLAND MODEL
Same as Standard Model, but specially constructed to fit the radiator of Overland and Willys Cars. Price $10

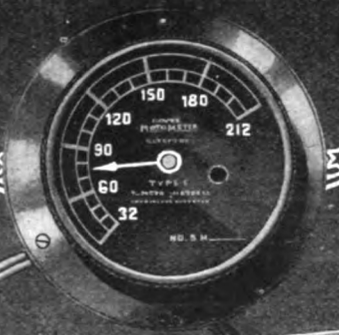
JUNIOR MODEL
With heavily nickel-plated rims adapted for medium priced cars. Price $5

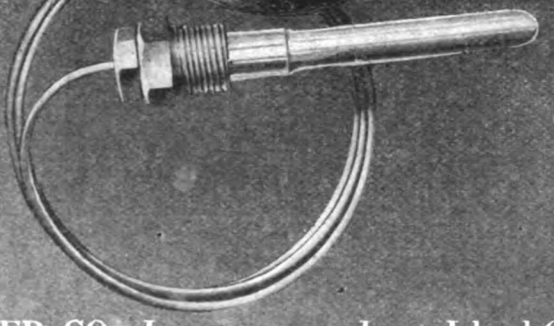


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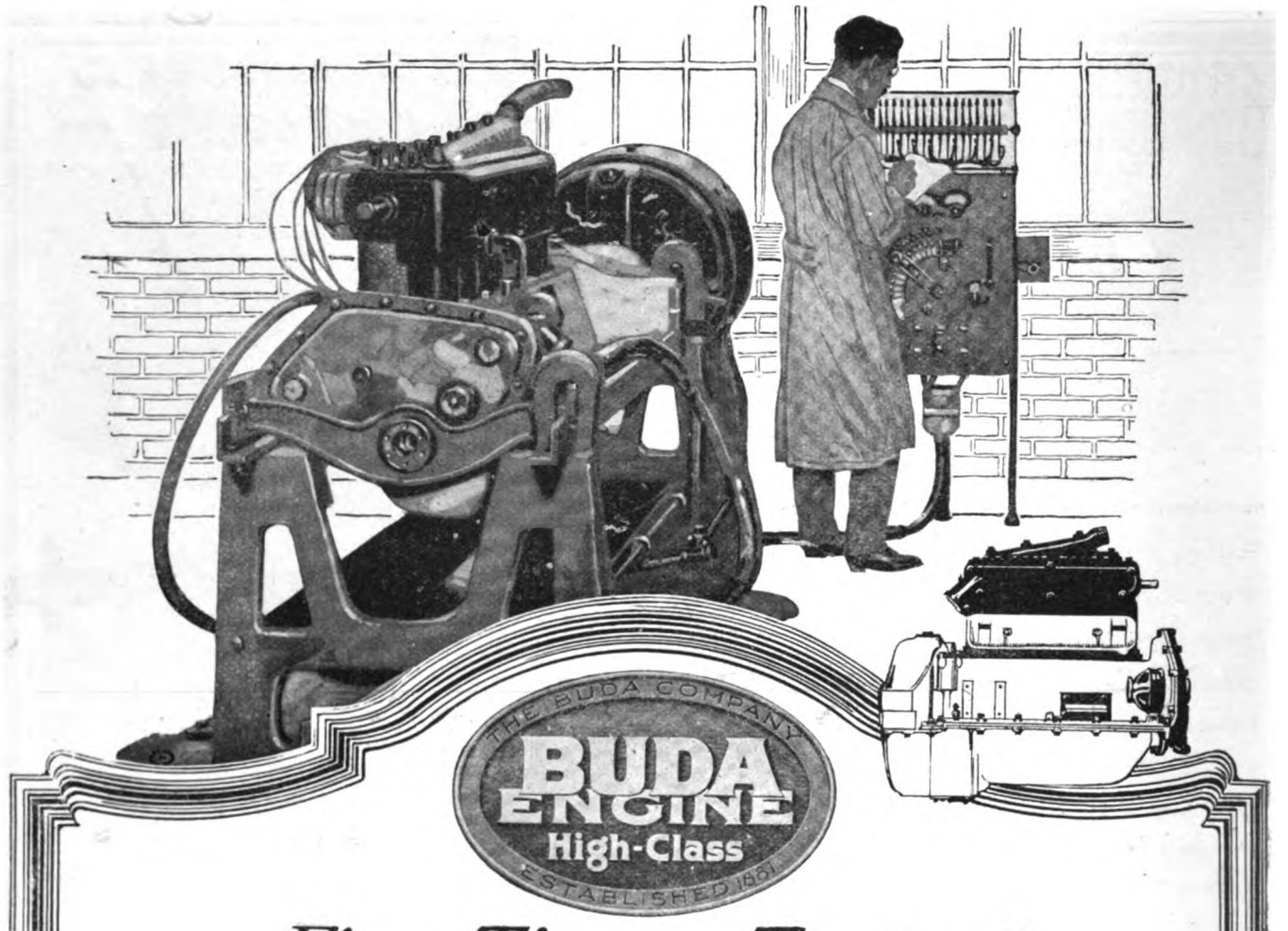






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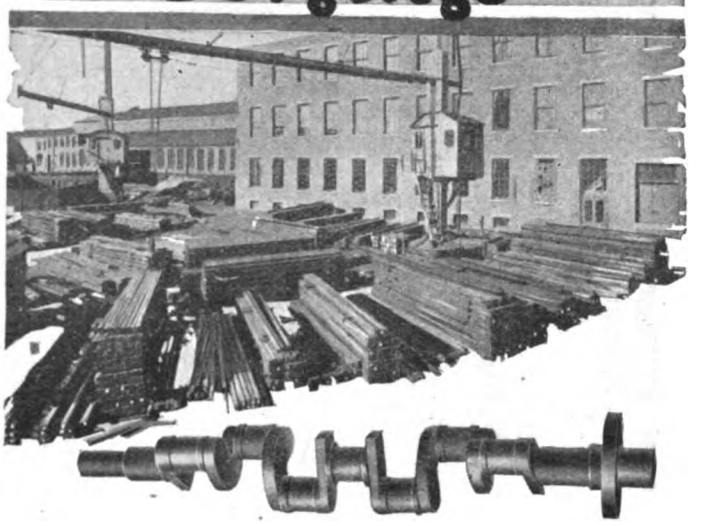
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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XXXVIII NEW YORK—THURSDAY, FEBRUARY 21, 1918—CHICAGO No. 8

Specialization Helps Tractor Industry

Automobile Practice Exerting Its Influence on Tractor Design—Makers of Parts and Accessories Doing Their Part —New Tendencies Revealed at the Two Big Tractor Shows

By David Beecroft

KANSAS CITY, Mo., Feb. 16.—The influence of automotive engineering on the farm tractor industry was well exemplified at the special tractor show which has been running all week and came to a close here this morning, and also at the show held in the Twin Cities last week. Between the two shows upwards of 90 per cent of the tractor industry was represented and this representation included all the large makers with the exception of the Ford, which was not represented at either show.

The interest in the tractors in both cities was greater than that in automobiles and trucks. This was natural, because of the shortage of farm workers and government demands for greater crop acreage this spring, with constantly increasing acreage during the period of the war.

Tractor engineering has made material progress during the past year, both as regards improvement in design, the use of better steels, greater use of anti-friction bearings, more efficient engines, reduction in weight, a better distribution of weight over front and rear heels, and in the more efficient protection of parts from dust and water.

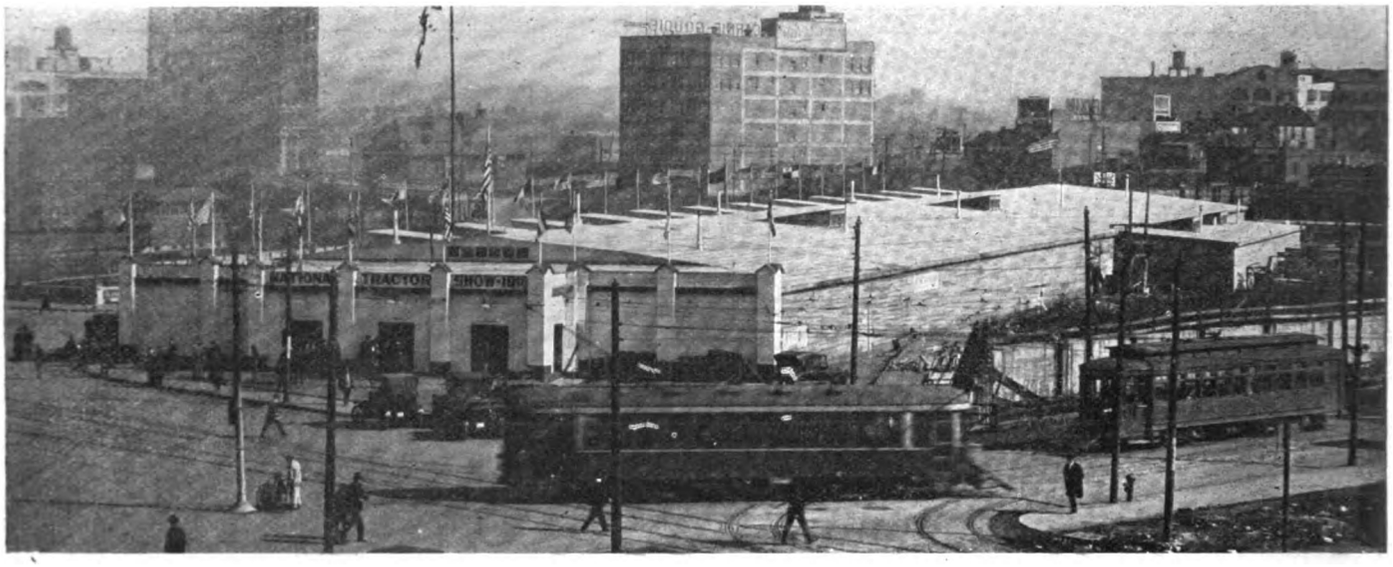
Improvement Largely Internal

The story of improvement does not appear nearly so much on the surface. Externally a machine may be just about as it was a year ago, but Timken or Hyatt bearings may carry the steering and driving wheels in place of the plain bearings used a year ago. It may have an engine that has been revamped in the last year to burn kerosene more efficiently and has water jacketed spark plugs, more water space over the cylinder heads, detachable cylinder heads, looser fit pistons, larger crankshaft bearings, perhaps force feed engine lubrication, a new design of gearset with forged gears and ball or roller bearings. These are some of the more important changes that have taken place within the last year. It is a story of the influence of automobile engineering practice, but the improvement has been general, and concerns never connected with the automobile or motor truck industry have profited substantially by designs from these industries.

Many New Tractor Concerns

The unprecedented and unexpected demand for tractors has resulted in many concerns entering, and in this respect it is easier for new firms to enter the tractor industry to-day than it was for concerns to enter the automobile and motor truck industries at a similar period in their development. This is due to the ease with which tractor assembly can be carried on already. Thanks to the production lessons of the automobile industry, there are already makers profiting by the experience of five or six years ago in the automobile industry, and are making parts for tractors. Thus you can secure radiators of tested quality, and there is no activity among tractor makers, excepting those building unusual types of large machines that demand extraordinary capacity. There is not that tendency that existed in the automobile industry years ago for a new concern to develop its own type of radiator. The radiator man has already solved that, and radiator design and construction are in step with the

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A special building was put up for the Kansas City Tractor Show and, though it cost over $18,000, it has been one of the best investments ever made by the trade. There were forty-three different makes of tractors on view

highest standard set in the development of the tractor.

The ease with which tractors can be assembled is further assisted by the engine development. Those engine makers who have built for automobiles and trucks have for several years been working on tractor engines and have been wrestling with the difficulties of handlng heavy fuels. To-day they have engines ready for delivery to the tractor industry. They are generally large engine concerns with capacity, but several new firms which will specialize on truck and tractor designs have sprung up. The entire knowledge of truck and automobile engineering has already been swung into tractor engine development.

What is true of engines is also true of ignition apparatus. The magneto, battery ignition, generator, starter and battery engineering practice has already taken hold of the tractor industry. The first tractor with electric starting has been on the market for some time and is manufactured in large numbers. Magneto makers have risen to the occasion to provide dust-proof and waterproof magnetos, and at the show here Remy showed its new tractor job with a spray of water constantly playing over it and another of the same design operating under a bell jar into which was injected a dust cloud.

Ball and Roller Bearings Increase

Bearing manufacturers—both ball and roller—have been active in the tractor field. Hyatt deserves credit for the pioneering work done as well as for the co-operative work carried on with tractor makers. To-day all of the ball-bearing interests are doing excellent work, and their bearings are finding increasing use in gearsets and other parts. The manufacturers of other kinds of roller bearings have been in the field, and their bearings are now found in many parts of different tractors, particularly in the gearset and on the transmission shafts.

The same can be said of carbureter makers, who brought into the tractor field their former experience and added the knowledge they had on kerosene. In handling kerosene the research work of the Wilcox-Bennett organization has been very potent in maintaining the correct perspective in using heavier fuels, and while the kerosene problem is still far from a final solution, in that there is not a job that operates anywhere near as satisfactorily as on gasoline, a great deal of progress has been made, and—best of all—the big job in handling kerosene efficiently has been impressed on several makers of carbureters as well as on makers of tractors.

With all of this so-called latent automotive energy back of the tractor movement, it is not surprising to find tractor assembly moving much faster than might be expected, and it is not surprising to find in these assembled jobs the last word in modern design and practice. It is a fortunate coincidence that there are so many tested and tried-out units that the assembler can secure, as it should result in that needed speeding up of production which the exigencies of war demand.

There is perhaps one respect in which there is a shortage of tried and tested parts and where the assembler has not that breadth of selection that he has in purchasing engines, magnetos, bearings, radiators, carbureters, etc., and that is in the gearset design. The automobile and truck gearset designer has not been working on the tractor requirements and consequently his jobs are not seen, but their place is largely taken by individual designs developed by the different tractor makers to meet their individual requirements.

Some Gearset Specialists

There are, however, firms that specialize on tractor gearsets, and two companies in particular, Foote and Nuttall, have developed new designs intended to permit the use of live rear axles in conjunction with larger diameter wheels. The Foote gearset permits of using a 60-inch rear wheel mounted direct on the live axle, and the Nuttall design was shown in tractors with 48-inch rear wheels. Neither of these new designs has been tested out, and so the immediate future of the gearset is not a settled point. There is, however, little doubt but that the live axle design will be accomplished in conjunction with a gearset and the necessary wheel diameters for soft-ground use that will give all the reduction needed without undue tooth pressure. The job is not yet done, and tractor gearsets offer an attractive field for design.

Still further, a department that is holding back tractor assembly is the frame design. There is no such thing as a standardized tractor frame. Each frame has been worked out to meet the ideas of the designer. There was only one tractor at the Twin Cities and Kansas City shows that had a heat-treated, pressed-steel frame, and that was the new R. & P. job, the product of the Republic Truck Co. It has a very simple design, with side pieces

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bottle-necked slightly in front and then dropped to pass below the back axle. The front cross member is an inverted arch affording a trunnion support for the engine and in turn resting on the center of the axle. The new National tractor, not seen at either show, also uses a pressed-steel frame. Nearly a dozen tractor makers admitted that they were waiting for some firm to bring out a good design of pressed-steel frame, and that just as soon as this happens they will drop their rolled channel job, or their cast-steel job or their made-up contraption and take on the pressed-steel design.

Front axles also offer a good field for the axle maker. The time is ripe to bring out some standard designs of axles. The use of roller bearings in the wheels will hasten the standardized axle. Practically a straight forged design, with Elliott or other types of ends, will fill the requirements.

Tractor Classifications

With such fairly satisfactory avenues to secure tested and proven units, it is not surprising that many new tractor firms should be on hand and that they should have quite reliable jobs. There are perhaps ten of such.

The development of the year has not been confined exclusively to the new assemblers, as many of the old-line makers have improved, although there is one class where the design is not in any way associated with automobile or truck practice, where the development is not so pronounced.

The tractor field literally divides itself into two broad classifications, with a third class occupying a middle position between them. Thus one class may be designated as the farm-implement design, the other the automobile design, and between these the middle class.

This classification does not mean that firms making farm implements follow the first division; in fact, the opposite is the case with several houses, and some of the farm-implement makers have been leaders in exploiting the automobile design; witness Case, Wallis and Rock Island.

On the other hand, there are the implement makers that have a distinctive tractor design, and these constitute the first group. In this are International Harvester, with its Mogul and Titan models; Avery, Rumely, Hart-Parr, Waterloo Gas Engine Co., Fairbanks, Morse & Co. and some others.

In the automobile classification are such names as Case, Wallis, Ford, Samson, Cleveland, Velie, Bates, Four Drive and several other new names that have come to the front in the last few months. In general this classification adheres to general automobile arrangement with the four-cylinder engine, radiator, gearset and axles in practically the same general layout as in an automobile or truck. They use automobile or truck design of units and aim at the same standard of materials, bearings, weight reduction, etc.

Then comes the intermediate class, including all designs that are in the nature of a compromise between the farm machine idea on the one hand and the automobile idea on the other. In this classification might be placed such firms as Emerson-Brantingham, Twin City in its smaller models, Parrett and some others. They were developed very largely in a machinery atmosphere, but have absorbed very liberally of the best automobile practice, and all have most efficient machines, leaders in their respective fields. They use the four-cylinder engine, but in transmission and chassis details are not quite in the automobile classification.

With the first classification, the agricultural machinery class, the use of the twin engine, or the single-cylinder design, both horizontal, is general. These are generally large-size engines, with cylinder ranging from 6 to 8 in. in bore and with proportionate strokes. They are heavy constructions and bear little if any resemblances to automobile engine design. The transmission systems are proportionately heavy, with many exposed gears and cast gears used in place of forged designs. The use of anti-friction bearings is not general.

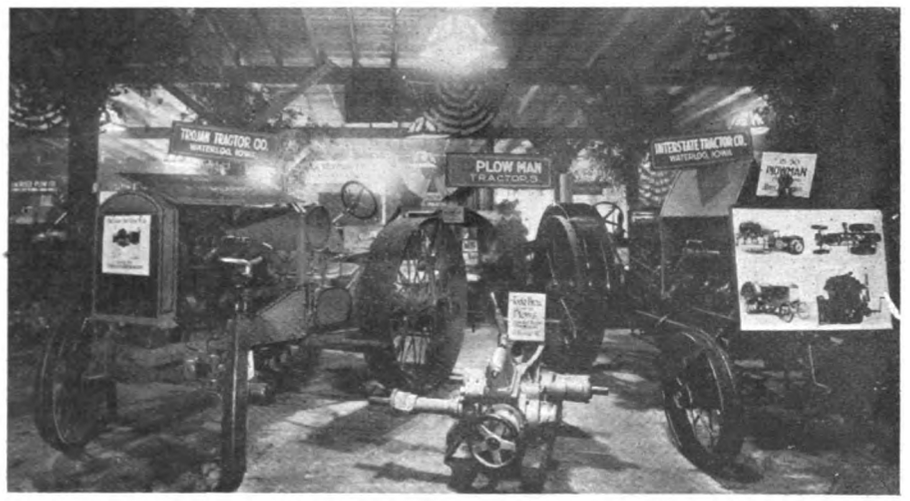
Just when these three divisions will come together or in what form is not within the scope of this show report, but it will form one of the most interesting developments of the future. There are in the farm machinery classification those huge designs of tractors that pull ten or a dozen plows, machines which have wide use in the large areas of the West, and there is some speculation whether these machines will continue or some smaller form of automobile design will take their place.

Two Schools of Engineering

The farm machinery or implement classification and the automobile design represent two entirely different schools of engineering, and the rule that will determine the future of each is the law of the survival of the fittest. There is no doubt that there is some feeling between the two classifications. The farm machinery classification had the field by virtue of priority of manufacture, and what the automobile classification has achieved has been obtained by later manufacture.

There are not a few problems in tractor development that are yet remote from a satisfactory solution. One of these is that of weight and another is wheel diameter and necessary gear ratios. There is practically no definite group that is settled on wheel diameter, and the fact that some of the latest designs range in wheel diameters from 42 to 60 in. indicates the variety of thought.

Exponents of high-wheel machines, say 60-in. diameters, do not think that it is possible to perform all farm work with wheels that are much less than this in diameter. They point to the early plowing necessary for oats, where a field must be plowed before all of the wet spots have dried up, and that a large-diameter wheel is necessary for such work. Some others point to the wheel



A corner of the Kansas City tractor show

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diameter necessary for rice farming. Others point to the still greater need for some form of farming where great moisture of soil is essential. The fact that we have with us creeper types, fashioned after the Holt caterpillar; that we have 42-in. wheels, 48-in. wheels, 56-in. wheels and 60-in. wheels on machines intended for practically the same work is evidence of work yet to be done before the eventual is reached.

The question of wheel diameter and tractive effort and drawbar pull is closely associated with that of weight, and nothing definite exists as to the most desirable weight for a three or four-plow tractor. Scarcely any two engineers agree. They are not entirely settled in their own minds.

One concludes that weight up to a certain point is necessary for traction and another holds a different view. One admits that a small-diameter wheel will pull its load on good soil, but not on sandy or soft soil. What is needed is a good series of official tests in which every tractor will be put through the same series of tests that will embrace different soil conditions. This has never been done as yet. Such tests would answer many of the questions that are being asked regarding the performance of creeper machines in different soil conditions. A few strenuous tests such as the automobile industry had in its early days are needed to-day in the tractor business.

Undoubtedly different designs of tractors will be the eventual solution. It is the history of all industries that at first there is the blanket type of machine that is sold as suitable for every kind of job, but later as the industry develops differentiation sets in and efficiency dictates that it is economically more sound to adapt different designs to different uses.

With the tractor industry we are in that stage where too many makers would like to sell their machines for every kind of soil and would interpret it as a weakness if they admitted that their machine is not suitable for certain localities. This is unfortunate, but it is the price that all developing industries have had to pay for the short-sighted maker.

Differentiation in the tractor industry will be accelerated by good tests, tests which will show efficiency of design, the practical phases of design and the commercial aspects of design. As the motor truck industry developed we watched differentiation take its place. The same was true of the automobile. The same has been taking place with amazing speed in our aviation program. We are witnessing the same in the motorcycle field, and we must not be surprised at it in the tractor field, where we should take no injudicious steps to combat it.

Tractors Show Mechanical Refinement

New Gearsets Permit Use of Large Wheels with Live Axle—Weight Being Reduced

KANSAS CITY, Feb. 16—The newest thing at the Kansas City tractor show was the R. & P. tractor built by Ruggles and Parsons, the moving spirits in the Republic Motor Truck Company. This tractor is perhaps the best exemplification of automobile influence on tractor design and is the first tractor to use a pressed-steel frame, heat treated; it has a special design of Torbensen internal gear drive for tractors, and uses the Italian type of wheel. This tractor represents very close adherence to automobile design in the arrangements of all its parts.

A new tractor, which has not in any sense originated from automobile men, but rather from tractor men, is the Trojan, in which the most important feature is the new Foote gearset, which, with its combined live axle, permits of using 60-in. driving wheels, a greater diameter than has ever been used before with a live axle design. Spring drive in the rear wheels to relieve the gear teeth of shock is used. In working out the job John B. Foote, of the Foote Brothers Gear & Machine Company, has kept tooth pressure low, but has a gearset of considerable weight and employing upward of twenty gears. His reductions are in five stages, the greatest being 16 to 1. A planetary system is used in conjunction with a sliding set, and one bevel reduction at the front end.

The set affords three forward speeds, which in miles per hour approximate 1.5, 2.12 and 4.3. By changing a set of two gears which are outside of the case, but yet enclosed, it is possible to change the entire speed ratios and give a higher ratio of speed, as 2.2, 3 and 6 m.p.h. The cost of an extra set of these two gears is $16, and by this additional investment the farmer has a tractor with a range of six forward speeds.

To change this set of gears calls for removing a plate on the side of the gearbox and not more than 15 minutes' work. An increase in draw-bar pull of 50 per cent is obtained by this arrangement.

The Foote unit is more than a gearbox and rear axle combination and has a forward extending cradle which supports the engine, constituting in reality about seven-eighths of the tractor frame. The front end of the gearbox ends in a bell housing to fit the corresponding end on the crankcase, S. A. E. standards being used.

All gears in the set are .15 to .25 carbon forgings and are heat treated except the ring gear on the differential, which is a semi-steel casting. The Foote company plans to manufacture this gearset in two models, one for three-plow jobs and the other for six-plow jobs.

The Nuttall Gearset

Another new gearset, and one designed for live-axle drive, was exhibited by the Nuttall company, gear makers. It is a combination with the live rear axle and all gears are forged and heat treated and shafts are carried on roller bearings. This set, suitable for a three or four-plow tractor, gives two forward speeds and is claimed to serve with a 52-in. drive wheel and a motor speed of 850 r.p.m. With an engine speed of 900 r.p.m. and 48-in. wheels tractor speeds of 2.5 and 3.5 m.p.h. are given.

This gearset has two gearshafts in front of one paralleling the live axle which is incorporated in the gearbox. At the front end is a bevel reduction from the clutch. The first shaft carries the large bevel and a pair of sliding gears. On the second shaft are two large diameter spurs and the differential. The ends of this shaft carry the small pinions meshing with the large master

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gears on the live-axle shafts, which are 22 in. in diameter and 2.25 in. face.

The set complete weighs 1300 lbs. and will be in production for Fall delivery. This gearset is used in the Sexton, a new tractor made in Asbury Park, N. J., and in this job 48-in. wheels are used.

There are many other examples of what changes have taken place in the past year, changes which tell in unmistakable words that the tractor is here and the looked-for development is rapidly under way.

Two-Wheel Designs

Four two-wheel tractors have been shown this year, the leader being the Moline Universal, which has not been changed in design; the Square Turn, a Chicago design, which uses very large wheels and carries the plows underneath the frame; the Noble, of Kansas City, which uses a Continental block engine carried on a framework swung between the two 60-in. wheels, and the Beeman, which is a miniature cultivator resembling a hand one.

New Creeper Type

The Belt-Rail, as its name suggests, is a creeper type with two steering wheels in front. This has been developed by the Beltrail Tractor Company, St. Paul, Minn., by the interests that make Crex matting. This concern used 3600 horses on its farms where the special grass for making this matting grew. It required a machine that could operate well on soft ground to do the work, and the creeper type is the result. The design has been well worked out, using a four-cylinder Waukesha engine, a two-speed transmission, with Hyatt bearings, worm-and-segment steering, Bennett air cleaner, etc.

Features of Some of the New Tractors

THE J. T. tractor, the first model of which was brought out two weeks ago, is a wheel-less creeper design with a long creeper on each side having 57 x 8 in. ground contact. Each creeper rides on a train of idler pulleys and is driven from a large rear gear that in turn receives its power through an internal gear drive entirely inclosed. Steeeing is by use of internal brakes acting on the differential, one brake on each half of the differential.

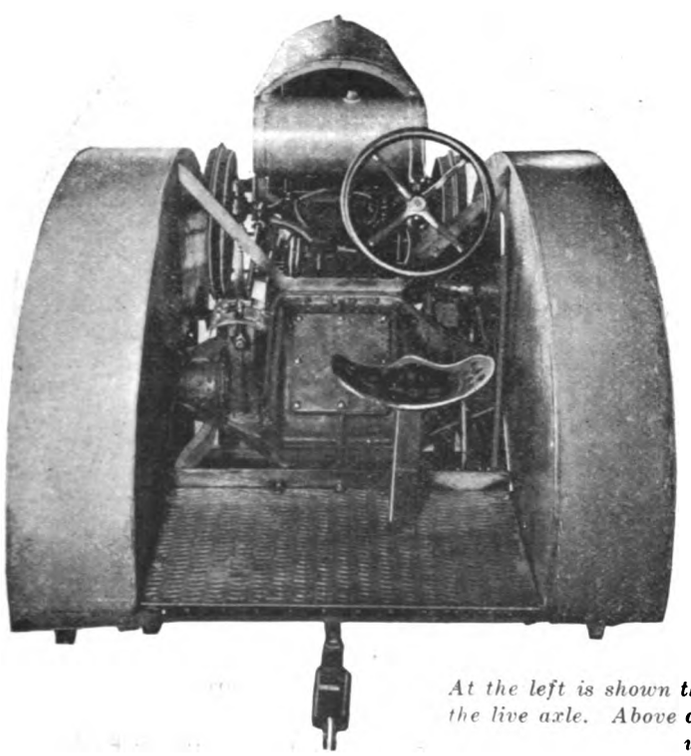
The four-cylinder, block, valve-in-head Erd engine burns kerosene, the J. T. carbureter working in conjunction with an exhaust jacketed manifold. With the engine at 800 r.p.m. the three forward speeds are 1.25, 2.5 and 5 m.p.h. The gearset is made by the Detroit Gear & Machine Co. and the jackshaft by the American Ball Bearing Co.

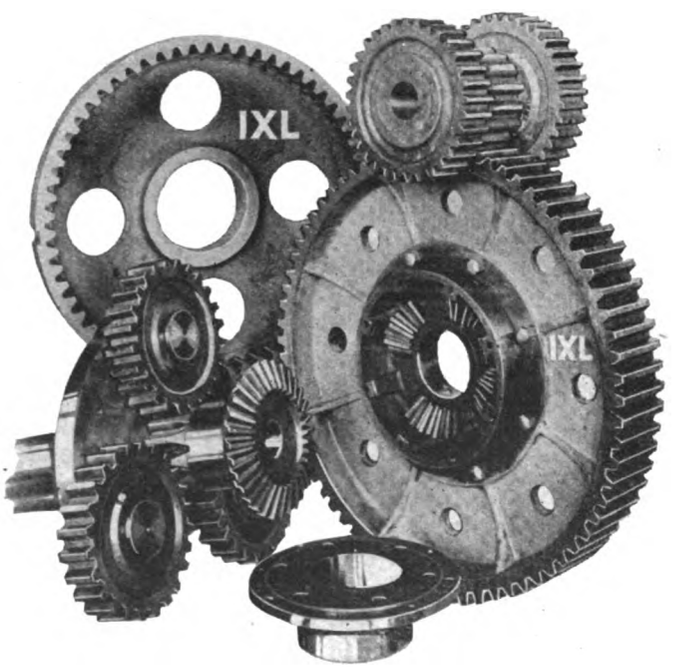
The J. T. Tractor Co., Cleveland, Ohio, occupies a three-story plant and hopes to assemble 5 machines per day in 6 months. George P. Comey is president, J. J. Tracy, chief engineer, H. L. Lance, general manager and C. E. Grove, salesmanager. The company has not yet built up its distributing organization.

Fair-Mor is the new tractor name for Fairbanks. Morse & Co. the large builders of railroad supplies, including a line of gasoline engine trucks for section work, which have been marketed for many years. The Fair-Mor tractors have been made for several years, but largely for export, and have only now been introduced into the great Mississippi farming belt. There are two models, both of which burn kerosene and use twin-cylinder engines of slow-speed design (400 to 600 r.p.m.).

The larger model, a 12-25 job for three plows, is built as an imitation of a steam traction engine, with the cellular radiator as the body, the twin-cylinder engine lying on top of the rear end of the radiator and the gearset and fuel tank forming the firebox. The rear wheels are 56 by 18 in. and the engine cylinders 6.5 by 8 in. The radiator is closed at its front end and the air enters through the rear and travels forward, escaping through the funnel on top. This air circulation is maintained by the exhaust, which escapes at the front of the radiator and also in the base of the funnel, thus creating an air draft.

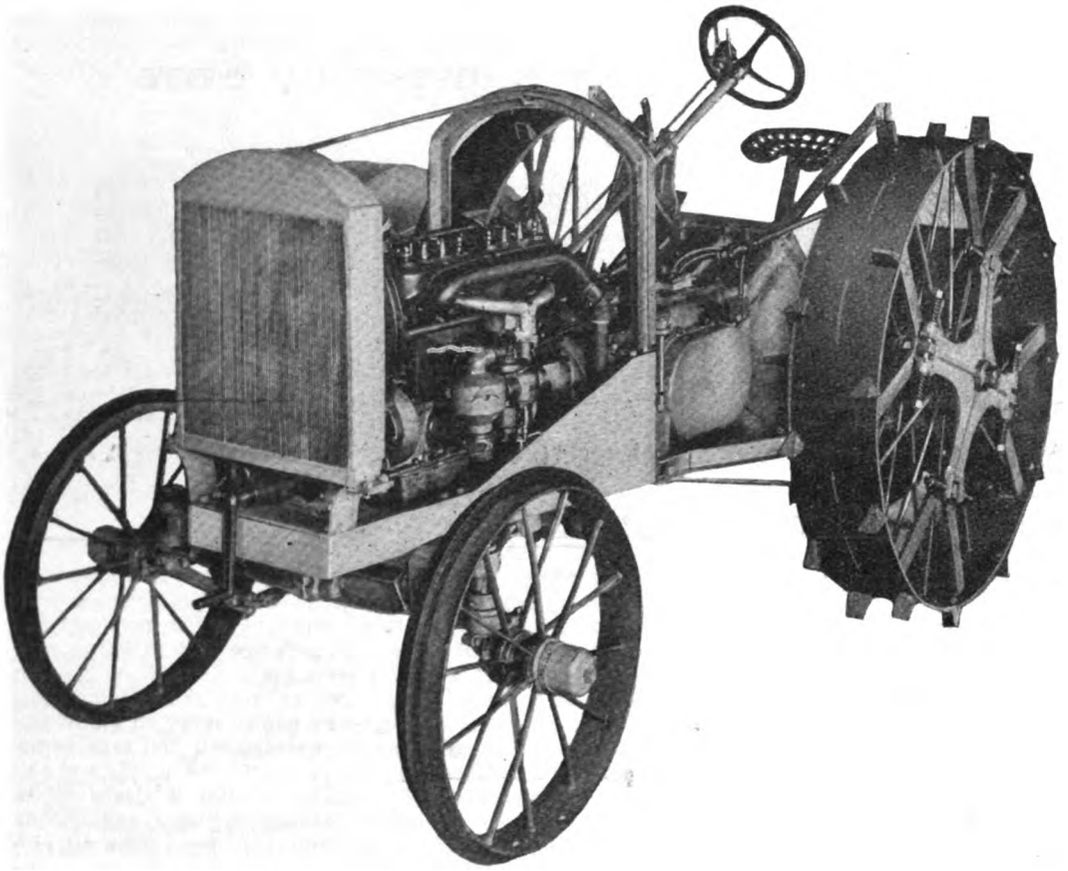
Kerosene is pumped by plunger pump into a globular chamber of about carbureter size at the front end of the engine, or close to the cylinder heads. This globe is heated by the exhaust, and as the kerosene is sprayed into it hot air also enters to take up the kerosene. On its way to the cylinders a current of cold air is added to increase the power. A butterfly throttle controls the flow of mixture. The radiator capacity is 100 gal. and the total weight is given as approximating 5500 lb.





At the left is shown the rear of the Trojan tractor and the housing for the live axle. Above are the component parts of the Foote gearset with which the tractor is equipped.

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The Trojan tractor is one of the first to have very large drive wheels used in conjunction with a live axle. This is made possible by the use of the new Foote transmission, component parts of which are illustrated on the preceding page

The smaller Fair-Mor model is a conventional design but much the same in principle, using a twin-cylinder 6 by 7 in. engine, which runs at 600 r.p.m. Its rating is 10-20 and, like its larger brother, it has large drive wheels with inclosed drive. It has direct pulley drive for belt work.

Coleman Worm Drive

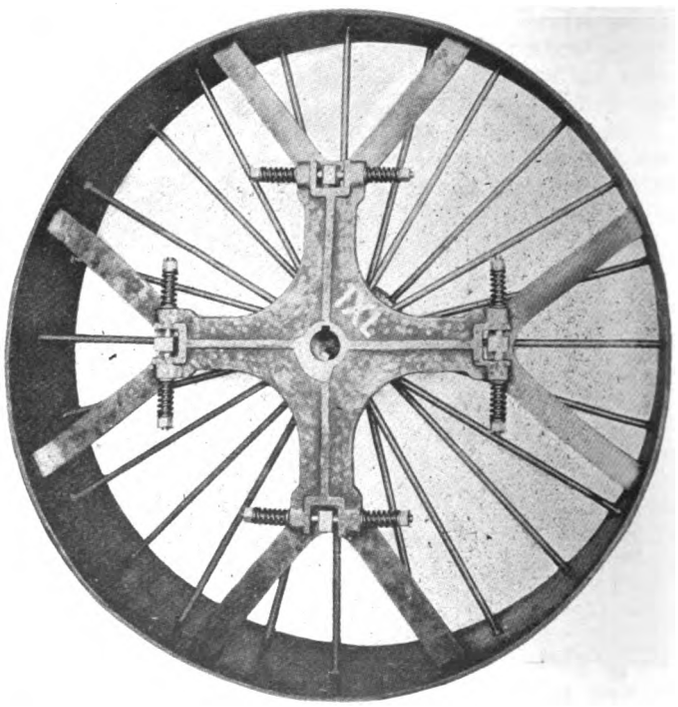
One of the few worm drive tractors aside from the Fordson, the new name for the job made by Henry Ford and his son Edsel, is the Coleman, of which perhaps thirty have been made to date, although development work was started several years ago and manufacture begun a year ago. The worm mounted on top of the wheel in the rear axle is used in connection with a two-speed gearset. The worm and wheel give a reduction of fifty to one. The wheel is 26 in. in diameter, and the worm 4 in. in diameter, six teeth of the wheel being constantly in mesh with the worm. The worm is mounted on Timken bearings and has special provision for lubrication. The live rear axle is carried on Hyatts, as is the differential.

The engne is a four-cylinder block Erd. Forged gears are employed in the gearset. The rear wheels are relatively small, 42 in. in diameter on the small model and 46 in. in diameter on a larger model.

Plano Tractor

The Plano Tractor Co., Plano, Ill., began tractor development 2 years ago and have just started production on a new four-wheel design using a 4¼ by 5½ Buda engine, which drives through a Plano design of gearset to the rear drive wheels, which are 42 by 12 in. There is a total reduction between the engine and rear wheels of 49 to 1. The front wheels are also large diameter and having the frame very narrow at the front gives the job good maneuvering ability. The frame is cast steel and almost yoke shaped with the narrow end or stem of the yoke in front. The weight distribution is such that 30 per cent is over the front wheels and 70 over the rear. The drive wheels carry large manganese steel gears which are intended to be run without lubrication and are guaranteed for 2 years. In the two-speed gearset cast gears are used and shafts are carried on Hyatts. The radiator is back of the engine and just to the left of the operator's seat.

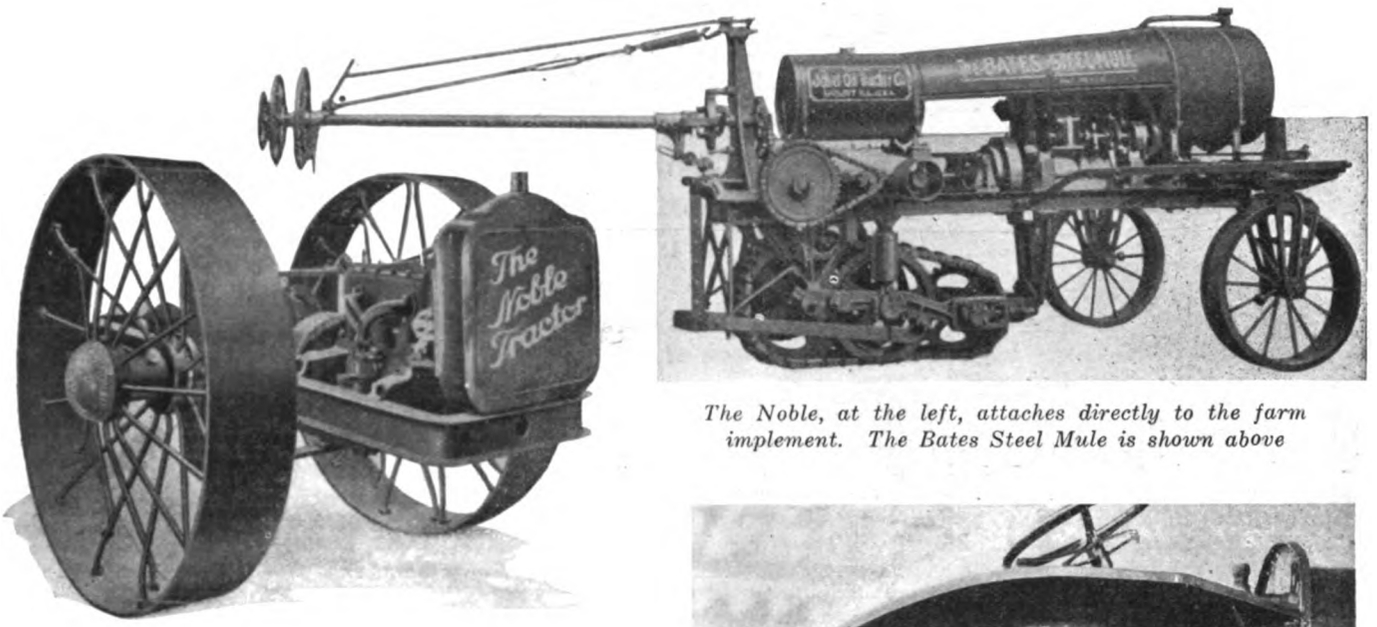
Use is made of a special water air filter made by the company. It is inclosed in a rectangular box which is two-thirds filled with water and is kept at this level from the radiator system. The box is divided horizontally into upper and lower halves by a metal plate. Air enters the lower half and in passing through the water is led through a devious course by a series of vertical baffle plates attached alternatively to the top and the bottom of the compartments. The double-bowl Kingston carbureter consumes kerosene.



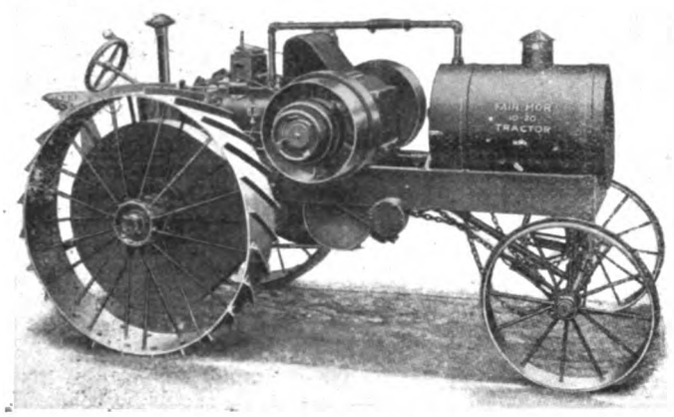
The Trojan tractor uses 60-in. wheels driven by a live axle, the driving strain being softened by a spring arrangement shown in this view

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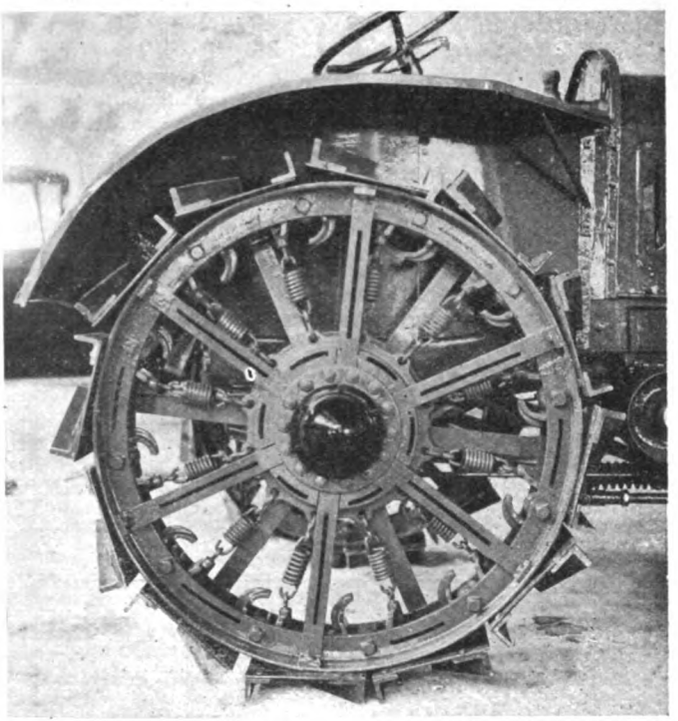
Some of the New Tractors at Kansas City Show



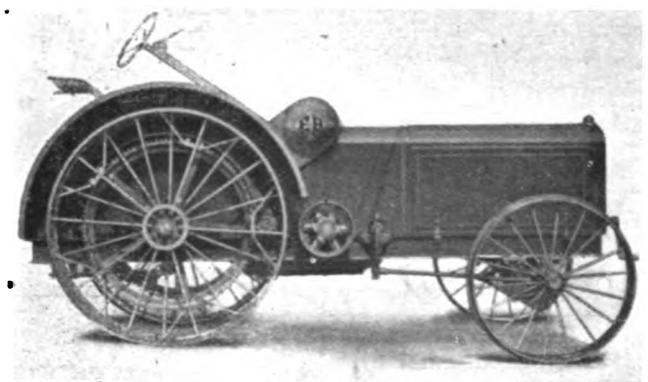
The Noble, at the left, attaches directly to the farm implement. The Bates Steel Mule is shown above



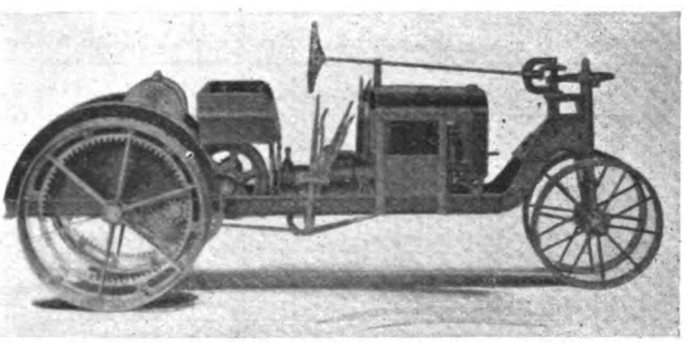
The Fair-Mor tractor follows already familiar principles in design and construction and, like many modern machines, has four wheels



The wheels of the R & P tractor are styled "pad" wheels and are the same design as are used on military tractors in the Italian army



This is the standard Emerson-Brantingham tractor with four wheels and the engine under a forward hood



The Avery has internal gear drive

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Effects of Low Temperatures on Starting*

Reduction of Battery Capacity and Terminal Voltage with a Decrease in Temperature—Congealing of Oil and Decrease in Efficiency of Starters at Low Speeds

By O. W. A. Oetting
Engineer of the Willard Storage Battery Co.

THE starting troubles encountered because of cold weather conditions such as we have experienced during the past three months are most exasperating to the car user, but in the majority of cases are avoidable if all the effects of low temperatures have been anticipated by the automobile designer. The proper application of the electric starter and storage battery for use on passenger cars, motor trucks and tractors presents problems to the engineer which if properly solved will prevent some of the troubles which frequently have occurred in the past.

No apparatus is required to operate under such a variety of conditions as the automotive engine and its accessories. The range of temperature from the heat of summer to the freezing cold of winter is one of the conditions that must be appreciated in making the proper application of the storage battery for this service. The storage battery can be made that will operate in a satisfactory manner under these extreme conditions, but engineers must take into consideration certain facts. In cold weather the capacity and the voltage of a battery are less than they are at normal temperatures. Likewise, it is much more difficult to start an engine because of the effects of these low temperatures on the lubrication and also the carburization of the fuel. In addition to these facts, we find that the efficiencies of the electric starting motors are considerably lower at the low weather conditions. In determining the size of the storage battery the power required to start the engine under these cold weather conditions must be used as a basis.

Considerable data on cold weather starting have been secured. It is the purpose of this paper, first, to give a short résumé of these tests and, second, to summarize these results so as to predict, if possible, the size of storage battery that is required for starting any engine, giving the approximate ampere-hour battery capacity in terms of the piston displacement of the engine.

*Paper read before the Cleveland Section of the S. A. E. on Feb. 15.

Battery Sizes

Heretofore, not enough attention was given to the size of storage battery that was required on a car and almost invariably a smaller size of battery was used where a larger battery would have given better service under all conditions. This haphazard application of the battery shows great inconsistencies when a plot is made of the battery sizes against the engine displacements, as shown in Fig. 1. The data for this plot are taken from a list of all the 1917 passenger cars and are no doubt representative of present day practice. It can be seen that the 80 amp.-hr. battery is used on cars having piston displacements from 95 to 425 cu. in. On the other hand, the 100 amp.-hr. battery is used on cars with displacements ranging from 170 to 425 cu. in. Undoubtedly, cars with piston displacements over 200 cu. in. should be equipped with a larger battery than 80 amp.-hr. and those with displacements greater than 250 cu. in. should have a battery larger than 100 amp.-hr. The plot in Fig. 1 is correct only if the gear ratios between the starter and engine are the

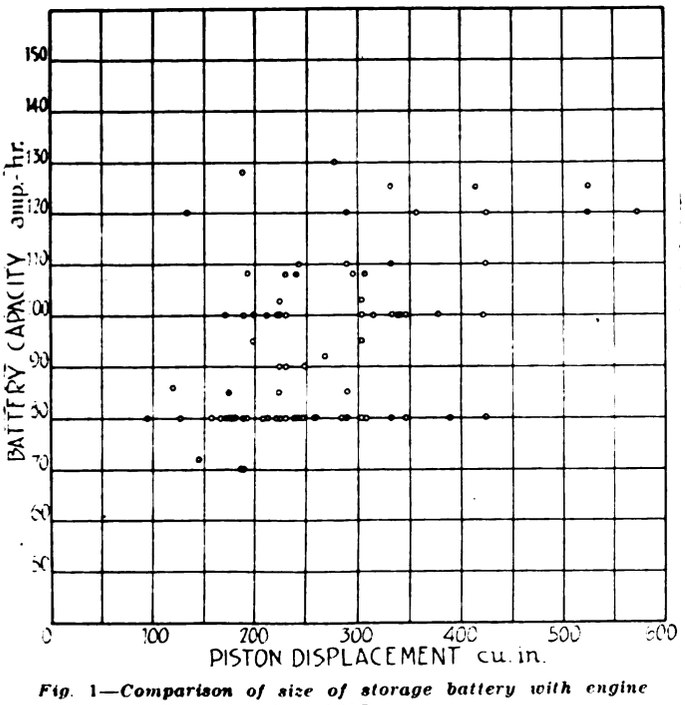


Fig. 1—Comparison of size of storage battery with engine displacement on 1917 passenger cars

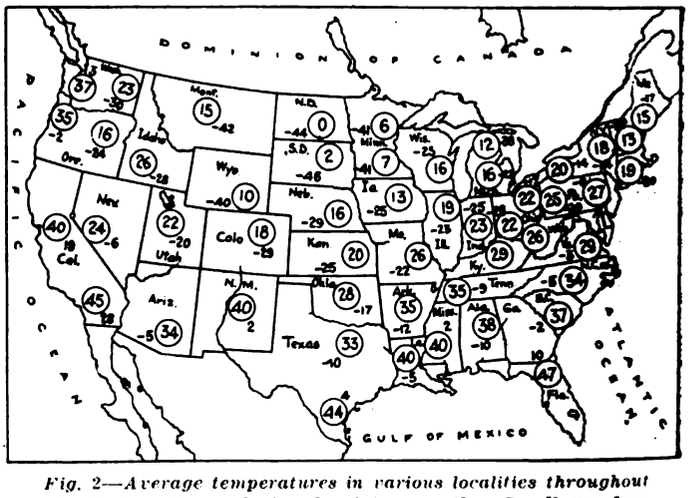


Fig. 2—Average temperatures in various localities throughout the United States during 3 winter months. Small numbers beside circles give absolute minimum temperatures during this period

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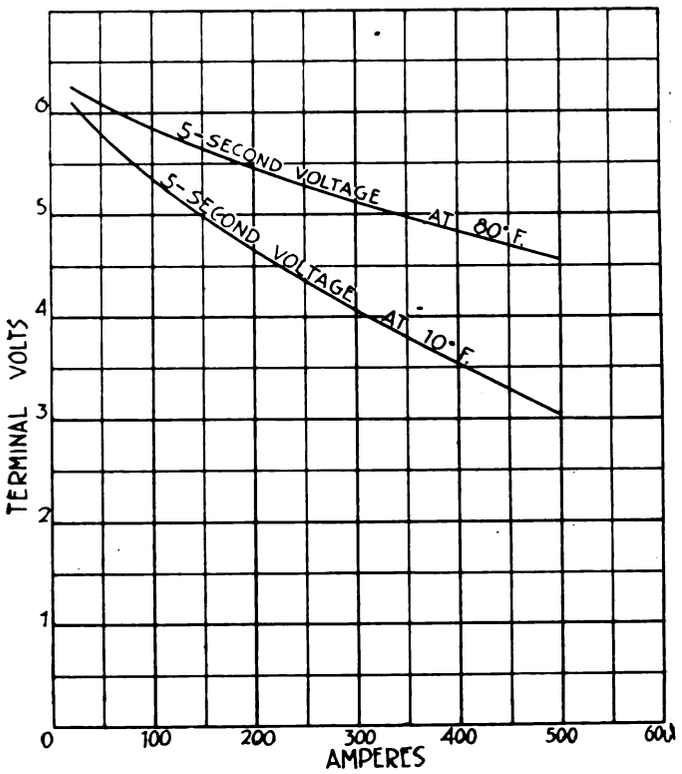


Fig. 3—Comparison of voltage characteristics of 100 amp. hour storage battery at 80 deg. Fahr. and 10 deg. Fahr.

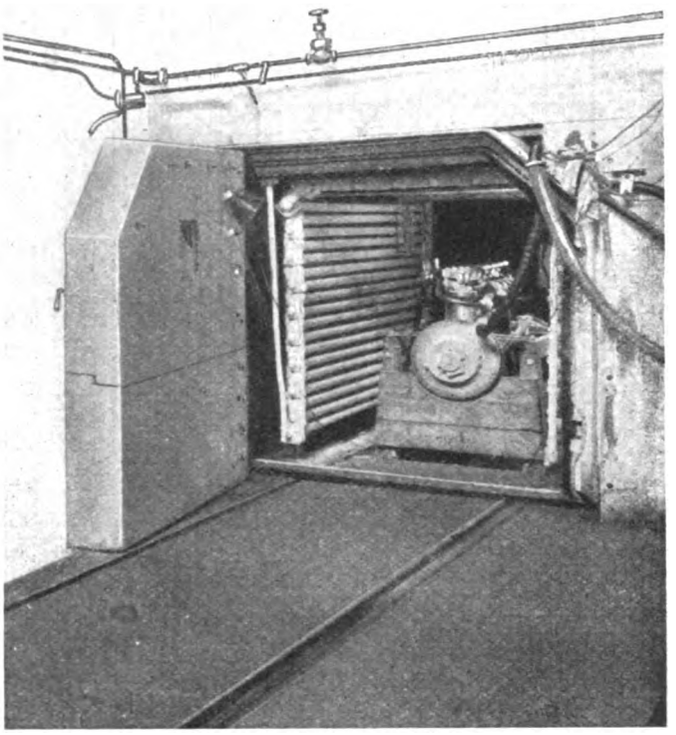


Fig. 4—A refrigerating machine and cooling chamber for testing engine with starter and battery at low temperatures

same. On the present day cars this is practically so, as the majority of the cars are equipped with the single gear reduction with ratios approximately equal to 10 to 1.

With the purpose in mind of securing some factor that will determine definitely the size of battery required for every size car, engines were tested with their starting motors and batteries in a large refrigerator to find the actual power required to turn over the engine at various temperatures. The exact minimum of temperature at which the engine should start promptly is, of course, debatable.

A temperature of 10 deg. Fahr. has been found to be a good basis for cold weather testing. Fig. 2 shows a chart which was compiled from data on temperatures obtained by the U. S. Weather Bureau. The figures within the circles are averages of the temperatures observed for a long series of years at various stations throughout the United States during the winter months. The small figures beside the circles give the absolute minimum temperatures at the same localities during this period of time. It will be noted from this chart that only three States have an average temperature lower than 10 deg. Fahr. If then we take 10 deg. Fahr. as a cold weather standard and design the engine and all the automobile accessories to operate properly at this temperature, little trouble should be experienced during the winter months and satisfactory service from the apparatus will be assured.

One of the effects of low temperature on a storage battery is to lower the terminal voltage, especially at the high rates of discharge that are required by the starting motor. Fig. 3 shows the "five second voltage" curves of a 100 amp.-hr. battery at 80 deg. Fahr. and at 10 deg. Fahr. By the term "five second voltage" is meant the voltage that a battery will give at the end of five seconds at a certain discharge rate of current. In other words, the battery shown in Fig. 3 will have a voltage of 4.82 after five seconds' discharge at 400 amp. at a temperature of 80 deg. Fahr. It will be seen from this curve that this battery would not be suitable for an engine with a starter requiring 300 amp. at 4.5 volts when the temperature was 10 deg. Fahr. or lower. Curves such as these should be used in all starting motor designs.

Fig. 4 illustrates a refrigerating machine and cooling chamber used for testing an automotive engine with its

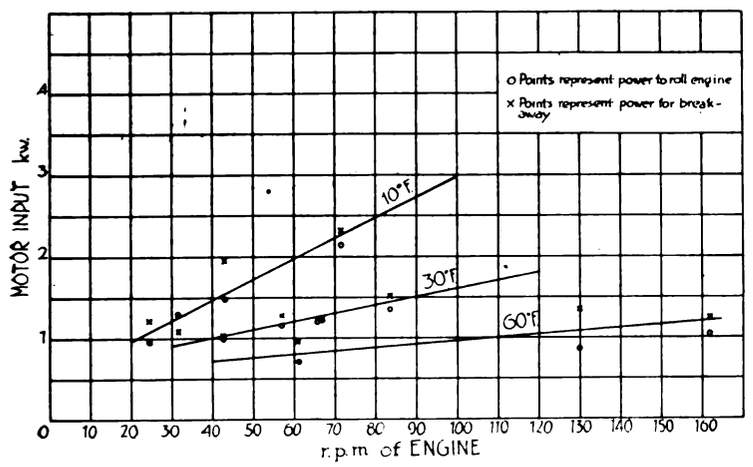


Fig. 5—Power required at various temperatures for starting a four-cylinder engine of 171 cu. in. displacement

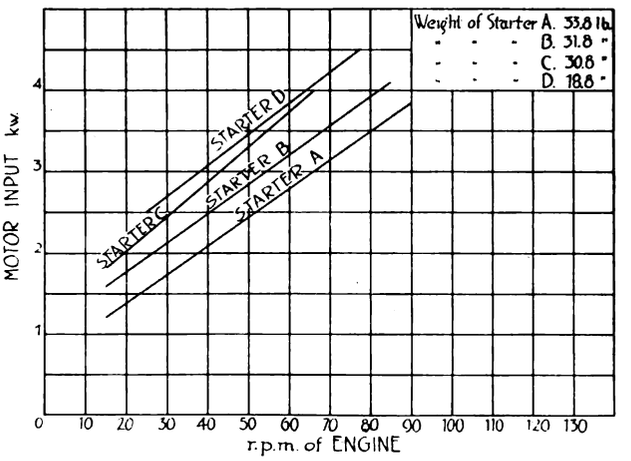


Fig. 6—Power required at 10 deg. Fahr. by four different types of starters on a six-cylinder engine of 268 cu. in. displacement

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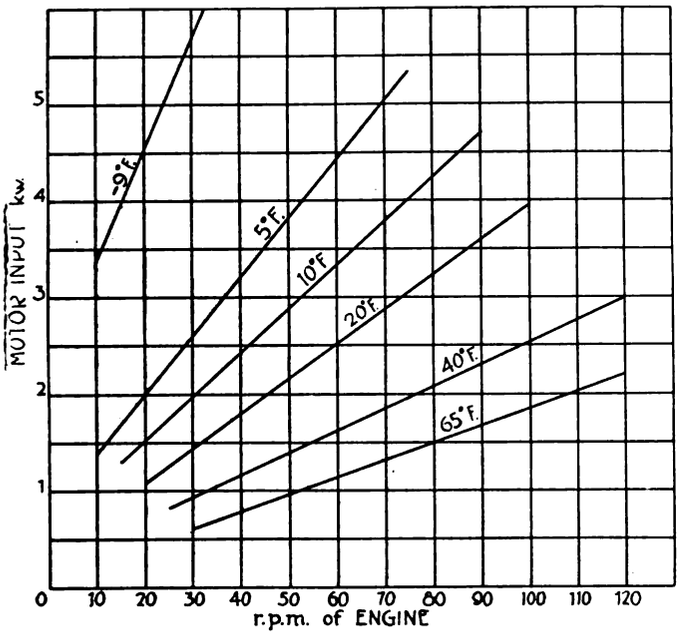


Fig. 7—Power required at various temperatures by starting motor on an eight-cylinder engine of 332 cu. in. displacement

starter and battery at low temperatures. This refrigerator can be cooled to a temperature as low as —30 deg. Fahr. The engine to be tested is placed within this box and wires are brought out from the battery and starter to read the electrical input required to start the engine at low temperatures. A thermometer and some anti-freeze solution are placed in the cooling chamber of the engine and the temperatures can be observed from the outside of the box by means of a small observation door in the main door of the box. The revolutions of the engine are obtained by means of an electrical contactor scheme which rings a bell outside of the refrigerator. After the starting data are obtained at the normal room temperature, the box is slowly cooled to any desired temperature and the starting characteristics of the engine at this temperature are then observed.

Table I gives the results of a test on a certain four cylinder engine having a piston displacement of 171 cu. in. The values in this table give the power that is required to break away the engine and then roll it at a certain speed and temperature. These results are plotted in Fig. 5, the curves showing the average power used for the breakaway and roll of the engine at various engine speeds and temperatures.

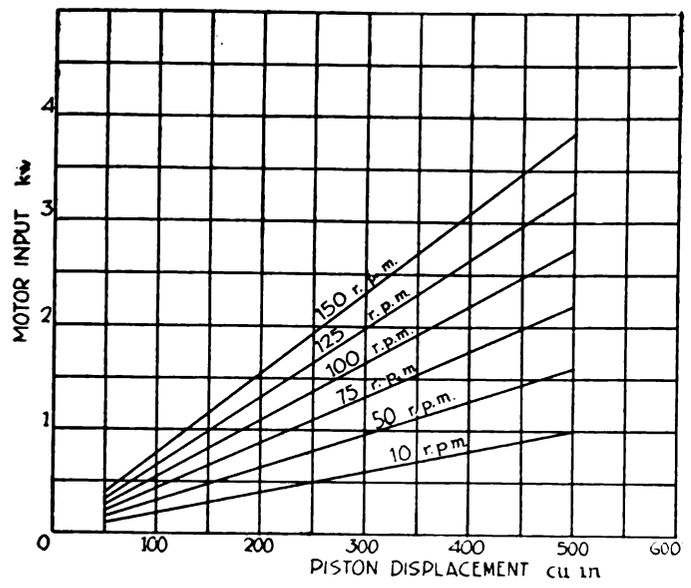


Fig. 9—Approximate power required to break away and turn over various sizes of engines at normal temperatures

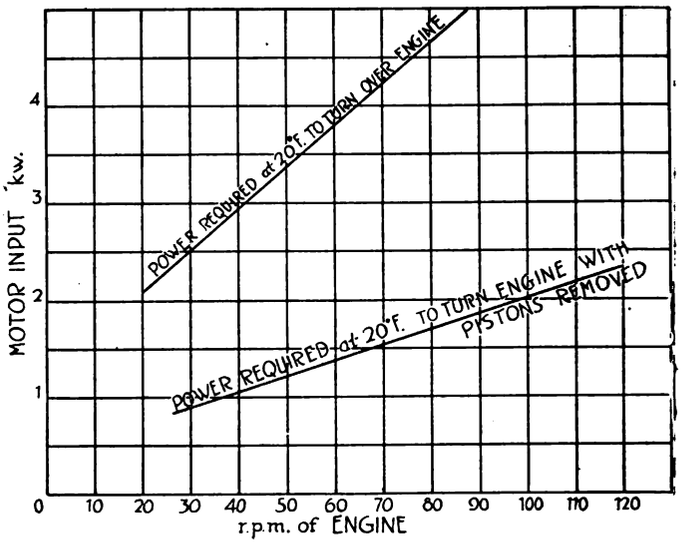


Fig. 8—Test showing comparison of power required to turn a six-cylinder engine of 303 cu. in. displacement without pistons and connecting-rods

The engine in this test had one cylinder which required about 50 amp. more than any one of the other three cylinders during the roll of the crankshaft. This, however, is the service that is demanded of a new storage battery on a car, as the engines often are not "run in" sufficiently before shipment is made by the car manufacturer. A 90 amp.-hr. battery at a temperature of 10 deg. Fahr. turned over this engine at a temperature of 8 deg. Fahr. at 30 revolutions per minute.

A considerable variation in the power demanded from the storage battery is caused by a poor design and application of the starting motor. Fig. 6 shows curves of power used by four different types of starters on a certain six cylinder engine. The light weight starter D requires about one kilowatt of power more than the starter A, in which the proportions of the various parts were more liberal. These curves indicate that the tendency to a lighter and cheaper starter will result in the necessity of the use of a larger storage battery. The automobile engineer must therefore decide where a compromise between the battery and starter will give the best economy and service. In the case of the engine in question, starter B was used. At 30 deg. Fahr. this starter with a 120 amp.-hr. battery rolled the engine at a speed of 30 revolutions per minute.

In Fig. 7 are shown curves from an eight cylinder engine having a displacement of 332 cu. in. This engine was made

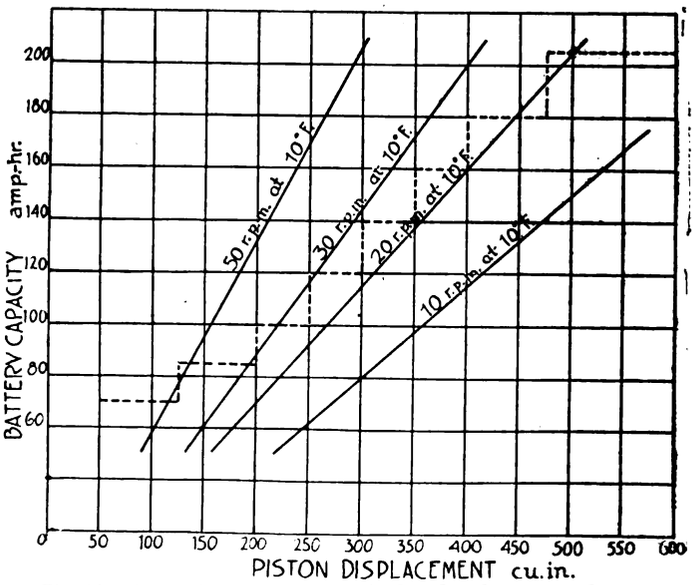


Fig. 10—Approximate power required to break away and turn over various sizes of engines at 10 deg. Fahr.

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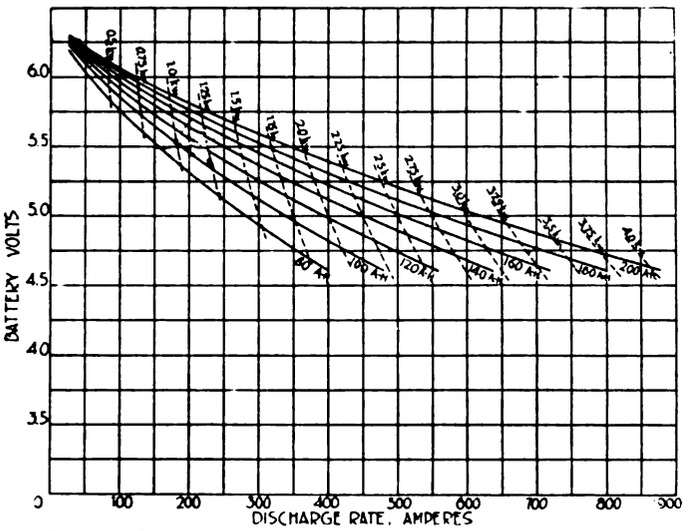


Fig. 11—Voltages of various sizes of batteries after 5 sec. discharge at 80 deg. Fahr.; dotted lines show power available during 5 sec. at the various discharge rates

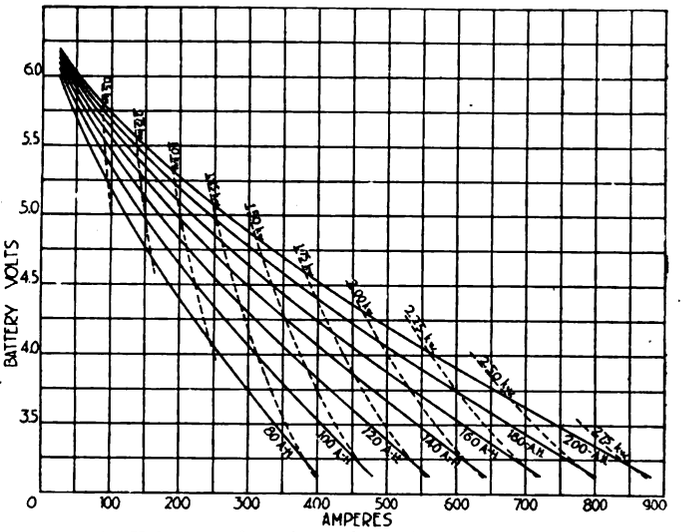


Fig. 12—Voltages of various sizes of batteries after 5 sec. discharge at 10 deg. Fahr.; dotted lines show power available during 5 sec. at the various discharge rates

by a well known engine manufacturer and the fittings of all the parts were well made. The results were therefore lower in proportion to the size of engine than the results obtained with some of the other engines tested at these low temperatures.

A bad feature in the design of bearings was brought out in one of the low temperature tests during these investigations. The bearing caps on one of the engines tested were made of aluminum, and at the low temperature these bearings were found to be shrunk tight on the shaft, due to the difference in the coefficients of expansion of the two metals. During the test it was observed that this engine required an unusually large amount of power to start it. The pistons, connecting rods and camshaft drive were therefore removed and the power required to turn the crankshaft and flywheel was found to be considerable. Fig. 8 shows that the power required for this latter condition was about one-third of the total power required to break-away and turn the engine without the pistons removed. At 6 deg. Fahr. with the pistons removed and 2.8 kw. supplied to the starter it was impossible to pry the engine loose with a 10-in. lever in the teeth of the flywheel. This test gave values that were about 100 per cent higher than the average of all the engines tested under these cold weather conditions.

Summary of Tests

Other engines in addition to those mentioned in the foregoing were tested, and all the results were averaged so as to determine, if possible, the power that is required to start any size of engine. It was found that it is hardly possible to lay down a hard and fast rule for this purpose, but a close approximation is possible. Average results on the engines tested differed for various reasons, such as variation in compression, difference in the viscosity of the lubricating oils at low temperatures, variations in the refinement of the engine fittings, and the difference in the design of the starting motors.

Figs. 9 and 10 give a summary of the power required to start the various sizes of engines at normal temperatures and 10 deg. Fahr. respectively. In these curves motor input is plotted against the piston displacement of the engine. It would have been more logical, perhaps, to have plotted the power against the area of the rubbing surface of the piston walls, but this relation did not average the points any better than the one shown in the curve. As a matter of convenience, then, the co-ordinates used in the curves were chosen.

Having ascertained the power that is required to start the engine, only one more step is necessary to determine the approximate size of storage battery that is needed for this service. Figs. 11 and 12 show the "five second voltage" curves of various sizes of batteries at 80 deg. Fahr. and 100 deg. Fahr. respectively. The power that is available for five seconds from any of these batteries is the product of the volts and the amperes at any of the intersections of these co-ordinates. The dotted lines on these curves represent the power that can be obtained from any of these batteries for a period of five seconds. From these curves it is possible to determine the amount of power that a given size of battery will deliver when discharged at a certain rate of current or else discharged at some predetermined terminal voltage.

From these curves and the results of the engine tests it is possible to estimate the cranking speed of any size of engine with a given battery at a temperature of 10 deg. Fahr. when it is equipped with a 6 volt starter with a gear ratio approximately equal to 10 to 1. This has been done in the curves shown in Fig. 13. This figure shows the average results of the engine speeds at 10 deg. Fahr. with the size storage battery plotted against the size of the engine. Table II gives the minimum size of battery that is satisfactory for use on a 6 volt starting system when the gear ratio is approximately equal to 10 to 1. The basis for this data is the power that is required by the starter at 10 deg. Fahr. as shown in Fig. 10 and also that power which is available at this temperature from the battery when the rate of discharge is about four times its twenty minute rate. No allowance was made for the drop in the leads or starting switch between the starter and the storage battery. This drop varies in the different applications from 0.2 to 0.5 volts and should be made as small as possible, so as to utilize the maximum power that is available from the battery.

The values given in Table II have been indicated in Fig. 13 by the dotted lines. It will be noted that the battery sizes given in the table lie between the cranking speeds of 20 and 50 revolutions per minute at 10 deg. Fahr. There are diverse opinions in regard to the minimum speed for successful starting, a condition which necessarily depends not only on the electrical system but also on the ignition, lubrication and carburization of the fuel. The battery capacities recommended in Table II are the *minimum* sizes that will give satisfactory starting service at 10 deg. Fahr. in accordance with the average results of all these cold temperature investigations. Some engines may be found that will require larger batteries than these sizes, and in such cases greater capacities should undoubtedly be used.

Table II—Starting Battery

Capacity required with 6 volt system and starter gear ratio of about 10 to 1.

Cubic Inches Displacement	Ampere-Hours
Up to 125	70
125 to 200	85
200 to 250	100
250 to 300	120
300 to 350	140
350 to 400	160
400 to 475	180
475 to 600	205

For starting systems of higher voltage or gear ratios greater than 10 to 1, the battery size can be reduced proportionally.

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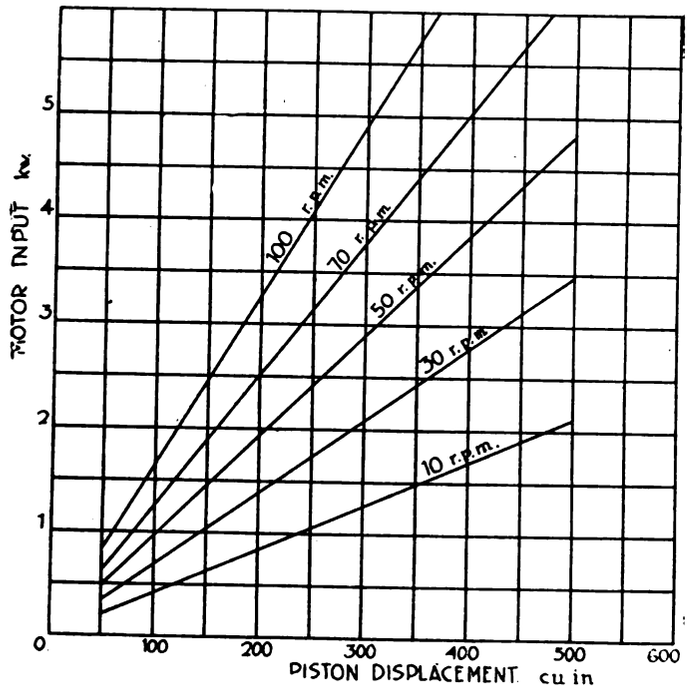


Fig. 13—Minimum battery sizes satisfactory for starting service for 6-volt starting with gear ratio about 10 to 1

One of the features that was brought out very forcibly in the low temperature tests was the effect of the cold on the viscosity of the lubricating oils. As the temperature decreases, the viscosity increases and causes a much greater resistance to turning. One certain grade of oil became a solid mass at these low temperatures. A medium grade of oil in another test was found to have the consistency of extra heavy oil when cooled at 10 deg. Fahr. Therefore, a light or medium grade of oil of a quality that will not lose its lubricating properties at 10 deg. Fahr. or hinder the successful operation of the starting system should be used on cars during the winter months.

Another of the features noted in these investigations, viz., the effect of low temperatures on the ignition system, showed clearly one of the reasons for the adoption of battery ignition in place of magneto ignition. At the low cranking speeds encountered under these cold weather conditions, the cranking speed was seldom rapid enough to fire the fuel in the cylinders when the magneto was used. However, when a battery of sufficient capacity is used to turn over the engine successfully, the battery voltage will always be high enough to fire the engine equipped with a well designed battery ignition system.

The grade of fuel and also its carburization have a great influence on successful starting at low temperatures. The installation of a good electrical system will be utterly negative in results, if the grade of fuel or poor carburization keeps the engine from firing. If the electrical system turns over a cold engine at some reasonably high speed, it should be unnecessary for the car user to be put to the inconvenience of heating the carbureter and manifold of the engine to cause the ignition of the fuel.

Conclusions

1. The size of a storage battery for starter service is determined by the power required to start and roll an engine at some reasonably low temperature (10 deg. Fahr.) at a sufficient speed to cause ignition.

2. Starting troubles may be due to various causes, viz., lack of battery capacity, improper application or insufficient size of starter, viscosity of lubricant at low temperatures, faulty ignition, poor carburetion, or an inferior grade of fuel.

3. A good design of engine and its accessories should take into consideration all of the causes and provide for satisfactory starting at a temperature no higher than 10 deg. Fahr.

4. At 10 deg. Fahr. the available battery capacity is approximately 50 per cent of the normal capacity and the voltage at this temperature also is reduced to a considerable degree.

5. At 10 deg. Fahr. the efficiencies of the starting motors vary between 10 per cent and 40 per cent for the low cranking speeds encountered at these low temperatures. A design of motor should be used which gives better starting torques and higher efficiencies at these low speeds, even if it is necessary to sacrifice some of the normal temperature cranking speed.

Better Starting Characteristics

6. A convenient double reduction gearing between the starter and the engine flywheel can be made that will give better starting characteristics under cold weather conditions than a single gear reduction.

7. A good quality of lubricating oil and a good grade of fuel are requisites for satisfactory starting.

8. As there is a wide divergence in the design and manufacture of the various automotive engines, each design of engine should be tested separately to determine the power that is required to start it under cold weather conditions. In the absence of such data, the approximations derived in this paper should be useful.

Table I

Motor Volts		Amperes		Watts		Speed	Temperature
Break	Roll	Break	Roll	Break	Roll	R. P. M.	Degrees F.
4.75	4.0	200	175	950	700	61	60°
5.20	5	260	175	1350	875	130	60°
5.9	5.75	210	180	1240	1035	162	60°
4.15	3.60	245	275	1020	990	42.5	30°
4.60	4.25	280	270	1285	1150	57	30°
4.70	4.25	260	280	1220	1190	65.5	30°
4.50	4.25	275	285	1240	1210	66.5	30°
5.60	5.10	260	265	1510	1350	83.5	30°
3.90	3.4	310	280	1210	950	24.5	10°
3.70	4.2	290	310	1075	1300	31.5	10°
3.90	4.2	315	300	1230	1260	33	10°
5.80	4.5	335	330	1950	1485	43	10°
6.10	5.5	380	390	2320	2140	71.5	10°

Figures in columns headed "Break" are the instantaneous readings taken the moment the circuit closed.
Figures in columns headed "Roll" are the average readings taken while the motor was rolling.

Hubbell Toggle Switches

A LINE of switches for automobile work is being manufactured by Harvey Hubbell, Inc., Bridgeport, Conn. One of the switches made is a single pole toggle type. It is adapted for controlling light circuits. By pushing the handle up and down the lights are turned on and off respectively. This switch has a maximum load capacity of 50 watts.

For operating electric horns the concern manufactures a momentary contact switch. When the handle is pushed up the circuit is closed, and when the pressure is removed the toggle is released and the circuit opens. The two switches thus far described are designed for flush mounting on the dashboard or instrument board, and the handle, of course, projects to the rear of the instrument board. The firm also manufactures a switch with a recessed plate in which the handle projects only very slightly from the plate and cannot catch in the clothing of the occupants.

A lock switch is also made, for use either in lighting or ignition circuits. A special two tone horn switch gives two contacts and permits of producing either a low or a loud tone by means of the same horn. When the handle is pushed into the perpendicular position one of the circuits is closed, and when it is pushed further this circuit is broken and the other circuit closed.

The switches are furnished either as single switches or in side-by-side or tandem gangs up to four. The standard finishes are nickel and black.

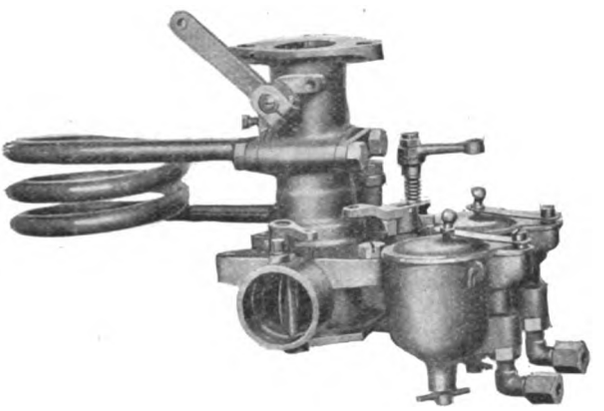
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Holley Heavy Fuel Devices

Kerosene Carbureter Applicable to Any Car and Vapor Manifold for Ford Cars to Be Manufactured by New Concern

THE Holley Kerosene Carbureter Co., which took over the Holley kerosene carbureter and the Holley vapor manifold for Ford cars from the Holley Bros. Co., is now in production on these two specialties and is placing them on the market. The Holley gasoline Ford carbureter has been sold, together with the facilities for manufacturing it, to the Ford Motor Co.

The Holley kerosene carbureter, universal type, is an adaptation of the Holley kerosene vaporizer which was described in AUTOMOTIVE INDUSTRIES May 3, 1917, page 870. The type then described was intended for Ford Model T cars and was also adapted for the tractor manufactured by Henry Ford & Son. The present model can be adapted to any type of engine; it is sold to the manufacturer directly and can be installed by making simple changes in the manifold castings to include the heating coil which is a part of the Holley system. The device is designed to use any hydrocarbon fuel with a final boiling point below 600 deg. Fahr. It starts with gasoline and after a short warming-up period the feed is switched to the heavy fuel for running. There are two float chambers to take care of the starting and running fuels.

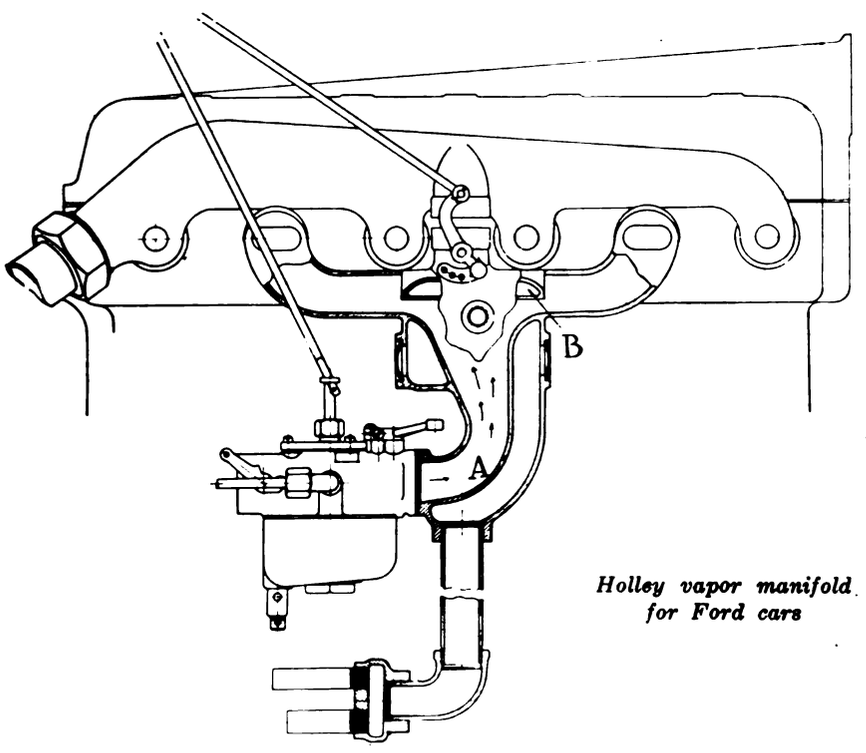


Holley kerosene carbureter complete with vaporizing tube

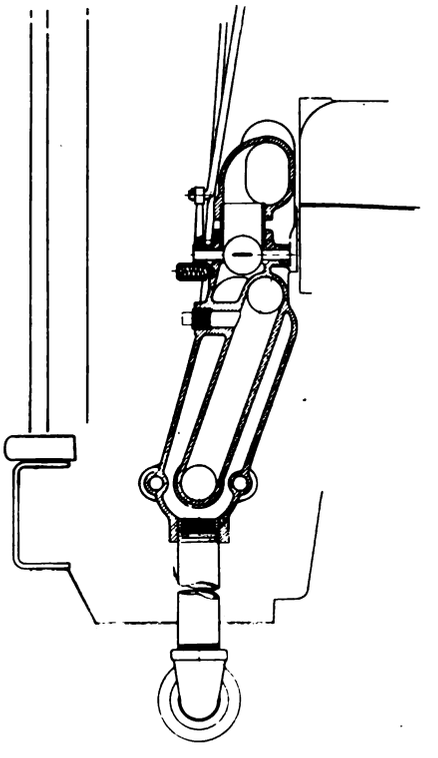
Principle of the Device

The principle upon which the device operates, as described in the previous issue of AUTOMOTIVE INDUSTRIES, is to first provide a primary mixture by means of a needle valve and a very small aspirating jet, which gives a mixture that is too rich for combustion. This rich mixture of atomized fuel and air is carried through a coil tube of very thin wall thickness exposed to the exhaust gases directly in the exhaust manifold. The temperature in the tube reaches 500 deg. Fahr. From this coil the rich mixture is led directly to a mixing chamber where additional air enters, diluting the mixture to make it combustible. The opening of the air in the mixing chamber is governed by the suction of the motor and by the opening of the throttle valve. To install this device on any engine it is necessary to arrange the manifold casting so as to inclose the vaporizing coil. There is also a device with a bypass which controls the amount of exhaust heat passing the vaporizing coil.

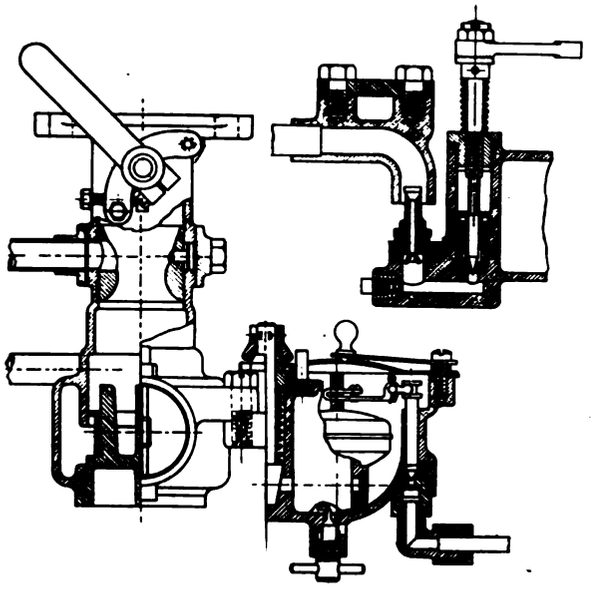
The application of the unit depends upon the design of the engine. The average gasoline powerplant should have the compression reduced to avoid overheating and consequent pounding, but the amount of the reduction is a matter of experiment and depends on the efficiency of the cooling system. Cooling defects, which are passed by unnoticed with gasoline fuel, come into prominence when kerosene is used, and are signalized by preignition and consequent pounding. It is possible to maintain the high compression by the introduction of water in the form of steam into the intake mani-



Holley vapor manifold for Ford cars



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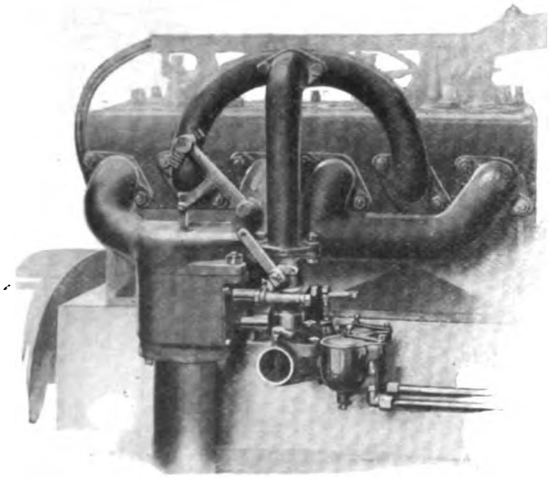
Assembly drawings showing construction of Holley kerosene carbureter

fold, and this can be done by locating the water injection pipe near the exhaust manifold and using the heat therefrom.

There are also some details that must be taken care of in an installation. A small auxiliary tank must be provided to hold gasoline for starting, while a larger tank should be arranged for the main supply of kerosene fuel. The shifter valve for changing the operation from gasoline to kerosene should be conveniently connected to the dash or control board so that as soon as the motor becomes warm, an immediate shiftover can be made. A primer located in the manifold, just above the carbureter side, aids in cold weather starting.

The accompanying sectional view shows a heated manifold adapted for Ford cars. This has been put on the market by the Holley Kerosene Carbureter Co. and is intended to completely vaporize gasoline by applying heat at the proper point. As will be noted from the arrows, the exhaust gases pass down, striking a hotspot at the top of the internal intake passage. The exhaust gases flow along this intake passage and finally pass out at the bottom. The heavy particles of fuel, after leaving the carbureter, strike against the wall at the point *A* and there are broken up by the heat from the exhaust gases. Should any of the particles not be broken up at this point they will be vaporized when they strike the hotspot at *B*, as this is directly in contact with the exhaust gases close to the cylinder.

It will be noted that the heavy globules are subjected to a rising temperature, starting at the point *A* with a lesser degree of heat and finishing at *B* with a maximum. A control valve is fitted regulating the amount of heat passing the intake manifold.



Typical installation of Holley kerosene carbureter

Importance of Aircraft Standardization

THOSE who have followed events related to the war will have noticed repeated changes in the organization of the British aerial service. Evidently the aerial fighting forces of our ally have not gained strength as rapidly as was expected, and one of the reasons therefor is the failure to fix upon a limited number of approved types of engines and planes and turn these out in the greatest possible numbers. Commenting on the situation, *Engineering* says:

Changes in Air Force Organizations

Events have been moving rapidly of late. They have provoked a crisis in the demand for men, which emphasizes the urgency of the right utilization of woman-power. The Air Council that has been formed to co-ordinate the needs of the air services has transferred the control of production to the Ministry of Munitions. This week it is announced that the French Air Board came silently into being some three weeks ago. Its head is the Minister for Armaments, and it was engaged nightly for the first fortnight in speeding up the construction of machines, in addition to reorganizing the service. Our American allies . . . have attacked the problem from the outset with the closest possible standardization and the fewest possible types.

The actual complexity and comparative novelty of an aero-engine and its accessories make the selection of designs more dependent for the time being than other classes of constructions on ascertained practice, just as the multiplicity of its parts makes an exceptional call for the use of the best methods of manufacture. A great volume of practice is already available in the experience of those who were concerned in making internal-combustion engines long before a practice of aviation had been created. It is not a complete aero-engine practice; but it is the basis of the aero-engine practice or practices developed during the war, and the best available body of information for criticizing and co-ordinating the construction of aero-engines.

Selection of Designs

A safe decision in the selection of aero-engine designs cannot be made without taking account of the older practice; and now, when the works in which these engines and their accessories and spares are made must be regarded as a single establishment working for a single air service, the smallest possible number of designs must be selected for manufacture if the maximum output is to be attained. The Production Department that now serves the Air Council in the Ministry of Munitions should surely be able to realize for itself that this selection of designs is necessary. It must also know that a single policy cannot be defined with the prospect either of yielding the best result or of commanding the widest confidence unless it has been formulated or approved in the light of the best available knowledge of internal-combustion engine practice; and it should not need the interposition of another department to persuade it that this indispensable condition cannot be assured unless the material to be considered has been weighed by some man or small body of men having the necessary familiarity with this practice.

British Now Have Over 40 Types

At present the service is far from enjoying the benefit of any such selection. We are credibly informed that over 40 different types of aero-engines are now being manufactured in this country, and about as many firms engaged in their manufacture. The labor absorbed in the extravagant multiplication of tools, jigs, gages, drawings and patterns, regrettable though it is, does not end the burden on the air service through this variety of designs. The effect, for instance, on the stocks of spares may easily be imagined; and, as we understand, the engines are so different in construction that aerodromes at the front not only require separate spares for the several types that are used there, but have also to keep for purposes of overhaul separate gangs of mechanics, versed in their individual peculiarities.

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Standardization in Factory Buildings

Industrial Plants Built According to Standardized Plans, with a Structural Steel Framework Fabricated in Advance, Can Be Erected Rapidly and at Low Cost

RECENT achievements in rapid plant construction have called attention to the great progress that has been made in standardized industrial buildings. With the appreciation that standard construction has met with in the automobile industry, there is little wonder that the eyes of the automobile world have been attracted by the merits and economy of this method of building construction. The case is exactly parallel to that of any other industrial product. Wherever a purchaser has to order a product especially designed and built for him, it naturally requires a long time for delivery, is much more expensive, and oftentimes not as satisfactory as a standard product. This, of course, is keenly realized by automobile and automobile parts manufacturers, and in the same manner it can readily be seen that standardization might equally well be applied to the building industry.

When a man builds his home he wishes it to possess beauty as well as utility. The building of real homes will never be standardized. When a man wishes to have a factory built he thinks of utility, permanence and economy far more than he thinks of beauty. It is a place for production. It is susceptible of standardization both in design and construction.



Façade (left) and interior (below) of the Hudson - Stuyvesant Motor Co.'s building

The Austin Co. of Cleveland has put this standardized building idea on a practical basis and has put up standardized buildings for a number of concerns in the automobile industry, such as the Packard Motor Car Co., Nordyke & Marmon Co., Peerless Motor Car Co., King Trailer Co., Jackson Rim Co., Jackson Wheel Co., Mott Wheel Co and a number of others. These buildings are standardized as to design, construction and cross-section dimensions, but vary as to length. Each building requires the minimum of material for good construction, and, consequently, can be built in the shortest time at moderate cost.

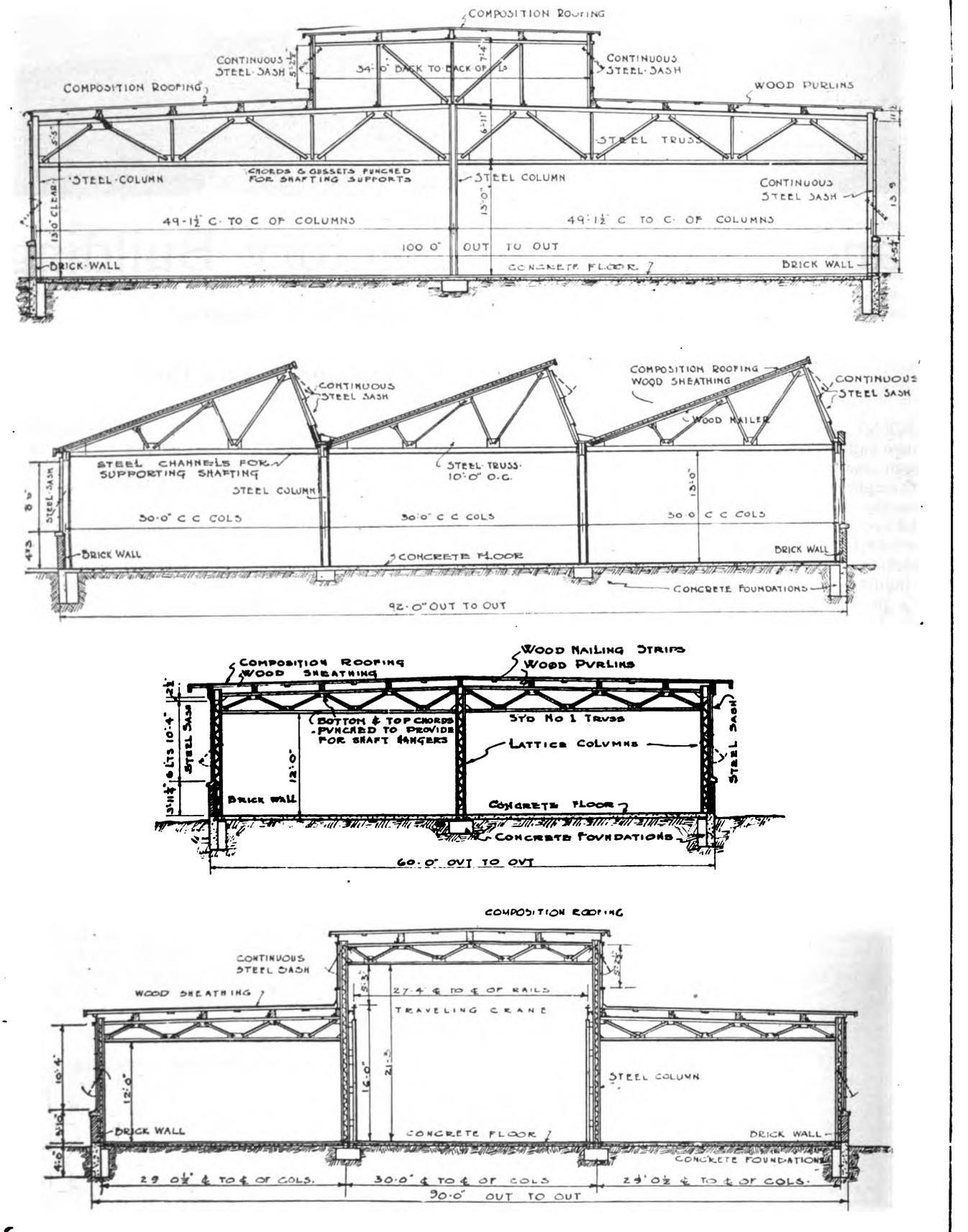
Advantages of Standardized Construction

The great value of standardized construction service is made possible by several newly recognized means to efficiency: The application of the best engineering talent to the given design; doing away with the necessity of working out details in each instance; purchasing materials at that geographic point where the market quotations may be lowest; carrying in stock, ready for immediate shipment, structural steel and practically all other requisite materials; speeding up of freight shipments; pushing all phases of construction simultaneously; sending out dependable erection forces trained to the standard method.

One of the basic ideas of the standardized building proposition is that if factory buildings can be erected in one-half or one-third of the usually required time, this means that the manufacturer gains weeks or months in production profits. If buildings can be put up in any multiple of a given length (say 20 ft.) this means that



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Cross-sections of four types of single-story buildings

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they are flexible units and that the owner may, at any time, by a re-employment of the standard design, add to or alter his commercial establishment in any way.

About thirty out of 300 of these structures, or 10 per cent, have been erected by the Austin Co. for firms in the automobile industry. The Austin Co. has found that by nine types of standard factory buildings they can cover the essential requirements of stabilized industries. Seven of these are one-story types; the minimum width is 60 ft.; each type is variable in length. Three types are completed under penalty in thirty working days after order, and four types in sixty working days. The time limit for the two multi-story models depends on size and conditions; but these also are short-time types.

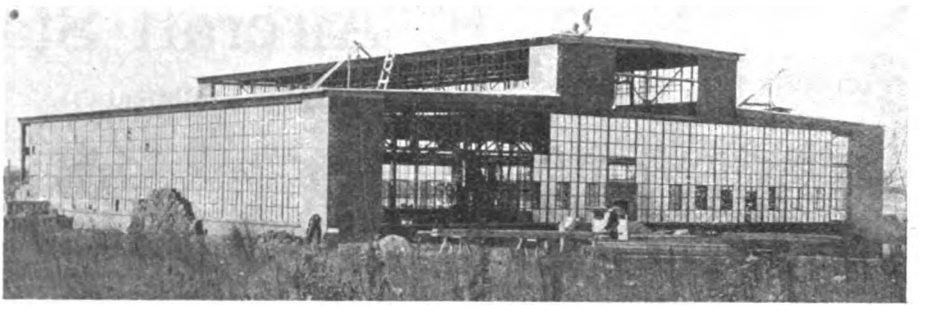
The nine types of Austin standard factory buildings include three types that can be completed ready for occupancy in thirty working days after the order is placed; four sixty-day types and two multi-story types that require somewhat more time. This remarkably quick construction is possible only because much of the work is done before the order is received. Plans are standardized and ready. Specifications are prepared and basic costs figured. Structural steel is ready-fabricated. Other materials are in stock or easily procurable in the standard sizes used. In short, these buildings are shop-manufactured in advance of the order for quick assembly on the owner's land. And they are in no sense portable or temporary buildings, but substantial structures for permanent service.

Careful analysis of large industrial plants indicates that no matter how highly specialized certain portions of these plants may be, there is a striking similarity in 30 per cent to 40 per cent of the floor space.

When general business is active, building is active—to the point where, in conformity to the law of supply and demand, advancing costs reach a prohibitive figure, then the pendulum swings backward. A chart of building activities for a period of 5 years shows an alternation of high peaks and deep depressions. How can the curve be equalized? By buying materials when prices are low, and carrying them in stock for future use—and this can be done only when buildings are standardized. This points to the desirability of standardization in building.



Showroom in Hudson-Stuyvesant Motor Co.'s building



Anderson Tire Co.'s Plant

The floor area may be varied at will. Standards may be any desired length in multiples of the bay, and further variations may be attained by the suggested combinations.

Under the old method of treating every building as a highly individual project, the owner, when he decides to build, communicates his requirements to an industrial engineer. The engineer studies the requirements, designs the building and submits the plans. The owner calls for certain changes, which are made. Two or more builders are then asked to submit estimates, and time is taken to get the bids in, compare them, and decide who shall have the job. At last the contract is let. Eight or 10 weeks have gone before a hand is turned in actual construction. In this time any of the one-story standard factory buildings could have been completed. But the builder under the old method is just beginning. He must order his material at current prices, have structural steel fabricated, perhaps have sash and doors made to order, and lumber cut to waste, to meet the individual plans.

It is possible for a company making these standardized buildings, knowing in advance what materials they require, to buy in quantities at advantageous prices. For instance, when there is a lull in the structural market, the steel companies are able to turn out these standardized fabricated structures at a low price, and this saving can readily be taken advantage of by those putting up factory buildings. A brief summary of the standard types may be of interest:

List of Standard Types

No. 1 is a building for storage or light manufacturing, requiring 30 working days for its completion. It has a width of 60 ft. and the length may be any multiple of 20 ft. The roof trusses or beams have ample strength for supporting shafting, and are set horizontal for that purpose. The beams are also strong enough to carry a monorail for loads up to 1000 lb.

No. 2 requires 30 working days, is 90 ft. wide, with three 30-ft. aisles of the trussed construction. The lengths are in multiples of 20 ft. Auxiliary columns may be provided to carry a traveling crane. This standard building may be extended sidewise to include any desirable number of aisles, or can be used as an upper story to Austin standards No. 8 and No. 9.

No. 3 is the most commonly used type. The building is 100 ft. wide, which is the most economical maximum that can be well lighted through side walls and one monitor. It is amply ventilated and has broad areas of unobstructed floor space. As there is only one column to every 2000 sq. ft., the length may be as desired, in multiples of 20 ft., and the building is susceptible of various combinations. The other standards carry the idea further along.

No. 4 is a saw-tooth building which can be furnished

(*Continued on page* 435.)

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S. A. E. Aircraft Standards

Third Installment

Aeroplane Engine Testing

S. A. E. Recommended Aeronautic Practice

The following test specifications are divided into two classes, one a Routine Factory Test and the other a Type Test.

Routine Factory Tests for Fixed Engines

(Low or Normal Compression)

Test No. 1

Engines may be run in by such methods as are found most satisfactiry for each type of engine, but must not be run under own power over ten hours before the first official test.

Test No. 2

For engines with compression ratio 5 and below.

Engine will be mounted on a torque stand or stationary stand and fitted with club or propeller, properly calibrated for rated load at rated speed. Engine will be fitted with all the accessories that are to be supplied by the engine manufacturer. If started by hand, it must in every attempt be started within five minutes by one man.

Test will consist of: Four hours continuous running at rated power and rated speed. All readings required shall be recorded on S. A. E. standard log sheet every ten minutes.

(a) The test must be continuous and in case of a stop occurring during the first hour, the run will be repeated.

(b) In case of a stop occurring after the first hour and not due to a fault of the engine, the run will be continued, but the inspector may require an extension of the running time equal to twice the time lost.

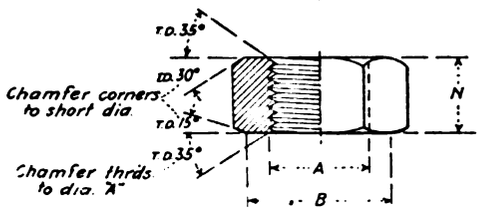
When a stop occurs at any time due to a fault of the engine, the inspector may require the complete run to be repeated.

(c) No manipulation of the engine, while running, will be allowed, except such as can be made by a pilot from his

Plain Hexagon Nuts

(For Bodies and Wings, Not Engines)

S. A. E. Recommended Aeronautic Practice



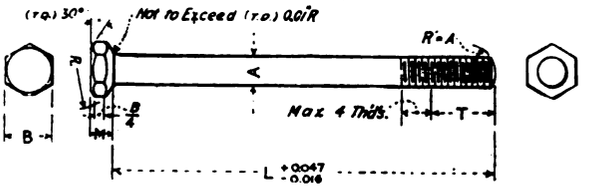
A Size	Threads per In.	*B* Hex. Short Dia.	*N*
*0.112 (No. 4)	To be	0.250 (¼)	0.094 (3/32)
*0.138 (No. 6)	determined	0.312 (5/16)	0.109 (7/64)
0.164 (No. 8)	32	0.375 (3/8)	0.125 (⅛)
0.190 (No. 10)	32	0.375 (3/8)	0.141 (9/64)
0.216 (No. 12)	32	0.438 (7/16)	0.156 (5/32)
0.2500 (¼)	28	0.438 (7/16)	0.187 (3/16)
0.3125 (5/16)	24	0.500 (½)	0.234 (15/64)
0.3750 (6)	24	0.563 (9/16)	0.281 (9/32)
0.4375 (7/16)	20	0.688 (11/16)	0.328 (21/64)
0.5000 (6)	20	0.750 (¾)	0.375 (⅜)
0.5625 (9/16)	18	0.875 (⅞)	0.422 (27/64)
0.6250 (5/8)	18	0.938 (15/16)	0.469 (15/32)

A = Size of Bolt.
All Threads U. S. Form.

T. D. = Tooling Dimensions.
Dimensions in Inches.

Ball Hexagon-Head Bolts

S. A. E. Recommended Aeronautic Practice



Bolts, Size A, Threads per Inch	*Limits A	B	M	R
.164 (No. 8)—32	0.164	.3125 (5/16)	.172 (11/64)	.375 (⅜)
	0.160			
.190 (No. 10)—32	0.190	.3750 (⅜)	.172 (11/64)	.375 (⅜)
	0.186			
.216 (No. 12 —32	0.216	.3750 (⅜)	.172 (11/64)	.375 (⅜)
	0.212			
.2500 (¼" —28	0.250	.4375 (7/16)	.203 (13/64)	.375 (⅜)
	0.246			
.3125 (5/16")—24	0.313	.5000 (½)	.250 (¼)	.375 (⅜)
	0.309			
.3750 (⅜")—24	0.375	.5625 (9/16)	.313 (5/16)	.500 (½)
	0.371			
.4375 (7/16")—20	0.438	.6875 (11/16)	.359 (23/64)	.500 (½)
	0.434			
.5000 (½")—20	0.500	.7500 (¾)	.375 (⅜)	.500 (½)
	0.496			
.5625 (9/16")—18	0.563	.8750 (⅞)	.469 (15/32)	.625 (⅝)
	0.558			
.6250 (⅝")—18	0.625	.9375 (15/16)	.516 (33/64)	.625 (⅝)
	0.620			

When body length L =	½"	⅝"	¾"	⅞"	1"	Over 1"
Length of thread T =	⅜"	7/16"	½"	½"	½"	¾"

All threads U. S. Form. Dimensions in Inches.
*Finished size including plating or rust preventing treatment when used. Bureau of Standards recommend .001 in. as thickness of plating for rust prevention.

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seat. Replenishing of gasoline and oil supplies and regulating of the cooling water temperature is allowable.

Engine will be disassembled, inspected and if all parts are accepted, it will be re-assembled. If in the opinion of the inspector, parts must be replaced, he may require the whole or portion of the run to be repeated.

Test No. 3

Engine with all the accessories that are to be supplied by the manufacturer will be mounted on a torque stand and fitted with a club or propeller, properly calibrated. It will be given a continuous run of one hour at not less than rated power and rated speed. All readings required will be recorded on S. A. E. standard log sheet every ten minutes.

After this test the engine shall be cleaned and inspected and put into condition for shipment. If satisfactory, the engine shall be stamped by the inspector.

Note—If desired, the horsepower may be corrected for air temperature and barometric pressure. In such cases the power will be corrected to a surrounding air temperature of 59 deg. F. (15 deg. C.) and normal sea level pressure which is 29.92 (760 mm.) of mercury at 32 deg. F. (0 deg. C.) and at 45 deg. latitude.
In case of question the corrected power shall govern.

(High Compression)

Test No. 2A

For engines with compression ratio exceeding 5:

Engine will be prepared as under Test No. 1 and No. 2.

This test will consist of four hours continuous running at 8/10 rated load and rated speed. Otherwise, this test will be the same as No. 2 and the same rules will apply.

Disassembly and inspection will be the same as in Tests No. 2 and No. 3.

Test No. 3A

This test will be the same as No. 3, but at 8/10 rated load and at rated speed.

After this test, the engine will be inspected and accepted as in Routine Test No. 3.

Type Tests for Fixed Engines

(Low or Normal Compression)

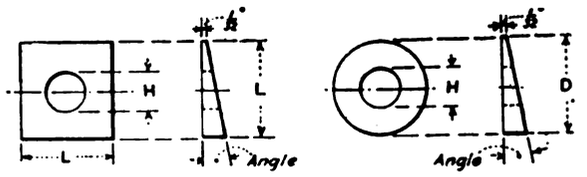
The first engine of a type and one out of each hundred in production will be given the following test:

Selection of this engine shall be made by the inspector without previous notice to the manufacturer.

The engine must not run under its own power over 10 hours before the first official test and must be taken from regular production. (See No. 1 Routine Test.)

Bevel Washers

S. A. E. Recommended Aeronautic Practice



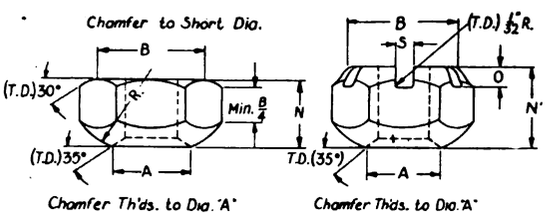
Square Washer *Round Washer*

TABLE OF SQUARE AND ROUND BEVEL WASHERS

Angle Values, 6, 12, 24, 36 Degrees for All Sizes

Bolt Size	H	D	L
No. 4 (.112)	No. 31 (.120)	3/8	3/8
No. 6 (.138)	No. 26 (.147)	7/16	3/8
No. 8 .164)	No. 17 (.173)	15/32	15/32
No. 10 (.190)	No. 8 (.199)	1/2	15/32
No. 12 (.216)	No. 1 (.228)	9/16	17/32
1/4	13/64	5/8	17/32
5/16	21/64	11/16	21/32
3/8	25/64	3/4	21/32
7/16	29/64	15/16	7/8
1/2	33/64	1	7/8

Note.—Both sides must be flat and free from burrs. If the washers can be cut by shearing and without distorting the surface, this is permissible. Stock must be bright medium carbon steel.



BALL HEXAGON NUTS

S. A. E. Recommended Aeronautic Practice

Size A and Threads per Inch	Ball Hexagon			Ball Castle			
	B	N	R	B	N¹	S	O
.164 (No. 8)—32	.375 (3/8)	.172 (11/64)	.375 (3/8)	.375 (3/8)	.250 (1/4)	.078 (5/64)	.078 (5/64)
.190 (No. 10)—32	.375 (3/8)	.172 (11/64)	.375 (3/8)	.375 (3/8)	.250 (1/4)	.078 (5/64)	.078 (5/64)
.216 (No. 12)—32	.438 (7/16)	.172 (11/64)	.375 (3/8)	.438 (7/16)	.266 (17/64)	.078 (5/64)	.094 (3/32)
.2500 (1/4")—28	.438 (7/16)	.203 (13/64)	.375 (3/8)	.438 (7/16)	.297 (19/64)	.078 (5/64)	.094 (3/32)
.3125 (5/16")—24	.500 (1/2)	.250 (1/4)	.375 (3/8)	.500 (1/2)	.344 (11/32)	.078 (5/64)	.094 (3/32)
.3750 (3/8")—24	.563 (9/16)	.313 (5/16)	.500 (1/2)	.563 (9/16)	.438 (7/16)	.125 (1/8)	.125 (1/8)
.4375 (7/16")—20	.686 (11/16)	.359 (23/64)	.500 (1/2)	.688 (11/16)	.484 (31/64)	.125 (1/8)	.125 (1/8)
.5000 (1/2")—20	.750 (3/4)	.375 (3/8)	.500 (1/2)	.750 (3/4)	.563 (9/16)	.125 (1/8)	.188 (3/16)
.5625 (9/16")—18	.875 (7/8)	.469 (15/32)	.625 (5/8)	.875 (7/8)	.656 (21/32)	.156 (5/32)	.188 (3/16)
.6250 (5/8")—18	.938 (15/16)	.516 (33/64)	.625 (5/8)	.938 (15/16)	.766 (49/64)	.156 (5/32)	.250 (1/4)

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Test No. 4

For engines with compression ratio of 5 and below.

The engine is to be mounted and equipped as in Test No. 2 of Routine Tests and fitted with a club or propeller properly calibrated.

Total running time shall be 50 hours, divided as follows:
Five hours at 9/10 rated power and at rated speed.
Not over one hour stop with minor adjustments allowed.
Five hours at 9/10 rated power and at rated speed.
Not over 13 hours stop during which engine may be disassembled, overhauled, carbon removed, valves ground and adjusted, magnetos and spark plugs cleaned and adjusted. No adjustment or replacement of major parts is allowed. Any multiple part, such as a valve, may be replaced when replacement is made necessary through defective material. In no case, however, shall more than one such part be replaced during the entire 50 hours.

Five hours at 9/10 rated power and at rated speed.
Not over one hour stop with minor adjustments allowed.
Five hours at 9/10 rated power and at rated speed.
Not over 13 hours stop and same work allowed as before.
Five hours at 9/10 rated power and at rated speed.
Not over one hour stop with minor adjustments allowed.
Five hours at rated speed and at rated power.
Not over 13 hours stop and same work allowed.
Five hours at rated power and at rated speed.
Not over one hour stop with minor adjustments.
Five hours at rated power and at rated speed.
Not over 13 hours stop and same work allowed.
Ten hours at rated power and at rated speed.
Rule (c) under Routine Test 2 will apply to each run.

In case of a forced stop during any of above runs, rules (a) and (b) under Routine Test No. 2 will apply.

If the stop is due to a failure of any multiple part such as a valve, the part may be replaced, providing such failure is due to defective material and a similar part has not previously been replaced since the 50-hour test was started.

During complete run all required readings must be recorded on S. A. E. standard log sheet every 10 minutes. The mean power (see note under Routine Test No. 3) must not fall below the rated power; and gasoline and oil consumption must not exceed the predetermined maximum.

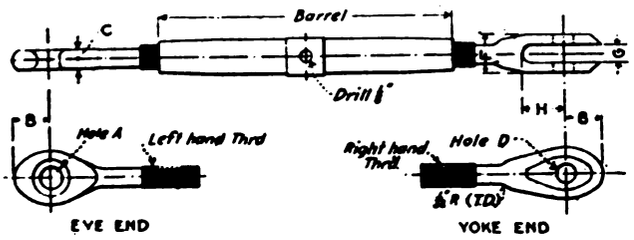
After the test is completed, the engine is to be disassembled and, if acceptable to the inspector, may be reassembled after replacing any parts which the inspector may designate.

Test No. 5

Engine is to be mounted in a fuselage or tilting stand and fitted with propeller. With the axis of the engine making 15 deg. with horizontal, it is to run at full power full speed for 15 minutes. Then without altering speed or any part, or adjustment, the axis is to be brought again

Turnbuckles for Aircraft

The dimensions given are for short and long turnbuckles, each length having either two eye-ends or one eye-end and one yoke-end.

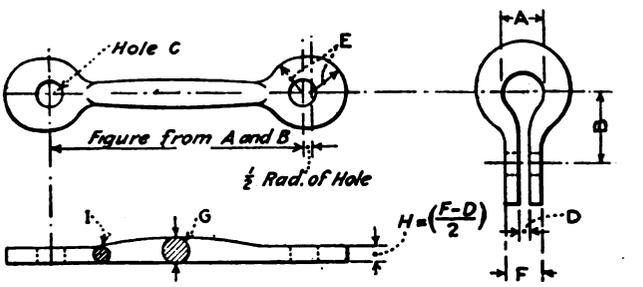


Nos.	Strength in Pounds	Eye Ends, Inches			Yoke Ends, Inches				
		A	B	C	D	E	F	G	H
1	500	5/32	9/32	1/8	3/16	9/32	3/16	5/64	3/8
2	1,000	5/32	9/32	1/8	3/16	9/32	3/16	5/64	3/8
3	1,500	3/16	11/32	3/16	3/16	11/32	1/4	5/64	3/8
4	2,000	13/64	11/32	3/16	3/16	11/32	5/16	7/64	7/16
5	2,500	13/64	13/32	7/32	1/4	13/32	11/32	7/64	7/16
6	3,000	13/64	13/32	7/32	1/4	13/32	11/32	7/64	1/2
7	3,500	13/64	7/16	1/4	1/4	7/16	7/16	13/64	1/2
8	4,000	13/64	7/16	1/4	9/32	7/16	7/16	13/64	9/16
9	4,500	21/64	7/16	9/32	9/32	7/16	1/2	13/64	9/16
10	5,000	21/64	15/32	9/32	9/32	15/32	9/16	17/64	9/16
11	6,000	23/64	15/32	5/16	5/16	15/32	9/16	17/64	9/16
12	7,000	23/64	15/32	5/16	5/16	15/32	5/8	17/64	5/8
13	8,000	25/64	1/2	11/32	5/16	1/2	5/8	21/64	11/16
14	9,000	25/64	1/2	11/32	3/8	1/2	11/16	21/64	11/16
15	10,000	25/64	5/16	3/8	3/8	5/16	11/16	21/64	11/16

Type of turnbuckle	Short	Long
Length of barrel	2 in.	4 in.
Made in numbers	1 to 7 incl.	1 to 15 incl.
Length between centers of eyes with:		
Threads flush with ends of barrel	4 in.	8 in.
Ends extended a maximum	4 3/16	8 3/16
Ends extended a minimum	3¼	5½

With two eye ends, thread one left hand and the other right hand.
With one eye end and one yoke end, thread eye end left hand.

Shackles



Turnbuckle No.	Shackle Strength, Lb.	D*	C	E	A	B	G	I	F
1	500	5/64	3/16	1/4	1/4	9/16	3/16	5/32	3/16
2	1000	5/64	3/16	1/4	1/4	9/16	3/16	5/32	3/16
3	1500	5/64	3/16	1/4	1/4	9/16	3/16	5/32	1/4
4	2000	7/64	3/16	1/4	1/4	9/16	3/16	5/32	5/16
5	2500	7/64	1/4	5/16	5/16	5/8	1/4	5/16	11/32
6	3000	7/64	1/4	5/16	5/16	5/8	1/4	5/16	11/32
7	3500	13/64	1/4	5/16	5/16	5/8	1/4	5/16	3/8
8	4000	13/64	9/32	11/32	3/8	11/16	3/8	5/32	3/16
9	4500	13/64	9/32	11/32	3/8	11/16	3/8	5/32	1/2
10	5000	17/64	9/32	11/32	3/8	11/16	3/8	5/32	5/16
11	6000	17/64	5/16	3/8	7/16	3/4	7/16	5/16	5/16
12	7000	17/64	5/16	3/8	7/16	3/4	7/16	5/16	3/8
13	8000	21/64	5/16	3/8	7/16	3/4	7/16	5/16	3/8

Dimensions in inches. *Opening for clip lug.

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horizontal and then tilted to 15 deg. in the opposite direction and run 15 minutes.

If this test is satisfactory, the engine will be put through Routine Test No. 3 except that the running time shall be 30 minutes instead of one hour. After this test, the engine will be inspected and accepted as in Routine Test No. 3.

(High Compression)

The same rules apply regarding preparation and selection as for Test No. 4.

Test No. 4A

For engines with compression ratio exceeding 5.

This test will be the same as test No. 4, but the first five runs shall be made at 7/10 rated load and at rated speed. The next four runs will be made at 8/10 rated load and at rated speed.

Disassembly and inspection will be the same as in Tests No. 4 and No. 5.

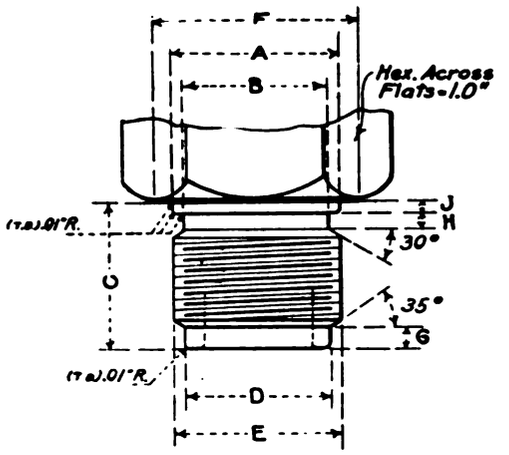
Test 5A

Engine will be put through a test the same as No. 5, but at 8/10 rated load and at rated speed.

If the engine passes Test 5A it will be put through Routine Test No. 3A except that the running time will be 30 minutes instead of one hour. This engine will then be inspected and accepted as in Routine Test No. 3.

Spark-Plug Shell Dimensions

S. A. E. Recommended Aeronautic Practice



Thread: 18 mm. 1½ mm. pitch.

Form of thread: International standard (same as U. S. standard only ½ as much truncation at root of thread).

SPARK-PLUG SHELL DIMENSIONS

Dimension	Maximum		Minimum	
	Mm.	Inches	Mm.	Inches
A	18.03	0.710	17.93	0.706
B	16.87	0.664	15.87	0.625
C	15.87	0.625 (5/8)	15.87	0.625 (5/8)
D	15.87	0.625		
E	17.97	0.708	17.85	0.703
F			23.83	0.938 (15/16)
G			2.38	0.094 (3/32)
H	1.98	0.078 (5/64)		
J	1.19	0.047 (3/64)		

TAPPED HOLE DIMENSIONS

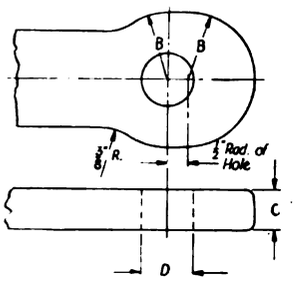
Diameter	Maximum		Minimum	
	Mm.	Inches	Mm.	Inches
Outside	18.325	0.72146 (0.721)	18.187	0.71603 (0.716)
Pitch	17.176	0.67622 (0.676)	17.051	0.67124 (0.671)
Root	16.201	0.63783 (0.638)	16.076	0.63291 (0.633)

Note.—The limits for spark-plug threads as shown in the following table have been reported as adopted by the (British) Engineering Standards Committee. The standard thread for spark-plug terminal is No. 8-32 (0.164 dia.), A. S. M. E standard.

SPARK PLUG THREAD DIMENSIONS

Diameter	Maximum		Minimum	
	Mm.	Inches	Mm.	Inches
Outside	17.975	0.70768 (0.708)	17.850	0.70275 (0.703)
Pitch	17.001	0.66933 (0.669)	16.876	0.66441 (0.664)
Root	15.864	0.62457 (0.625)	15.739	0.61964 (0.620)

Clip Ends



Clip and Turnbuckle Number	Strength, Lb.	B	C	D
1	500	¼	5/16	5/16
2	1,000	¼	5/16	5/16
3	1,500	¼	5/16	5/16
4	2,000	5/16	3/32	5/16
5	2,500	5/16	3/32	¼
6	3,000	3/8	3/32	¼
7	3,500	5/16	3/16	¼
8	4,000	3/8	3/16	9/32
9	4,500	3/8	3/16	9/32
10	5,000	3/8	¼	9/32
11	6,000	3/8	¼	5/16
12	7,000	7/16	¼	5/16
13	8,000	7/16	5/16	5/16
14	9,000	15/32	5/16	3/8
15	10,000	15/32	5/16	3/8

The width of the arm is determined according to the strength of the material. Dimensions in inches.

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The FORUM

Recommendations for Focusing Automobile Headlamps

G. L. Sealey*

WHEN automobile headlamps are properly focused, the center of the filament of the incandescent lamp coincides with the focal point of the reflector. When this condition is attained, the resultant beam is concentrated, dark spots are eliminated, objectionable stray light is diminshed and the greatest amount of useful light is obtained. The sketch, Fig. 1, shows simply how the light is distributed by a parabolic reflector for three positions of a point light source. A', A', are parallel beams distributed when the point source is at the focus, while B', B', and C', C', are the beams distributed when the point source is, respectively, back of and in front of the focus. Although the filament of an incandescent lamp is not exactly a point source, and without going further into the theory of the parabolic reflector, it may be said that the concentrated filament of a mazda C lamp acts in the same general way as a theoretical point source. When the incandescent lamp is at the focus of a parabolic reflector, a beam of small diameter is directed forward which, when intercepted perpendicularly by a large card or paper, will give a light spot as shown by the photograph of Fig. 2. When the incandescent lamp is in front of or back of the focus, the light spot on the card will resemble that of Fig. 3.

An ideal location for focusing headlamps is a straight roadway having at least 75 ft. between the car and the side of a garage, or other surface vertical to the road, on which is drawn a line or mark 42 in. above the road level. When such a spot is found, the car should be placed so as to have the headlamps facing the side of the garage and projecting the light upon it. The relative position of the filament and focal point of the reflector should then be changed by moving the incandescent lamp (by means of the socket adjustment) forward or backward until the light spot of smallest diameter, or greatest concentration, is secured, as shown in Fig. 2. This operation should be performed on one headlamp at a time so as to be certain that each headlamp is correctly focused.

*Engineering Department, National Lamp Works of General Electric Company.

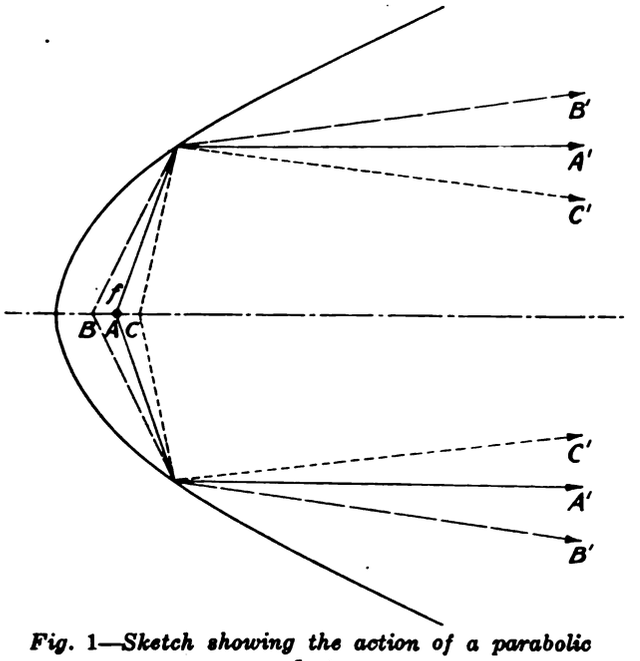
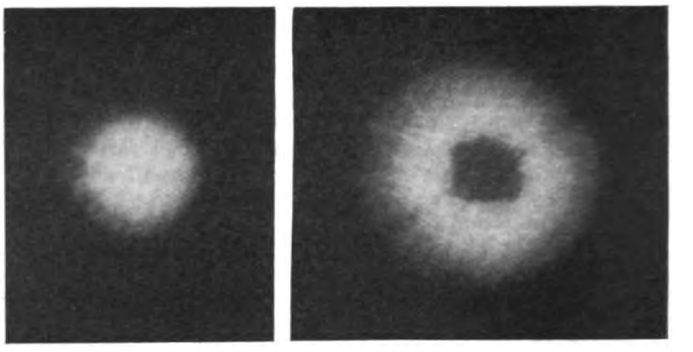


Fig. 1—Sketch showing the action of a parabolic reflector



Figs. 2 and 3—Spots appearing on card when lamp bulb is in focus and when it is either forward or back of the focus respectively

Four Types of Focusing Devices

The four principal types of automobile headlamp focusing devices, or socket adjustments, are: (1) rim, (2) external, (3) bulb, (4) rear. In the rim type of adjustment the incandescent lamp is moved forward or backward by turning a screw placed on the rim of the reflector, and in the external type of adjustment this adjusting screw is placed to the rear of the lamp housing. In the bulb type, adjustment is accomplished by twisting or turning the incandescent lamp bulb. It is necessary to remove the reflector from the headlamp, and to loosen a screw or other means of holding the lamp in position at the rear of the reflector before adjustment can be made with the rear type. The latter two devices are not considered satisfactory since they necessitate the direct handling of the incandescent lamp or the dismantling of the headlamp in order to secure the desired result.

When the filament has been brought to the proper position with reference to the focal point of the reflector, that is, when the lamp has been properly focused, the height of the main beam of light above the level of the roadway should be carefully observed. Most state laws require that at 75 ft. in front of the car the main beam of light shall rise not more than 42 in. above the level of the roadway under any condition of loading. By carefully observing the line, or mark, on the side of the garage and the beam of light obtained from the headlamps this law may be complied with. It is often necessary to tilt the headlamps slightly by bending the supports in order to accomplish the desired result.

Rules for Focusing

While the main point is that the direct light should be kept below the 42-in. line, it is also well to remember that the beams from the two headlamps should be so projected that they do not spread the light mainly to the side of the road instead of directly ahead. When the headlamps have been adjusted so that the lamps are properly focused and the light does not rise above the 42-in. line, the location of the beams from the two lamps with respect to one another should be considered. To have the road properly illuminated the two circles of light should slightly overlap one another at 75 ft. In other words, the most desirable illumination is obtained when, with the proper consideration of the other points just mentioned, the two beams slightly overlap rather than widely diverge. If the two beams are divergent they may be brought into correct relation by bending the supporting forks for the headlamps or by adjusting the rod connecting the two.

With the increasing agitation for laws to eliminate glare and an increasing attempt on the part of automobile drivers

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to be more courteous on the road, it is necessary that headlamps be correctly focused. It has been found that the great majority of automobile drivers are not fully acquainted with the method for properly focusing their headlamps. Since this condition exists, it is suggested that a straight stretch of roadway, with a garage, barn, or other vertical surface on which a 42-in. line may be marked, be found, and this place called to the attention of automobile drivers in each locality so that when in doubt they may drive up to this particular location and carefully measure the height to which the top of the beam rises. This will result in better compliance with existing laws. A little attention given by automobile drivers to the above points may prevent unpleasant situations with officers of the law.

Straight Cut Refinery Products

By George M. Holley

MR. HASTINGS has called to my attention a quotation from a paper by Dr. E. W. Dean, as follows:

"The Bureau of Mines has had called to its attention many devices for the utilization of kerosene, but believes that mechanical development in this particular line is a mistake. The logical and reasonable way to utilize kerosene is not as such, but as a mixture with the gasoline produced with it in the refining of crude oil. In other words, attention should *not* be given to the utilization of petroleum distillates containing both the gasoline and kerosene fractions of crude oil."

I am taking it for granted that the word "not" in the above paragraph is a typographical error, and should have been omitted, as, with this word in, the whole paragraph disputes itself.

This quotation is one of the most far-seeing statements I have read in several months. We have had here at the factory for several months straight cut fuels from refineries containing practically all of the gasoline and all of the kerosene which can be obtained from a barrel of crude, and it is self-evident to us that in the long run straight cut fuels will be used in preference to what is called either gasoline or kerosene at the present day, in other words, all of the fuels with a boiling point below 550 deg. In the particular field from which we obtained our straight cut fuel, this multiplied the yield from a barrel of crude by three. The straight cut fuel would cost only a trifle more. In the winter time it is a little harder to start, and, unless the vaporizing apparatus is very efficient, it does not drive away as well as ordinary gasoline.

We, however, take exception to Dr. Dean's statement that it is a mistake to develop devices for the utilization of kerosene, simply because a carbureter which will efficiently use kerosene oil will handle any other fuel that much more efficiently. A perfected kerosene carbureter is a highly perfected gasoline carbureter, and will give very much better satisfaction on ordinary gasoline. A highly developed kerosene carbureter will use ordinary gasoline in zero weather, just the same as the old type carbureters use gasoline in summer weather. In other words, atmospheric temperature does not affect carburetion.

The more you can drive home the straight cut fuel proposition, the larger the available fuel supply will be.

Exhaust Muffler Based on Gun Silencer Principle

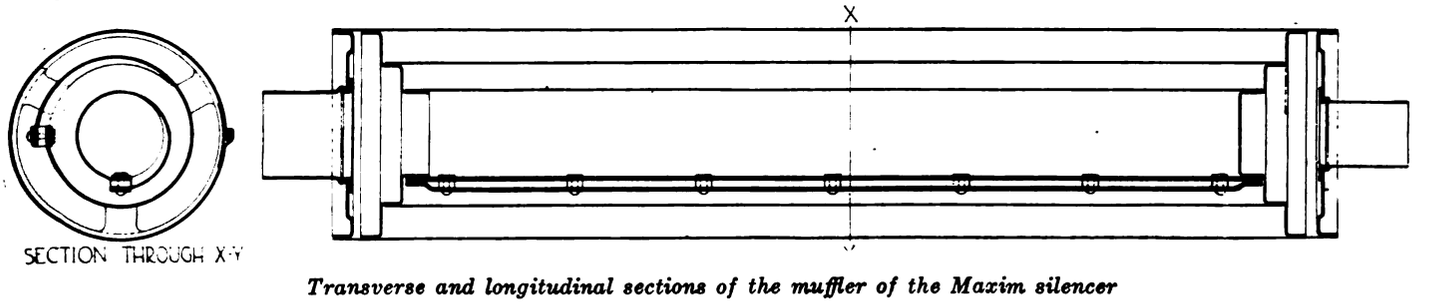
EVER since Hiram Percy Maxim invented the gun silencer he has been manufacturing on a small scale an explosion engine muffler based on the same principle. Recently Geuder, Paeschke & Frey, the well-known Milwaukee firm specializing in deep drawings of metal, has secured a license under the Maxim patent, and as it has very extensive works the prospects are that the Maxim muffler will be turned out hereafter in large numbers. A sectional view of this device is shown herewith. The exhaust products enter the central chamber at one end and thence pass into an annular chamber surrounding the central chamber, not through a multitude of holes as is customary, but through a slot 3/16 in. wide extending the entire length of the muffler. From the intermediate chamber the gas passes to the outer chamber in the same way—through a 3/16-in. slot the entire length of the muffler, but the direction of motion is the reverse this time. From the outer chamber, where, of course, the hot gases are subjected to a strong cooling action, they pass through three large punched holes in the inner header into a chamber at the end of the muffler and thence through the central discharge pipe to the atmosphere.

Mr. Maxim contends that in the discharge of the spent gases from the engine cylinders there are two distinct noises. The first, known as the primary noise, is caused by the high pressure gases issuing from under the suddenly lifted exhaust valve. This may be called the pressure noise, because it is due to the high pressure of the gases when the exhaust valve liberates them and to distinguish it from the other noise, the gas puff noise, which is produced as the gas issues from the exhaust pipe into the muffler device. This latter might be called the quantity noise.

Referring to the cross-sectional sketch of the Maxim muffler herewith, the way in which the pressure noise is prevented is easily explained. This noise consists of a wave which originates at the exhaust valve when the latter suddenly opens, the wave traveling through the exhaust pipe and into the inner tube of the silencer. It passes out of the latter through the tangential slot. Part of the wave passes one way and part the other way, because a noise wave, unlike a column of advancing gas, has no inertia. The splitting up of the wave continues at the outlet of the intermediate tube. Each time either one of the two waves coming through the inner tube leaves it, part of the wave is broken up, and these separate parts start traveling in both directions around the central tube. The original wave is thereby split up into a great number of smaller waves and is thus rendered quiet.

To overcome the quantity noise it is the general custom to obstruct the path of the gases in one way or another. Sometimes perforated baffle plates are placed inside the muffler, or again perforated concentric tubes are used. In the Maxim muffler the kinetic energy of the gas is dissipated in an entirely different manner. Instead of obstructing the escape of the gas, the latter is allowed to issue from the central tube through a tangential slot into the next tube. This causes a whirling of the gas, fresh incoming gas constantly being added to the whirl. No obstruction is placed in the path of the gases, the energy being dissipated by the cooling effect and by friction against the walls.

The outer cylinder of the muffler is lock-seamed and spot-welded right through the four thicknesses of metal, and the headers are spot-welded to the tubes. A muffler 24 in. long and 5 in. in diameter weighs 8 lb.



Transverse and longitudinal sections of the muffler of the Maxim silencer

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Body Details At the Salon and the Palace

Tendency Toward Lower Construction and a More Pleasing Appearance—Greater Comfort Also an Object

By George J. Mercer

THE two chief aims in body design are to keep the body low and light looking, and parts of the car that are separate from the body proper, but have a contributory effect, including the guards, the engine hood and radiator, the runboards, the gasoline tank, the lamps and the wheels, have all been altered with the above-mentioned ends in view.

Wheels are smaller, the wire wheels, especially, being 2 to 4 in. less in diameter than formerly; the runboards now average 15 and 16 in. from the ground to the top, a gain of 2 and 3 in.; the mud splasher, as shown in Fig. 1, helps in the same relation, and the long front guard meeting the runboard back at the dash line, as illustrated in Fig. 2, is a considerable help. The engine hoods are higher, necessitating a higher radiator, and permitting a higher cowl. The long, narrow louvres, as illustrated in this same view, give a distinctiveness not obtained in the older form.

The elimination of the lamp on the dash by the provision of dimmers on the headlight has been a decided improvement. Fig. 1 shows two ways of supporting the headlights. At the left the bracket is mounted on the frame, while at the right it is attached to the guard. The latter is very much the best arrangement; it looks cleaner, and as a tie rod is used in both cases, there can

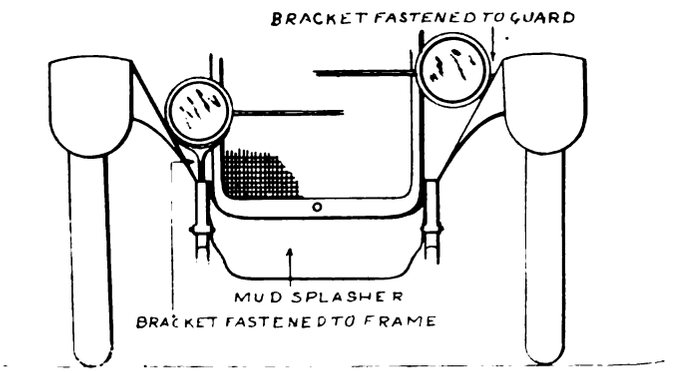


Fig. 1—Lamp support and splash guard

be no question as to the durability of the bracket on the guard. The diameter of the headlight front is important from the standpoint of appearance. On some cars this was 7 in., which looks insufficient. On others it was 10 in. and 12 in., which is better. Also, it is a mistake to have the metal rim black; if the rim is nickel the size of the glass appears to be increased.

Placing the gasoline tank at the rear was the first step toward lowering the bodies. Taking it from under the driver's seat permitted of the cushion being placed nearer the floor, and the roof line came down proportionately. With the lower seat the steering wheel must be

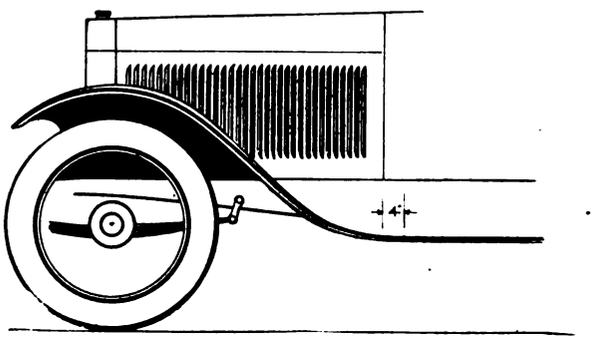


Fig. 2—Front fender running board joint

placed lower and more room provided for the driver between the dash and seat back.

Practically all cars have a kickup in the frame at the rear to provide clearance for the rear axle, and the portion of the frame forward of the rear guard is 2½ to 3 in. lower, making an average height from the ground of 25 in. To make a low-looking car this height should be 2, or preferably 3, in. less. The Pierce chassis has a double drop frame, the drop starting back of the dash and extending to the usual point in the rear. Other makers do not see enough advantage in this construction to adopt it; in fact, some who used it in the past have discarded it. Other builders have the body sides extend down over the frame, as illustrated in Fig. 3. The base line of the body is about 2 in. below the top of the frame, the floor boards being of this thickness, with just enough clearance not to touch above, and the body is supported on brackets. This is good construction, as there is less running length of contact, and squeaking due to friction between body and frame is obviated.

Sport Body and Conservative Type

Bodies can be divided into two classes on the basis of height—the sport body and the conservative type. The former is lower because the user is willing to sacrifice some degree of comfort for the sake of appearance; the latter is designed on lines that give the maximum of

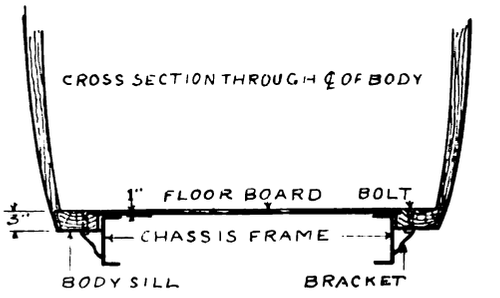


Fig. 3—Mounting of body on frame

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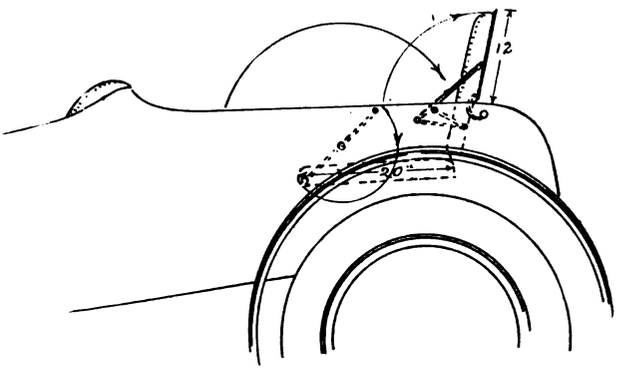
comfort. A body can be made very low if the cushions are placed on the floor, but it requires a young, slender person to get in and out of a body like this. A good rule for height is to have the eyes of a person seated in a car level with those of one standing on the ground. When this is the case a body will look right.

Fig. 4 is a four-passenger, close-coupled touring body, and illustrates the bevel-top edge that has come into such extensive use within the past year. Section A-A shows this in larger size, and the dimension 5/8 in. is a maximum. A moderate bevel looks well, an excessive one looks showy. This bevel gives the appearance of reducing the height of the side more than it actually does. Sometimes a paint stripe line is added about 1½ in. below the bevel, on the side. To look well it must be an inconspicuous stripe. The only place for a wide stripe is on the top, close to the outer edge. The popularity of the bevel edge is due to the fact that it allows the line to be continued from the radiator through the engine hood and to the rear without raising perceptibly. The back of the rear seat is high, but is concealed by the gypsy curtain quarter.

Proper Height of Body Sides

The dimensions given are for comfortable seating. Some makers have the sides 4 and 5 in. lower than here illustrated, but this will not give a feeling of security. The sides must come above the seat cushion sufficiently to make the passenger feel that he is riding in the car and not on top of it. To make the top of the driver's seat inconspicuous is the most difficult task for the body builder. The narrow second cowl of moderate height, and blending with the bevel edge, is largely used; but a cowl as shown in the illustration is coming into popularity. Handles on the outside of the doors are shown; these seem to be coming back into favor, probably on account of the trouble of finding the inside handle. The outside handle serves to close the door, and does away with the pad used in conjunction with the inside one.

The robe rail and the folding seats are two parts of the touring body that are prominent, and call for attention. The robe rail formerly was a stiff metal bar with handles at the ends. In a few cases this is retained, but the majority use an adjustable strap. The seats are practically all of the flush-folding type. Very few have the inner arm rest, and a depression is made in the front-seat back to receive them when down. Different plans are used to conceal them, but unless this is made in the form of a locker, which is expensive to build, the seat had best be left exposed. The drop curtain is not a success, because the space into which the seat folds is used as foot room when the seat is up, and when the curtain is used the cut is as low down as possible, and its edge interferes with the knees.



Folding seat dimensions

The use of the molding to cover the opening of the doors has been superseded to a great extent by having the panel project beyond the pillars, as shown in Fig. 4, representing a section of the door. In one construction this thin ledge projects over the body panel and forms an offset, the doors giving a raised panel effect on the side of the body of approximately 1/8 in. Carelessness of the builder in making bodies in which this offset varies from 1/8 to 5/16 in. has brought this method into discredit in high-class work, and it is now more customary to have the door set in flush with the body panel and show a narrow opening all around. This opening must be uniform, or it looks bad. The ledge on the door is formed by wrapping the panel sheet over the steel edge plate.

Folding Seat Details

Fig. 5 illustrates the folding seat used on runabouts. This is just the customary seat in which the two lids of the deck of the hammer are turned, one to an upright position to the back, and the other forward one revolved over to form the cushion, but the illustration is an improvement over the majority in that the height of the lid forming the back is less. The space required to make the well opening is 30 to 32 in. long, and it has been usual to divide this in the middle, making the lid that forms the back 15 or 16 in. high. The illustration shows this cut to 12 in. There was also provision for a top covering for this seat shown on several cars, the stand-

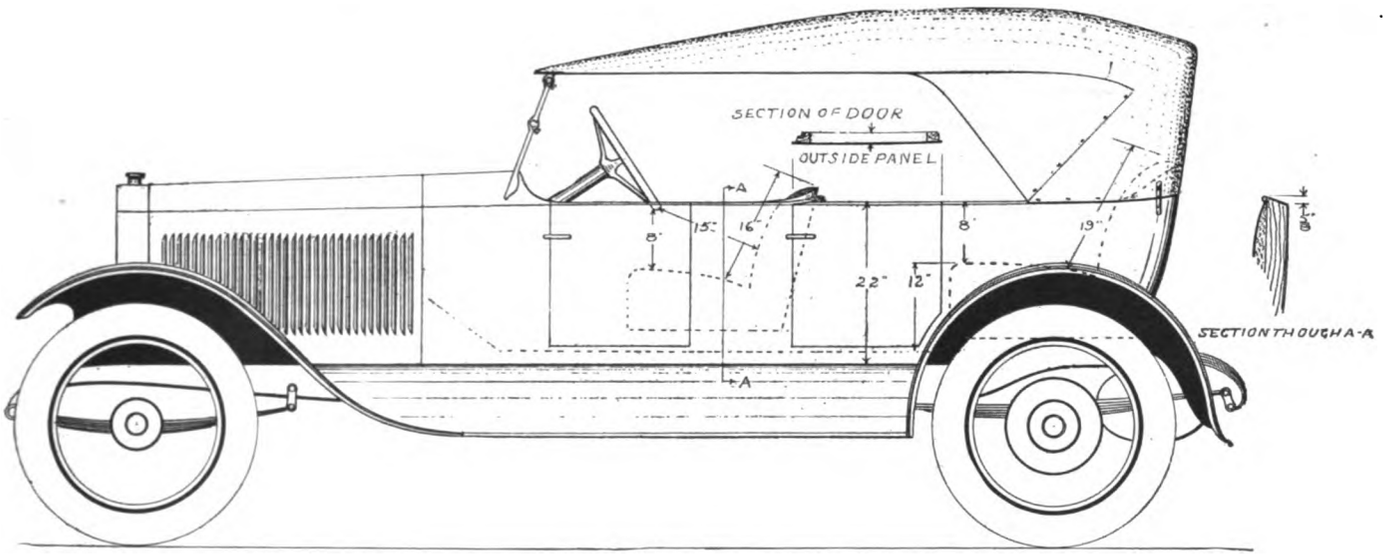


Fig. 4—Elevation of close-coupled touring body with bevel top edge

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ards and sockets for securing same being concealed in the well when not in use.

Most bodies are made with a wood framework, and over this is the sheet or aluminum panel, the method of framing and assembling the panels on the framework being changed according to the scale on which the model is produced. The all-metal body has been made almost from the beginning in the open type. It has the advantage that production can be handled more satisfactorily, and cost and time more readily controlled. This kind of a body, when the doors are closed, is apt to make a noise like the clanging of several pieces of loose steel. However, an all-metal body can be produced and the doors made to work satisfactorily. This can be done in almost any one of the present designs, and without material difference in the manufacturing costs, provided the experimental work is carefully done. With the all-metal body, either of castings or pressed steel—and the latter is the one most generally used—the preliminary work is the chief item, because once jigs, dies and patterns are made, it is almost impossible to make changes.

The open body is the standard stock proposition of all manufacturing concerns, and the all-metal body is bound to be the one most used, except among those who cater to a fluctuating trade that demands novelties. The older construction of a wood framework and metal construction will meet best the requirements of this trade. Either form of construction will meet all the demands of service and wear. The wood and metal, however, has the advantage of not requiring such a heavy outlay for tools and machinery, and that changes in models can be arranged for more easily.

Reversible Engines for Marine Work

WITH the exception of some small boats fitted with two stroke engines, practically all motor boats now are equipped with reverse gears. However, the four stroke engine may also be made reversible, and it would seem that if boats are to be equipped with electric starters, which can easily be arranged to start the engine in either direction at will, the reversing possibilities of the four stroke engine may well be taken advantage of, because very little additional mechanism is required, and this allows of dispensing with a bulky and heavy reversing gear.

General Reversing Principle

Wolseley Motors, Ltd., of Birmingham, England, have been giving some attention to this problem and have developed a design on which they have secured a British patent. In reversing the direction of rotation of the crankshaft of an internal-combustion engine, in which the sequence in which the cranks are operated by the pistons is the same in both directions of revolution, it is convenient to utilize the same camshaft both for forward and backward running, and it is well known that this can be effected by driving the camshaft through a three-bevel drive which is provided with a jaw clutch so that the direction of drive between the camshaft and the crankshaft may be reversed, the camshaft always revolving in the same direction.

The Wolseley invention applies to multi-cylinder engines in which there are two lengths of crankshaft, each of which if used alone with its corresponding cylinders and pistons could be reversed through the medium of a three-bevel drive, but which if taken together could not be so reversed, if used in connection with a camshaft on which the cams were unalterably fixed and which was common to all the cylinders; and consists of a modification of the invention described in Patent Specification No. 14480 of 1916, according to which there is used, in respect of each length of crankshaft, a camshaft in respect of the valves for each corresponding group of cylinders, and the camshafts are both driven through a single reversing mechanism and connected with one another through the medium of a clutch which can be moved to couple two shafts together in two different angular relations to one another, namely, in the relation to one another required for the forward running of the engine, and in the relation to one another required for the reverse running of the engine.

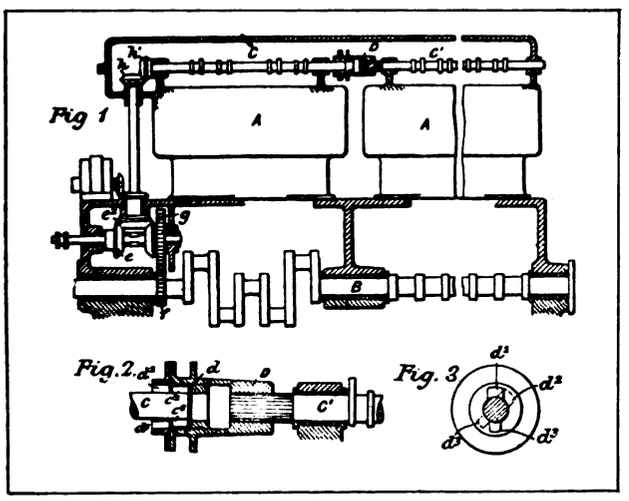


Diagram of eight-cylinder reversible engine

A, *A* are groups of cylinders of an eight-cylinder engine and *B* is the crankshaft. The camshafting for operating the valves is formed in two lengths *C*, C^1, which may be coupled together by a clutch *D*, and may then be readily uncoupled by moving the clutch endwise into its mid position shown clearly by Fig. 2. These lengths of shaft are both driven from the crankshaft through the medium of the spur wheels *f* and *g*, three-bevel drive *e*, e^1, e^2, and bevel wheels *h*, h^1. The clutch *D* is slidable upon a splined end of the shaft C^1, and cannot therefore turn in relation to such shaft. The end of the shaft *C* is formed with teeth c^2, c^3, which differ substantially in size or shape, and when the clutch is in its mid position, as shown by Fig. 2, are within a chamber *d* of the clutch which constitutes a neutral space, and the shafts *C*, C^1 are then unclutched from one another. Within walls of the clutch, which are at opposite sides of the chamber *d*, are formed gaps or notches d^2, d^3, of which the gaps d^2 correspond in size to the tooth c^2, and the gaps d^3 correspond in size to the tooth c^3.

Method of Operation

In reversing the engine, the endwise movable member of the clutch mechanism of the three-bevel drive is operated to reverse such drive, and the clutch *D* is moved to its mid position, thereby uncoupling the camshaft C^1 from the camshaft *C*. As the camshaft *C* is then turned by the crankshaft, the clutch *D* is pressed still further in the direction in which it has been moved to uncouple the shaft C^1 from the shaft *C*, and immediately the gaps d^2, d^3, of the wall of the clutch which is then pressing against the ends of the teeth c^2, c^3, of the shaft *C* come into register with such teeth, respectively, the gaps slide over the teeth and couple the shaft C^1 again to the shaft *C*.

Each gap in one wall of the clutch is, however, as indicated by broken lines, Fig. 3, in such angular relation to the corresponding gap in the other wall of the clutch as to insure that when the gaps in one wall of the clutch have been disengaged from the teeth of the shaft *C*, and the gaps of the other wall have been engaged with such teeth, the shafts *C* and C^1 will be in their relative positions for running the engine in the reverse direction. In the particular arrangement illustrated, each gap of one wall of the clutch *D* is at an angle of 45 deg. with the corresponding gap of the other wall.

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MANUFACTURERS' MERCHANDISING

The Farm Tractor Instruction Book

Send It in the Period Between Purchase of Tractor and Its Delivery—Use a Series of Letters to Sell the Book to the Farmer

Part I

H. L. THOMSON of the Moline Plow Co. gave some of the best advice that has been offered to the automotive industry in many months when he told his story of what a good instruction book should contain before the S. A. E. tractor engineers at their tractor dinner in Kansas City last week.

The worst trouble of the instruction book for a tractor, and the same can be said with regard to an automobile or a motor truck, is that it gets to the purchaser of the machine at the wrong time and in the wrong way.

First: It gets to the buyer of the machine in the tool box when the machine is received. This is wrong—the wrong way and the wrong time.

The instruction book should be sent to the buyer between the time the order is placed for the machine and the date when the machine is delivered. That is the psychological time for the job.

There Are Many Reasons

Why? There are many reasons. The buyer has more time to read the book before the machine is delivered. He is anticipating the machine. When it is delivered he will start immediately to use it, and will not have the time to read the instruction book.

Again: Much of the injury done to a tractor is done the first week. Whatever part is neglected in lubrication the neglect is worst the first week. The engine is abused more the first week; in fact, it is not extreme to declare that more injury is done to some machines the first week than in 6 months of service after the farmer has mastered the machine. Help him to master the machine before it gets into his hands.

Further: When delivering the instruction book to the farmer between the time of ordering the tractor and the date of delivery, carry on a kind of correspondence scheme with the farmer. Send out a series of letters.

Letter No. 1.—Send this out a few days before the instruction book is mailed. Tell in the letter how important it is to read the instruction book through and through. It is a part of the tractor. So sell the book to the farmer.

Letter No. 2.—With the second letter forward the instruction book. In this letter draw attention to one part of the tractor and one part of the book. If it has to do with engine lubrication, make the letter a kind of appetizer, so that the farmer will certainly read that part of the book relating to lubrication and will understand it better. Perhaps you can take up carburetion, or draw his attention to it.

State Specific Facts

Letter No. 3.—You may write one, two, or three more letters, according to the length of time elapsing between the date of ordering and the date of delivery. These letters should each deal with some part of the tractor as described in the instruction book. Make each letter relatively brief. Use short sentences. Your letter must do more than just tell the farmer to read pages 10, 11 and 12 on engine oiling. It must state specific facts with regard to your system. It might be you would state: "In our pressure oiling system the oil is pumped to the three bearings of the crank shaft under a pressure as high as 30 lb. The bearings of the crank shaft are so made that this pressure cannot squeeze the oil out before doing its work. There is no oil groove in the bearing that would let the oil be forced out; in fact, the shims are so made as to assist the bushing in holding the oil pressure. This is well told and illustrated on page 11, near the middle of the page."

Mr. Thomson had a lot of other things to say about tractor instruction books, so far as their makeup is concerned. That part of his talk before the Society of Automotive Engineers will be told in AUTOMOTIVE INDUSTRIES next week. After the meeting there were several old tractor makers who declared Mr. Thomson's talk to be one of the best and most practical they had heard for some time.

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

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Intercity Motor Truck Lines

DURING the past few months there has been considerable talk regarding intercity motor trucking. With the increasing effect of rail embargoes, coupled with the fuel shortage, there is no doubt that a great many intercity lines will be established the coming summer. It is expected that in the Middle West, as soon as the roads have become fairly dry, many towns will be connected up by such lines.

The value of this mode of transportation cannot be over-estimated, and the Interstate Commerce Commission should look upon the subject with an open mind and not permit itself to be moved by any previous prejudices against the operation of lines of this sort. It is encouraging to note that the commission has approved the line connecting Toledo, Cleveland, Detroit and Chicago. Recently, when a line was to be opened between Toledo and Detroit, the plan had to be abandoned because of opposition on the part of the commission.

Intercity transportation by motor trucks can be carried on successfully only on an organized basis. A company must be incorporated and it must have sufficient backing to properly finance the undertaking. To start a corporation of this kind going a large amount of investigation is required, and a considerable investment must be made. Once the service is in operation, there is no doubt that it will pay if the management is good. In fact, if the railroads are prevented from carrying freight under 25 miles, or even somewhat greater distances, some other means of transport must take their place, and there is nothing more logical than the motor truck train.

An undertaking of this kind should also have the backing of the local authorities, as it is of the nature of patriotic work, and one of the best kinds of cooperation it could have would be proper road maintenance. The intercity commerce which would be handled by truck lines is of a highly important nature and particularly important as regards moving farm products to nearby cities. These lines, therefore, may be classed as public utilities of the most necessary kind and should be encouraged.

Behind Orders

A YEAR ago we heard reports that factories had on hand large numbers of cars of which they could not dispose. This was not true of a great many companies, yet there were some that had in their storerooms cars awaiting orders from dealers. To-day it is entirely different, and a much more healthy condition, in a way, prevails. Owing to war work and traffic conditions factories have not been able to turn out the number of cars which they would have produced in normal times, with the result that deliveries cannot be made nearly as promptly as dealers desire. The actual purchases of cars throughout the country seem to be very close to what would be expected when it is considered that nearly two million men have been withdrawn from their ordinary positions in life and concentrated in and around the army camps. Add to this the large number of men who have entered other fields of Government work where their usual habits are altogether changed, and you have a condition which is bound to cause a reduction in passenger-car sales. Nevertheless sales have held up remarkably well in nearly all parts of the country. The result is that with the factories turning out large quantities of war work the dealers cannot get as many cars as they desire.

The used-car market is a good index of conditions. The used-car shows held throughout the country indicate that there is a rapid increase in the demand for these cars. They are not only being bought by people for city use, but they are also being purchased by suburbanites who desire to convert them into light trucks to carry their farm products to market.

The larger producing companies have had to reduce their production to a large extent to meet the orders for all sorts of material which have been coming in from the Government. The result is, naturally, that although the product is spread as evenly as possible over the country, in a spirit of

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fairness to all dealers, manufacturers have not been able to fill the demand.

People who have not heeded the advice of the dealers to buy their cars early are surely going to notice that it is not as easy to get quick delivery on a car as it was a year ago. The spring thaws are going to make drive-away conditions bad for a period of about two months. As a matter of fact, it is far easier to drive a car from the factory to the distributing point in January or February than it is in March and April.

Reviewing the situation, it is now clear how unnecessary it was to urge forced curtailment of production. Reduction in the amount of floor space available and the number of men on the job has cut the output of the factories to about the same extent as the Government would have done had it attempted to effect a reduction by arbitrary means.

Live Axle Tractors

FOR many years it was a familiar saying in automobile engineering circles that live axles were all right for light cars, but would not stand up on heavy vehicles. To-day, however, the great majority of motor trucks have live axles. It took quite some time before the proper materials for gears and shafting, the proper tooth pressure allowance and the best kind of shaft fitting for such axles were determined, and while knowledge concerning these factors was accumulating there was a considerable proportion of failures, especially of axle shafts. At the present time practically nothing but alloy steel, heat treated, is used for axle shafts; the factor of safety allowed is only about two and the wheels and gears are fitted to the shafts by means of splined joints.

The experience thus gained may be made available in the tractor industry. What the maximum torsion in the axle will be can be calculated quite closely from the engine dimensions and the gear reduction. Abnormal shocks due to jamming-in of the clutch may and should be guarded against by limiting the clutch capacity to a moderate excess over the maximum engine torque.

What is probably bothering tractor designers is the enormous dimensions found necessary for the axle parts if cold-rolled stock is used for the shafting and the wheels and gears are keyed on in the usual way. The solution of the problem lies in the use of chrome-nickel steel for the axle shafts and of high-class construction throughout. A final drive by two sets of spur wheels would seem to offer important advantages, as it obviates the heavy end thrust encountered with bevel and worm gears and permits the use of a relatively small differential. This could be combined either with a bevel-gear reduction or with another spur-gear reduction, depending on whether the engine set lengthwise or crosswise of the frame. Worm drive, of course, makes for simplicity, but it is a fact that the efficiency of the worm is at its maximum at speeds far beyond those which could be employed on tractor axles. There is also a well-founded impression that worm gearing will not stand much abuse.

Refinement of Lubricating Systems

A GOOD example of how automobile mechanism is gradually being refined is furnished by the engine lubricating system. We started out with the oil cup on the crankcase, borrowed from stationary practice, and with the variable level splash system, but arrived within a relatively short time at the constant level or circulating splash system. This served satisfactorily for many years, until the maker of an engine of special design, which by reason of its unconventional features consumes considerable oil, introduced the plan of raising the oil level as the load on the engine increased and lowering it with decreasing load. He has since found a number of followers among manufacturers of conventional engines.

In engine lubrication the best practice, of course, is to furnish just enough oil to the bearing surfaces to maintain an oil film between them at all times, but no more. Any excess supply of oil not only results in waste of the lubricant, but also in a smoky exhaust and in carbonized cylinders. At light loads, when the pressures between the bearing surfaces are small, there is little danger of the oil film breaking down even if the feed of oil to the bearing is slow. On the other hand, when the engine is working under substantially full load, the great heat produced tends to reduce the viscosity of the oil, and as at the same time the pressure on the oil film is greatly increased the film is apt to break down, unless it is constantly renewed. With constant level lubrication the level and the size of splashers must be determined to meet maximum load requirements, with the result that at light loads the engine tends to soot up and smoke. These difficulties can be obviated by varying the oil level with the engine load.

Increased engine speeds and the corresponding rise in bearing pressures have led to a more general use of force-feed lubrication. The pressure on the oil is produced by a gear pump, but ordinarily it is maintained constant by a relief valve irrespective of the load on the engine. With constant pressure on the oil the tendency will be to feed at the same rate regardless of the load, and this involves the same disadvantages as the constant-level splash system. One manufacturer has improved upon this constant pressure force-feed system by providing a by-pass valve in the oil feed line, controlled by the suction in the intake manifold and so arranged that when the suction exceeds a certain amount (nearly closed throttle) the pressure is relieved and oil is fed to the bearings by gravity only. This, therefore, constitutes a two-stage oiling system, employing pressure for the normal range of engine operation and gravity for idling.

It would seem a simple matter to provide for gradual variation of the pressure on the oil with variation of engine load. The oil pressure, of course, is determined by the settling of the relief valve. This is a spring-loaded valve and its spring pressure can be varied by connection with the throttle.

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□ Latest News of the

First Liberty Planes Shipped

American-Built Battle-Planes On Way to France—Broke Speed and Climbing Records

WASHINGTON, Feb. 21—The first American built battle planes are to-day en route to the front in France. These planes are equipped with the first Liberty airplane engines from machine production. One of them in a recent test, surpassed all records for speed and climbing for planes of battle type.

Engine production which began a month ago is now on a quantity basis and the peak of production will be reached in a few weeks. Only the 12-cylinder type is being manufactured, as developments abroad have made it wise to concentrate on the high powered engine instead of the 8-cylinder one.

This first shipment though not in itself large, marks the final overcoming of many difficulties met in building up this new intricate industry. The great remaining problem is to secure the thousands of skilled mechanics, enginemen, motor repairmen, wood and metal workers and so forth, needed to keep the planes in perfect condition.

Great Mechanical Force

This great engineering and mechanical force at the airdromes, the flying fields, and the repair depots, both here and behind the lines in France, is a vital industrial link in the chain to air supremacy. Without them, the planes turned out are useless and the flyers helpless.

The above statement issued to-day by Secretary of War Baker, is designed to give as complete a picture as permissible, under military requirements, of the progress of our air service.

In reviewing the air problem, Secretary Baker points out that after three years of warfare the total number of planes able to take the air at any one time on either side of the western front, has not been over 2500.

46 Mechanics to a Plane

This combined with the fact that 46 men are required on the ground for every plane in the air, gives a better perspective of European aviation conditions than has been commonly possessed on this side.

Every plane in the air requires two replacement planes on the ground and one training plane for every pilot who eventually reaches the front, with a spare engine for each plane. The first American-made battle planes were not due in France under the original schedule until July.

—

Automobile Men Hear Andrews

WASHINGTON, Feb. 2—Major Barrett Andrews who is here from the French front and served on General Pershing's staff, yesterday addressed a number of the automobile experts of the army forces here and also a number of truck manufacturers on the experiences of the motor transport section abroad. Secrecy was requested regarding the address as a number of military secrets were disclosed.

—

10,000 at Newark Opening

NEWARK, N. J., Feb. 16—Ten thousand persons attended the opening of the tenth annual Newark automobile show at the First Regiment Armory to-night. All the 60,000 sq. ft. of floor space has been reserved by eighty-six exhibitors who are displaying 186 motor vehicles. In this total forty-four makes of passenger cars and twenty-three makes of commercial vehicles are represented. Thirty-four accessory dealers have booths in the balconies.

—

Barlow Joins Moto-Meter

NEW YORK, Feb. 20—A. E. Barlow has been appointed sales manager for the Boyce Moto-Meter Co., Long Island City. He will have full charge of distribution through dealers and jobbers and will make his headquarters at the factory. Barlow was formerly sales manager for the American Ever-Ready Co. and for Findeisen & Kropf, Chicago.

—

Push "Return Load" Work

WASHINGTON, D. C., Feb. 18—The Highway Transport Committee is working out a plan under the "return loads" system to relieve congestion east of the Mississippi River. The plan is to first establish return loads through Boston to Washington, then New York to Buffalo and next Philadelphia to Chicago taking in Cleveland, Detroit, Indianapolis and Cincinnati. At first the aim will be only to hit the large cities, but later it is planned to include the smaller towns also. The committee is working through the Chambers of Commerce of the various cities on the routes, pointing out to them the need of getting together the man with goods to ship and the man with a truck empty or partly filled. Letters are going forward to-day which aim to soon have the system in operation. George P. Wilson, Secretary of Transportation for the Allied Trades Body, Philadelphia, will actively co-operate with the committee.

Much Opposition to Liberty Tractor

Idea Berated at Second Tractor Dinner of S. A. E. in St. Louis

KANSAS CITY, Feb. 14—The 200 who attended the second tractor dinner of the Society of Automotive Engineers at Hotel Baltimore, last night, heard the rumored Liberty tractor generally berated by the entire tractor industry. The Liberty tractor had not a friend present.

A. P. Yerkes of the Department of Agriculture, Washington, D. C., read extracts showing that Washington was opposed to it and that there was not the slightest sentiment there in favor of it. J. B. Bartholomew, president of the Avery company, led the crusade against it, declaring that the rumors already spread were holding up tractor sales, in that farmers were thinking some form of government standardized tractor was coming out and were not going to buy until they had seen it.

Much injury can come to the tractor industry at present by continued circulation of such rumors. The necessity to-day is for tractors such as are being built. There is too great a scarcity of engineers, tool makers, and draftsmen to go into the development of a Liberty tractor. If a Liberty tractor were to be developed by the government the matter should be kept secret, not only until after it was designed, but until it was tested out and found satisfactory and ready to go into production. Otherwise a stopping of tractor sales will ensue.

Dent Parrett, president of the Parrett Tractor Co., in his remarks as toastmaster defined tractor standardization as a commercial investment. A tractor standard to be worth while must save the manufacturer money, and it must also enable him to speed up production. The object of tractor standardization is not to restrict the versatility of the engineer, nor not to dwarf his originality of design, but rather to free him from petty details.

H. L. Thomson of the Moline Plow Co. gave some of the best suggestions regarding tractor instruction books that has been made public. He recommended that tractor manufacturers deliver the book to the buyer in the time between the placing of the order for the tractor and the delivery of the machine; and, further, that in the same period a series of letters be sent to the buyer drawing attention to different uses of the tractor and to those parts of the instruc-

(*Continued on page* 425)

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Automotive Industries

No Alarm Caused by Proclamation of Export and Import Control

Not Intended as Embargo but as Regulatory Measure—Exporters Say Needed Licenses Will Be Issued—Rubber Importers Expect No Harmful Results

NEW YORK, Feb. 16—The President's proclamation taking over control of all exports and imports through a licensing system, is not viewed with great alarm by the automobile industry. The proclamation itself specifically states that it is not to be considered as in the nature of an embargo on either exports or imports, but that it is designed as a regulatory measure pure and simple.

Under the terms of the proclamation, certain products deemed of essential value in winning the war cannot be imported or exported except under license. Where products are vitally necessary to the carrying on of the automobile industry, it is not anticipated that great difficulty will be encountered in obtaining licenses. This applies to imports.

Insofar as exports are concerned, it is pointed out that the industry has been suffering for the want of tonnage for some time, and that such additional restrictions as may be imposed under the terms of the proclamation are not likely to make a great difference. Motor cars and trucks are as essential to the Allies as they are to the United States. Space must be found for them in vessels and the opinion of prominent exporters is that licenses will be forthcoming when and as needed.

One serious aspect of the situation which chiefly concerns exporters is that if it should be decided to limit very strictly the exportation of motor cars and trucks to such countries as South America, South Africa, Australia, etc., a hardship would be imposed because of the virtual severance of business relations which have taken years to build up.

It seems likely that the War Trade Board through its licensing system will, to a certain extent, limit the carrying by ocean-going vessels of certain products which may be termed non-essential; just what this curtailment will amount to cannot be stated at this time.

In general, however, a feeling prevails that the proclamation is in effect a gigantic checking measure with the aid of which it will be possible to efficiencize both American shops and those of her allies.

For example, if foreign governments should request licenses for the importation of great quantities of any one raw material this would indicate to American authorities, who know of present production possibilities abroad, an expansion of facilities with increased production.

This information could, in turn, be used to advantage in perhaps reducing production of similar articles by a certain percentage on this side.

In other words, it would tend to eliminate duplication of effort and promote efficiency in that it would indicate where certain raw materials might be fabricated in the country of their origin to better advantage, perhaps, than in some other country.

Exports of motor cars and trucks reached new high levels in 1917. During the year a total of 65,086 cars and 14,284 trucks were sent over-seas. Though this total of nearly 80,000 vehicles seems a lot, exporters point out that the shipping space required for them is very small when compared with the total number of ships afloat. Allowing about 6 tons, cubic measurement per car or truck, the entire lot could be stowed away in 96 ships of 5000 tons capacity.

Obviously, however, a ship cannot be completely loaded with motor cars or trucks. The space might all be filled, but the carrying capacity would not be reached by a considerable percentage. In this connection, Peter Steenstrup, vice-president of the General Motors Export Co., says:

(*Continued on page* 431)

Approve Present Contract Method

NEW YORK, Feb. 16—That the present method of allotting contracts for military trucks, whereby the government deals directly with the various makers, is the best method and should not be changed, was the concensus of opinion following a joint meeting of directors of the National Automobile Chamber of Commerce and the Motor and Accessory Manufacturers Association Feb. 14. The meeting was called to consider methods of letting such contracts. A unanimous vote of confidence was given Christian Girl for the manner in which he is carrying on his work. The matter of placing more prominently before the public the inherent advantages of motor haulage as a means to help relieve railroad congestion is being considered.

Washington News Letter

President's Proclamation Expected to Influence Pro-Germans—No Restriction of Rubber Imports—Revise Daylight Bill

WASHINGTON, Feb. 19—Automotive industries are vitally concerned with the events in the Capital this past week. The chief object of the import and export proclamations of the President is to prevent the products of the United States reaching Germany and also to influence what is at present pro-Germanism in certain countries to a change of heart by restraining our exports to those countries.

For example, Argentina is at present considered pro-German. Brazil, on the other hand, is friendly to the American policies. Consequently it is unlikely that shipments to Brazil will be curtailed while it is very likely that but few articles will be allowed to be exported to Argentina.

In addition, the proclamations will, according to official announcement, allow for the curtailment of export and import of "non-essentials." For example, certain articles used in this country may be considered non-essential during the war, and if they are dependent upon materials imported from foreign countries, such importations may be curtailed.

The War Trade Board when confronted directly with the question "Will crude rubber for the manufacture of passenger car tires be curtailed in importation?" replied that it considered such tires useful and that it was unlikely that the import of the rubber for tire manufacture would be curtailed.

Another result hoped for from the proclamations is the diversion of material. For example, mahogany is needed for airplane propellers and is instead being used in great quantities for household furniture. By the license plan, the Government expects to prohibit the im-

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portation of mahogany for household furniture use, thus increasing the amount available for propeller manufacture. Another benefit anticipated through the curtailment of non-essentials is an increase in shipping tonnage available for carrying supplies to France.

It may be definitely stated here that at present there is no specific thought of curtailing the export of automobiles or the import of any materials necessary to the manufacture of automobiles or other automotive products. Officials of the War Trade Board stated, however, that they could not foretell the needs of the next few months, and it is possible that such curtailment may be found necessary for the benefit of the military establishment.

As reported last week, there is a rumor that the automotive activities of the War Department, excepting aviation, will be co-ordinated under one head. At this time there is no reason for changing this view, and in fact it may be said to have been strengthened considerably by additional reports within the past few days.

If this plan is placed in operation it will mean that the purchasing, procurement, maintenance, engineering and all other details regarding trucks for the entire army, including Quartermaster, Ordnance, Signal, Medical and Ambulance Corps, will be done in one office under the supervision of one man.

It is a plan that will abolish a considerable amount of duplication of effort and much confusion that now exists, besides adding to the efficiency of the army by reducing the numbers of kinds of trucks in use with the consequent reduction in the number of parts needed.

The daylight bill as amended last week in the House calls for a shift in working hours from March to October in place of an all-year shift. The amended bill may be considered greatly superior. Detroit, Flint and other Michigan cities operating under an eastern time schedule for more than a year have experienced the inefficiencies of the all-year-round plan. Workers in the winter months in Detroit start in at 7.30, which is really 6.30 central time, the real Detroit zone find the first few hours of the day as dark as night with a consequent slackening of production which affects their efficiency throughout the entire day.

—

Homer-Laughlin Takes Over Langbein

LOS ANGELES, Feb. 20—The auxiliary transmission for Ford cars and trucks, formerly styled Langbein, has been taken over by the Homer-Laughlin Engineers Corp. and will henceforth be styled Laughlin-Langbein auxiliary transmission.

—

Gay on War Trade Board

WASHINGTON, D. C., Feb. 18—E. F. Gay, formerly Dean of the Harvard School of Business Administration, has been appointed to the War Trade Board representing the United States Shipping Board and will devote his attention to import problems and their relation to the conservation of shipping tonnage.

Big Improvement by Railroads

Idle Cars Reduced by 44 Per Cent in Last 12 Days—Coal Moving Freely

NEW YORK, Feb. 20—The railroads are in a better condition at present than they have been for a long time past. During the period between Feb. 6 and Feb. 19, congestion of cars on lines East of the Mississippi was reduced by 44.2 per cent.

In other words, there has been a reduction of 71,130 cars of the total number above normal that were standing idle on the tracks on Feb. 6. For the last week the situation has shown continued improvement and the mild weather has assisted greatly in moving cars. The peak of railroad congestion was reached the first week in February.

Reports made yesterday by eastern railroads give in detail the number of cars above normal on their tracks. These are cars which are stalled, side-tracked, unduly delayed or held up for any reason, and, therefore, represent an excess above that number which would be the normal flowing traffic. This is the measure of railroad congestion. The following table shows the number of cars above normal on eastern roads, Feb. 6 and Feb. 19:

	Feb. 6	Feb. 19
Eastbound loads	59,784	39,257
Eastbound empties	13,345	3,140
Westbound loads	39,841	28,287
Westbound empties	47,934	19,090
Total loads	99,625	67,544
Total empties	61,279	22,230
Grand total	160,904	89,774

The report shows that even in the last 24 hours ending at noon yesterday, there was a gain of 5000 freight cars in relieving congestion. The handling of coal has greatly improved in the last few days. Reports show that the flood danger on the Ohio River is abating, the river falling at Pittsburgh, Parkersburg and Wheeling.

A statement has been issued by the Pennsylvania Railroad in which it is stated that its lines have moved twelve times as much hard coal in the first 18 days of February as in the same period in January. Other freight had also been greatly accelerated. It is expected that the improvement will continue.

—

Truck Inspectors Wanted

WASHINGTON, Feb. 18—Open, competitive examinations for inspectors of military trucks and assistant inspectors of motor vehicles to fill vacancies in the Quartermaster Corps, U. S. Army, and the Ordnance Department at large of the War Department, have been announced by the Civil Service Commission. The duties of the appointees will be in connection with the production of standard military trucks and motor driven-vehicles. In most cases it will require following the raw materials through various processes to the completion of the finished product in the various factories to which appointees may be assigned. Inspectors of trucks will be paid from $1,800 to $2,400 per annum and assistant inspectors $1,200 to $2,000. Certain qualifications are essential and on account of the urgent need of the Government for men in these branches papers will be rated promptly by the Commission.

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Zinc Prices Fixed

WASHINGTON, Feb. 20—Maximum prices of 12 cents per lb. f.o.b. East St. Louis for Grade "A" zinc, 14 cents for plate zinc, and 15 cents for sheet zinc, f.o.b. plant, have been fixed. This agreement, made by the War Industries Board with the producers, has been approved by the President. It was also agreed that the producers would not reduce the wages now being paid, and that the same prices for zinc would hold in all sales to the Allies, the Government and the public. Furthermore, producers will take all possible steps to prevent the distribution of zinc from becoming a matter of speculation, and will do everything in their power to keep up the production of zinc so as to insure an adequate supply.

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Chandler Earns $2,382,403

CLEVELAND, Feb. 20—The Chandler Motor Car Co. earned a net profit of $2,382,403 in 1917, a gain of $666,235 over 1916. This was the amount left from a gross income of $3,277,715, which was $843,945 more than 1916. The earnings equal $34 a share on the outstanding stock, compared with $24.50 in 1916. The balance sheet follows:

	1917.	1916.
Land, buildings & equip.	$650,056	$475,062
Good-will	5,000,000	5,000,000
Cash	698,976	1,800,422
U. S. Liberty bonds	279,190	.....
Customers' notes	15,928	14,215
Customers' accounts	101,481	53,181
Creditors' debit balances	28,783	.....
Cars sold for export	192,114	123,287
Merchandise inventory	3,018,742	1,876,985
Invest. in subsidiary co.	35,090	32,000
Advances to manufacturers	35,229	72,867
Miscel. notes and accts.	25,004	.....
Deferred assets	39,011	30,830
Total	$10,119,604	$9,478,849
Liabilities:		
Capital stock	$7,000,000	$7,000,000
Unpaid purchases and exp.	22,349	905,799
Dealers' deposits	97,860	113,928
Dividend payable	210,000	210,000
Accrued taxes	28,334	53,122
Reserves	97,872	5,214
Surplus	2,663,189	1,190,786
Total	$10,119,604	$9,478,849

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Caldwell Goes With Ajax

TRENTON, Feb. 20—Elmer E. Caldwell has been appointed assistant advertising manager of the Ajax Rubber Co. of New York. He was formerly in a similar position with the Michelin Tire Co., and prior to that was advertising manager of the Canadian branch of Willys-Overland, Inc., in Toronto.

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Much Opposition to Liberty Farm Tractor

(*Continued from page* 422)

tion book relating to these subjects.

Mr. Thomson argued for more simply written instructions, and not the language that one engineer uses when talking to another. The farmer is not familiar with this He does not know its meaning. Blueprints should not be used as the farmer does not understand them, but X-ray wash drawings or pen and ink sketches are advantageous. A good cover should be used so that oil will not soak through or water spoil it. The book should be pocket size, and have incorporated in it complete instructions as to how major tractor repairs should be made, with illustrations of the more difficult steps. It should tell how to take up lower connecting-rod bearings; how to scrape crankshaft bushings; how to take the carbon out of the cylinders; how to grind valves; and how to put in new piston rings. The instruction book thus becomes a real service to the farmer. It should contain large oiling charts, showing how frequently parts should be oiled; there should be carburetion charts explaining adjustments; and there should be valve-timing charts and ignition charts.

Urge Community Tractors

Dean W. M. Jardine of the Kansas State Agricultural College, Manhattan, Kan., argued for community tractors in the eastern part of Kansas, where there are many farmers who could not economically own private tractors, but where one tractor could work for five or six farmers. At present they are opposed to this community system, but the State Council of Defense has Dean Jardine working on the job. He further recommended that tractor makers send one or two of their machines, or as many as they can spare, into the state for spring plowing and announced that the State Council of Defense will arrange to secure land which can be plowed at a good price per acre. A further recommendation was that tractor dealers use their demonstrating machines for contract plowing at a stipulated price per acre, the State Council of Defense securing the land to be plowed.

Kansas has to plant 24,000,000 acres of crops this spring and has approximately 70,000 fewer farm laborers than a year ago. Tractors must be used for the work. In the hot month of July over 9,000,000 acres must be plowed for winter wheat, because land plowed in July generally yields a 50 per cent increase in crop. There is scarcely any other part of the country where the tractor is more needed than in the winter wheat belt of Kansas. The weather is too hot for the horse and often the ground is too hard. Kansas has at present 6000 tractors, 2000 of which were sold last year. Tractors are needed for the 35,000,000 acres that Kansas has to harvest this year.

The 10-20 tractor is the average size used in the state.

Use Laboratory for Tractor Tests

Manufacturers Taking Advantage of Purdue Offer of Scientific Facilities

KANSAS CITY, Feb. 18—Professor G. A. Young, in charge of mechanical engineering and testing at Purdue University, Lafayette, Ind., speaking before the S. A. E. tractor engineers here, outlined the broad plans of Purdue for testing farm tractors. The university is the official testing laboratory for railway apparatus, and new designs of brake shoes, air brakes, draft gears, etc., must take the Purdue test before they may be placed on the market.

Professor Young offered his great testing laboratory for the use of tractor makers and manufacturers of engines for tractors. The testing laboratory that is ready for tractor testing is larger than the entire building housing the tractor show here, where there are displays of 43 tractor makers and more than that number of makers of accessories and apparatus.

The equipment of the laboratory includes a Diehl electric dynamometer testing outfit and there are 2600 hp. of steam power available for tractor testing work and in addition 400 hp. generated for testing uses by gasoline engines.

The Purdue aim, in so far as tractors are concerned, is to bring out by test information as to the designs of tractors which are theoretically right, those practically right and those commercially right.

In all tests a general standard will be followed and adhered to, so that information will have a permanent value and can be used for comparison years hence. The engines will be tested for power on standard gasoline and also on any special fuel that the maker may desire. The complete tractor will be tested in the field for drawbar pull, etc. In the engine test every necessary record will be taken, such as air velocity for cooling, water temperatures, oil temperatures, fuel efficiency, power output, torque, etc.

Already some tractor makers have decided to send their machines to Purdue to have them tested and some engine makers are also going to take advantage of the offer that Purdue has made.

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Will Help Road Building

WASHINGTON, D. C., Feb. 18—Director McAdoo of the United States Railroad Administration has notified C. P. Coleman, Chairman of the Executive Committee of the American Association of State Highway Associations that the U. S. Railroad Administration will cooperate with the Secretary of Agriculture by transporting materials for the construction of national highways designated by him as military or economic necessities whenever the equipment is available and not needed to move supplies for the Army, Navy and the Shipping Board.

Michigan College Will Train Tractor Operators

LANSING, MICH., Feb. 18—A school which will train men for the 1918 food drive by teaching them the operation of farm tractors will be conducted here by the Michigan Agricultural College from March 4 to 16, with Prof. H. H. Musselman in charge. This training camp is for men who expect to use these tractors, or would like to fit themselves for such service on Michigan farms in 1918. Candidates for the course should report at the college on March 4 and enroll in the department of farm mechanics for the special tractor, as if they were regular students. A dozen engines, both steam and gas, will be used in the work.

—

Predict Demand for Industrial Labor

DETROIT, Feb. 18—If predictions are realized, there will be an active demand for all kinds of industrial labor in this city within the next 30 or 40 days. It is expected that within this time the factories now in the course of construction will have their machinery placed and be ready for production.

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$9,726,873 Increase in Michigan Deposits

LANSING, MICH., Feb. 18—Figures supplied by Banking Commissioner Frank W. Merrick show an increase of $9,726,873 in deposits of the 512 Michigan banks from Nov. 20 to Dec. 31, 1917. The increase in commercial deposits was the greatest, being $8,672,118; the additional sum of $1,034,754 went into savings accounts. Commercial loans and discounts showed an increase of $5,576,453, while savings loans and discounts reveal a decrease of $2,653,647; commercial bonds and mortgages a decrease of $2,253,912, and savings bonds and mortgages a decrease of $634,455. This, however, still indicates an increase of $44,437 in all sorts of loans over the same period the year before. Michigan state banks and trust companies maintained on Dec. 31 a total reserve of $126,454,725.95, which was 21.75 per cent of the total deposits.

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Chandler to Make Tractors for Government

DETROIT, Feb. 20—The Chandler Motor Car Co. has received a large contract for the manufacture of tractors for the government. It is estimated that the contract amounts to $10,000,000 or more and it is understood that the tractor will be a heavy duty type to be furnished to the Allies by the United States. A large addition is to be made to the present plant and it is expected that the filling of the contract will require several years. At the same time work has been started on the million dollar factory building for the Cleveland Tractor Co. and it is expected that another tractor concern headed by George T. Comey, with whom are associated J. J. Tracey as chief engineer and Harry L. Lance as general manager, will acquire a plant in Cleveland within a few days. It will manufacture the J. T. creeper type tractor.

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Thaw Brings Cheer to Detroit Factories

Relief of Coal Situation and Production Increase Result—Anderson Electric, Maxwell and Dodge Brothers Concentrating on Government Work

DETROIT, Feb. 16—One of the most important developments of the week here and in vicinity is the effect of the thaw. This has tended to open the roads westward, so that drive-aways are starting again from nearly all the factories. Up to this week the only gateway out of Michigan was by way of Detroit and Toledo, and this was only kept open due to the continual passage of trains of trucks for the government, followed by drive-aways of commercial cars and passenger cars.

The coal situation has also been relieved by the thaw, and general production is on the increase.

The Anderson Electric Car Co. is doing a considerable amount of government work at the present time, particularly on trucks No. 1 and No. 2, government specifications. They are also making electrical industrial trucks for the government. The passenger car output at the present time is about ten a day. They report business very good, particularly throughout the East, and excellent in Washington, where they have sold 125 cars during the past year.

The Cadillac Motor Car Co. is experiencing difficulty in shipping cars, due to freight congestion. They require from thirty to forty freight cars a day, but have been only able to secure ten or twelve a week. They are driving all eastern deliveries away, but it is impossible to drive west at present. They report automobile labor plentiful and are having no difficulty in getting all they need.

All the government work done by the Cadillac company is carried on in a separate plant, and regular production is not interfered with. They are scheduled to begin building Liberty engines in May or June.

The production of Maxwell tractors and the proposed large capacity Maxwell truck is being held up pending the arrangement of the factory to take care of government work. There is a great amount of government work coming into the Maxwell-Chalmers plant resulting in the rearrangement of production to a considerable extent.

The inability of the Commerce Motor Truck Co. to deliver cars or to secure freight cars is responsible for the great curtailment of the output of this company. They are now manufacturing six cars a day, whereas the output to fill orders would be fifteen per day.

The production of Dodge Brothers from the beginning of the concern to date is 225,000 cars. Production is not being curtailed at the present time, although work on war contracts has been started. They are unable to get enough freight cars to make deliveries, and drive-aways have been cut down owing to the impassable condition of the roads in the West. However, drive-aways through Toledo and points East and South are going ahead without delay, and it is also possible to reach all points North.

The Republic Truck Co. has increased its production to eighty commercial cars a day, indicating that the manufacture of war trucks is not interfering materially with regular production.

The Hudson Motor Car Co. has received a contract for 2000 Nash trucks from the government. The Paige Motor Car Co., the Premier Motor Car Co. and the National Motor Vehicle Co. will each make a similar number.

The Federal Motor Truck has received a second order for several hundred 3-ton chassis for the signal corps. The first order, which was also for several hundred trucks, has been completed. The monthly production of the company is about 300, about 60 per cent of which is of the 2- and 3½-ton capacity, and the other 40 per cent quite evenly divided among the 1-, 1½- and 5-ton trucks. At the present time the company is driving away about thirty-six trucks a week to Cleveland, Indianapolis and Toledo, the moderate weather facilitating these drive-aways. They report business very good all over the country.

—

Williams Heads Highway Industries Association

WASHINGTON, D. C., Feb. 18—The Highway Industries Association held a meeting here Saturday and elected the following officers and directors: President, S. N. Williams, sales manager of the Garfield Motor Truck Co.; first vice-president, A. R. Hirst, Wisconsin State Highway Engineer; second vice-president, E. J. Mehren, McGraw-Hill Publishing Co.; third vice-president, S. T. Henry, Allied Construction and Machinery Corporation. Directors include Windsor T. White, White Company, Cleveland, representing the motor truck industry through the N. A. C. C.; William E. Metzger, Columbia Motor Company, representing the motor car industry through the N. A. C. C.; W. O. Rutherford, sales manager B. F. Goodrich Company, representing the Motor and Accessory Manufacturers' Association; A. N. Johnson, Portland Cement Association; W. P. Blair, National Paving Brick Association; A. P. Sandles, National Crushed Stone Association; H. J. Love, National Stone Association; S. J. Morrison, National Association Asphalt Block Manufacturers; E. G. Sutton, National Association, Sand and Gravel Producers, and S. T. Batty, National Association Road Machinery Manufacturers. An executive committee was appointed, including Williams, Hirst, Mehren, Henry, Johnson, Blair, Sandles, White and Rutherford.

The association which now represents industries valued close to three billion dollars and employing 1,500,000 men will now devote its efforts to the location of Washington offices' after which it will get down to active business.

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Would Employ Alien Enemies

WASHINGTON, D. C., Feb. 18—A bill now before the Committee on Military affairs introduced by Congressman Moore of Indiana provides for the employment of all interned enemy aliens either as agricultural laborers or for public highway construction.

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New Steel Plant Begins Operation

FULTON, N. Y., Feb. 16—The Heroult electric plant of the Fulton Steel Corp. has begun operations and is turning out alloy steels of different kinds, including nickel chromium, ball bearing, magnet and other steels. One of the chief products will be high-speed tool steel of the Great Bear brand, the invention of Irving R. Valentine, metallurgist of the company, who was formerly connected with the General Electric Co.

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Paige May Buy Signal Truck

DETROIT, Feb. 18—The Paige-Detroit Motor Car Co. has made an offer to the Signal Motor Truck Co. to buy its entire business and assets. The offer only awaits ratification of the Signal stockholders, which will probably be given at the meeting to be held about Feb. 20. Owners of the preferred stock of the Signal company would be entitled to the full amount, provided it does not exceed $106 a share with accrued dividends.

The amount offered has not been made public. C. P. King and W. K. Hoagland, voting trustees of the Signal, say that it would be sufficient to pay all debts and equals the company's sound assets.

—

Hinkley Making Army Truck Engines

DETROIT, Feb. 18—The Hinkley Motors Corp., which was one of the first local companies to receive a government contract for engines for army trucks, is now filling this order. The capacity of the plant is from 40 to 50 army truck engines a day, and production is gaining rapidly.

—

Lozier Commissioned a Major

WASHINGTON, Feb. 19—Harry Lozier, former president of Lozier Bros. Co., Cleveland, and founder of the old Lozier Motor Car Co., has been commissioned a major in the Procurement Division of the Ordnance Department.

—

New Perlman Factory Near Completion

JACKSON, MICH., Feb. 18—Machinery is now being installed in the new building erected by the Perlman Rim Corp. to replace the one destroyed by fire last month, and the building is being rushed to completion. It is expected that everything will be ready for production next week.

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Army Truck Service Pooled in France

Major Andrews, Assistant Chief of Motor Transport Section, Says New Efficiency System Eliminates Waste, Red Tape and Duplication of Effort

By Allen Sinsheimer

WASHINGTON, D. C., Feb. 15—Contrary to general impression, there is very little cross-country driving necessary in France. Trucks, more trucks and still more trucks are the requirements of the American Expeditionary Forces. Greater standardization by makers of small parts on trucks, combined with more simplicity and less elaborate design, is the demand of our army abroad.

These and many other interesting and important observations were made here to-day by Major Barrett Andrews, assistant chief in charge of operations of the Motor Transport Service under Colonel Francis S. Pope, with the American Expeditionary Forces in France. Major Andrews, serving directly at General Pershing's headquarters, is in this country for a brief stay, giving to army officers here the benefit of the experiences of our army abroad.

Of particular importance is his message that all of the motor service of the American army abroad has been pooled excepting the aviation trucks, and is now entirely under the direction of Brig. Gen. H. F. Rogers, Chief Quartermaster Corps, A. E. F., who operates directly under General Pershing. General Rogers has so organized the motor transport service as to completely eliminate waste, duplication of effort, red tape, and loss of time, and with the result that there is a saving of 15 to 25 per cent of truck service.

For example, under the pooling system, if the trucks of the Engineer Corps are idle, they can under the scheme be used by the artillery for hauling ammunition, or if the trucks of the artillery are idle they may be used by the Quartermaster Corps for carrying supplies, while under the old system whereby each corps controlled its own trucks, they could not be used by the various other divisions without considerable red tape, and frequently not at all.

French Roads in Good Condition

The popular opinion in this country that the roads of France are destroyed and that all driving is across country is entirely untrue, stated Major Andrews. The roads of France are maintained at a very high standard. Old trucks and old truck bodies are used for road work. The Singalese are detailed in crews much like the section gang of the American railroad plan, and are stationed at intervals along the highways.

The trucks carry crushed rock to the stations of the road crews and to other points along the highway, working on certain schedules, and the workers operating usually directly after the roads have been shelled make their repairs promptly. In some instances they work while under shell fire.

Motor trucks carry supplies and ammunition within 1200 yards of the front line trenches. The preference in motor trucks by the expeditionary forces, as expressed by Major Andrews, is for 3-ton and 5-ton trucks with the regular war body. The reasons are that the



MAJOR BARRETT ANDREWS
Assistant Chief of Motor Transport Service in France

regular body is more adaptable and under the pooling scheme is really necessary, as the trucks are constantly used for diversified work. And the desire for 3 and 5-ton trucks is expressed by the fact that General Rogers believes it better to have many supplies moving along slowly but steadily rather than the limited supplies that could be hauled by the speedier and smaller trucks. The highways are divided for use so that the trucks take the outside while the passenger cars take the center, and the space is limited, thus further making the less speedy and larger trucks more desirable.

Standardization is found particularly important at every turn. Requirements for the military trucks include power, light traction effort, four speed transmission, great strength of all transmitting members, security by use of double ignition, extra lights with minimum of exposure, bumpers front and rear, means of towing, and in general all qualities that stand for sturdiness and durability.

The advantages of standardization, is the message from across the ocean, are so apparent that no argument should be necessary. It begins with the manufacturer, includes the furnishing of spare parts, making of repairs, familiarity of all concerned with the type.

The advantages in making repairs in the shops and in the fields are incalculable, and the reduction in tonnage required to carry over sets of spare parts for standardized trucks instead of for many different kinds is of the greatest importance in its dimensions.

General Rogers includes in his duties as Chief of Motor Transport Service procurement, maintenance, technical supervision and all repairs, except as applied to aviation trucks. Cars are districted throughout the field according to their make to insure a sort of standardization of parts for each district, thus avoiding the waste that would be created by haphazard distribution of the many different makes of trucks.

Large Supply Depot

The plan of maintenance includes a large supply depot in central France far from the front, where a huge stock of parts is kept, and which is so situated as to have excellent railroad facilities and a large repair shop close by which will be the main repair shop with a capacity of 1200 trucks per month.

Four types of repair shops will operate in all. There will be assembly at the base repair shop, a factory to do work requiring two to three weeks' work at a point nicknamed "Central Park," semi-mobile repair shops operating 15 to 30 miles from the front lines on the jobs requiring several days of work, and the field repair shops working close to the front lines and making adjustable repairs.

Spare parts are distributed on two plans, salvage and exchange. The salvage includes the return of all metal and other materials to the big center depot where there will be a salvage department, and the exchange system includes the return wherever possible of damaged and ruined parts such as magnetos before the new parts are issued. Of course this scheme is pliable, working only to insure as much saving as possible and never interfering with the highest efficiency which demands in emergencies the quickest action.

Catalogs have been compiled, one showing the parts peculiar to each make of truck, and the other combining the parts common to all trucks. There are approximately 1800 important common parts. The factory numbers of the special parts have been continued in use in the catalog and thus it is simple to order a part that has been ruined, since all the driver has to do is to use the factory number on the injured part.

All parts are ordered by drivers through the commanding officer of the division, by requisition, but orders is-

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sued by General Pershing and General Rogers have eliminated the written requisition at the front, thus doing away with the time lost by the red tape and allowing for prompt work when it is needed.

The majority of the trucks are provided with permanent tops, the drivers being afforded every possible protection by the tops, special windshields and large goggles, because of the dust which has been found extremely thick all through the fighting territory. There are two men, both expert drivers, attached to each truck, and, according to Major Andrews, the drivers of motor trucks are the most popular men in the army, since they are the carriers of food, ammunition, bedding and clothing.

Troops are marched on foot only to an extent necessary to keep them fit and whenever possible are moved from point to point by motor truck. Cooking for troop and truck companies being moved overland is now accomplished in rolling kitchens arranged on trucks.

The difference between the repair work of the French army and the American army, stated Major Andrews, is the difference between hand work and machine work, for the French make the majority of their repairs by hand while the American forces are installing complete mechanical equipment to adequately provide for machinery repair.

All Parts Should Be Standardized

Manufacturers in this country will insure considerably greater efficiency for their products if they will turn out their trucks with as many nuts and bolts and other minor parts standardized as is possible. Tires are causing considerable trouble because of the great variation in sizes. And Major Andrews was particularly emphatic in his request that the makers combine to standardize insofar as possible without necessarily affecting design. Simplicity and strength are the two real requisites.

There are none of the many facilities for caring for trucks abroad that exist in this country. During the cold months the radiators had to be drained daily because there was no anti-freeze solution available and at night no heated garages in which to store the trucks.

Gasoline is used conservatively for cleaning purposes because of its scarcity. All of which is mentioned by Major Andrews to illustrate the vast difference between treatment of the machines abroad and here, which is the important reason why makers should give much consideration to making trucks mainly powerful and simple rather than elaborate.

Major Andrews was particularly emphatic in his praise of the present pooling system in use, stating that "pooling of our trucks, cars and motor supplies was the result of General Pershing and General Rogers, who without any red tape used their sound business judgment, of which they both have abundance and have worked out an organization that will enable us to handle the motor transport service of the expeditionary forces with 25 per cent fewer trucks than would be required if they were not pooled."

Motor trucks drive near the front lines without headlights or sidelights, with drivers smoking cigarettes to serve as guides and warning signals.

The American motor trucks have been found the best by all odds, not only in the American army, but in all divisions of the Allied forces and have, according to Major Andrews, motorized the war.

Forty per cent of the passenger cars used in the army have closed tops owing to the heavy dust and the frequent rains. Officers are not allowed to drive their own cars and operate under orders strictly specifying that officers must be ready for duty at all times and must not engage in such duties as will ruin their uniforms.

Repairs to passenger cars is planned along the same lines as with the trucks. Speed along the main roads through which the passenger cars take the middle course leaving the outside to the trucks is limited to 35 or 40 m.p.h., while in the roads near the front lines speed is prohibited above 20 m.p.h., except in cases of emergency.

Great numbers of trucks are needed abroad. In fact, stated Major Andrews, it is not possible to ship too many trucks as they can be used for so many purposes not now allowed because of the numbers.

Two-wheeled type trailers are giving the best results, but all types of trailers are handicapped, according to Major Andrews, because of inadequate design. He stated that the most urgent need was for a self-lubricating towing device, and that there would be great demand for trailers so equipped.

Major Andrews will return to France within a few days, carrying back with him complete details and photographs of the new standardized trucks and of the great work accomplished here for motorizing our army. He could not of course reveal any of the numbers of trucks in use nor the number of men in the motor transport service, but stated that much has been accomplished abroad and that he had every confidence in the present conduct of the military activities of the American Expeditionary Forces.

Government Needs 90,000 Men

Must Be Familiar with Motor Vehicle Work—53,124 Chauffeurs Wanted

WASHINGTON, Feb. 15—The government is in urgent need at present of more than 90,000 trained men familiar with motor vehicle work. The members required in a few of the important divisions follow:

Chauffeurs	53,124
Repairmen	30,900
Magneto repairmen	218
Tire repairmen	156
Truck drivers	465
Motorcycle riders	2,534

This represents but a small fraction of the great armies of trained workmen needed for the army. From the electrical trade alone, approximately 22,443 men are required.

There is a demand for approximately 17,000 radio operators, and 5600 commercial engineers, electrical engineers, and chemists. There is need for 29,400 men including metal workers, general machinists, and tool makers. More than 6000 railroad men and 1800 steam engineers, and approximately 14,400 men for wood work and airplane manufacture are required.

Airplane Mechanics Hard to Get

WASHINGTON, D. C., Feb. 18—The Aviation Service of the Signal Corps finds it difficult to secure suitable airplane mechanics despite the thousands already enrolled. It finds that the average automobile mechanic does not make a good airplane inspector because the work performed on automobile engines is considerably less accurate than on airplanes, the automobile repair training being often a sort of hit or miss system. It was found at one camp that 2500 mechanics enlisted because of automobile training and experience are unsuited to the work. They will probably be transferred to motor truck divisions.

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Simplify Export Regulations

WASHINGTON, D. C., Feb. 18—The War Trade Board through the Treasury Department has requested collectors to accept shippers' export declarations in lieu of individual licenses for all goods if it is shown that the goods are covered by a bill of lading marked for export or a through export bill of lading provided the bill of lading is prior to Feb. 20 and the goods actually exported by March 15.

This announcement is made to set at rest the fears of export shippers following the President's import and export proclamations of last week. Goods from warehouses or from points near the point of exit will be allowed for export if it is shown that such goods will be exported by March 1.

After March 1 this latter class of merchandise will require individual export license. After March 15 all goods if to be shipped after March 15 with the bill of lading dated after February 19 will require individual license. The War Trade Board requests shippers exporting goods with bill of lading dated prior to Feb. 20 to file application for export license immediately.

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Keep Civilians Out of Airplanes

WASHINGTON, D. C., Feb. 18—New army orders prohibit all persons from riding in army airplanes other than members and employees, Aviation Section, Signal Corps, officers and enlisted men of the army, navy and marine corps and components in active service, heads of executive and judicial branches of the Government, Senators and Representatives and civilian flyers examined for instructor positions.

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Return Loads Bureaus a Great Aid

Connecticut Has 14 Bureaus Listing 700 Trucks—How the Plan Is Working Out

NEW YORK, Feb. 19—The State of Connecticut has formed and has in actual operation to-day, fourteen Return Loads Bureaus in as many cities in the state for the purpose of relieving railroad congestion by acquainting all the shippers in the state of concerns or individuals who have motor truck equipment available for the overland haulage of goods.

This was the message brought by William S. Conning, Chairman of the Committee on Motor Truck Transportation of the Connecticut State Council of National Defense, to the Highway Traffic Assn. of the State of New York at a meeting held to-night in the Automobile Club of America.

Connecticut has assumed the leadership in this work for there is no other state in which a similar system of bureaus has been established. The Return Loads Bureau is a means whereby any shipper desiring to move goods between his own city and any other city may immediately get into communication with either motor truck transportation companies or private individuals owning trucks that are available for this work either on a contract basis or by separate loads.

There has been a great need for bureaus of this kind, which are similar to the return load organizations in Great Britain. Particularly since the acute railroad congestion of the past winter there have been great amounts of goods which could not be shipped by railroad. Some of these goods were finished products to be hauled to shipping points to begin their final shipment to destination, while others have been partly-finished products to be hauled between various manufacturing plants, each of which performed some one or two operations on the goods.

Until the formation of the return loads bureaus in Connecticut, the state's manufacturers were at a loss to know what concerns they could call upon to handle these goods over the roads by motor trucks.

The system has proved a very great success and a very great convenience for the many manufacturers of the State of Connecticut, who have thus been able to move many hundreds of thousands of tons of freight since last winter which otherwise could not have been taken from their shipping room platforms.

Perhaps the most important aid which has been rendered has been the fine cooperation extended by Charles J. Bennett, Connecticut Highway Commissioner, in keeping the Connecticut State roads free of snow during the winter months.

While the great State of New York, which ranks first in the number and value of war contracts, has hesitated in keeping its roads open for the delivery of the many million dollars of goods made in the State, Connecticut has kept its main highways cleared of snow so efficiently that farmers in the rural districts have complained that they could not run their sleighs over the roads because there was not sufficient snow on them. The cost of this snow removal work has been borne out of the funds collected for licenses for both vehicles and operators, and has been performed by a very efficient equipment of motor truck plows, scrapers, horse teams and an efficient organization of Highway Department workmen.

In explaining the development of the Return Loads Bureau idea, Mr. Conning pointed out that the Chambers of Commerce or War Bureaus in each of the cities has undertaken the work patriotically and has even had its telephone number listed a second time under the heading "Return Loads," so that any truck operator arriving in any city in the state in which one of the bureaus was established could immediately get in touch by merely asking the telephone girl for "Return Loads."

He also brought out the fact that the Return Loads Bureaus' main function has been to get the shippers and transportation concerns together, leaving to themselves all questions as to the rates charged, the reliability of the haulage concern and the responsibility on the part of

More than 700 trucks of 1-ton capacity and over are now listed in the fourteen Return Load Bureaus established in as many Connecticut cities. Those cities which have these bureaus now in actual operation are as follows: Bridgeport, Bristol, Danbury, Greenwich, Hartford, Manchester, Meriden, Middletown, New Britain, New Haven, New London, Norwich, Stamford and Waterbury.

The only city which should have such a bureau and which has not yet put one into operation is Norwalk. The routes between the fourteen cities which have established the bureaus number forty-eight. Each of these numbered routes are drawn up on a large map which is posted in the office of each of the bureaus, so that each bureau may know the routes in other parts of the state over which some of the 700 motor trucks now listed are available for overland haulage.

Furthermore, the head of the bureau in each city knows exactly what trucks are available for any other of the forty-seven routes by means of a master file of the cards listing the available trucks for each route. For instance, the bureau in New Haven knows what trucks are available for haulage work between Danbury and Bridgeport or between Hartford, South Manchester or Norwich.

As practically all of the main highway routes are included in the routes listed by the Return Loads Bureau, the system offers a real network of routes to supply practically every one of the manufacturing centers of the state.

Each motor truck listed is placed on a card with the name and address of the owner, the size and capacity of the truck, the kind of goods it can most economically haul and the number of the route over which it operates.

All of the trucks which run on any particular route are given the same route number, and are kept in a file in which the route numbers are arranged numerically. This is a ready means of reference for any route, since each one of the fourteen bureaus are supplied with a complete list of the trucks available on all routes.

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Hale & Kilburn Reorganizes

PHILADELPHIA, Feb. 20—The Hale & Kilburn Co. has been reorganized as the Hale-Kilburn Corp. The new money subscribed will be paid in to-morrow, and the certificates of the new corporation are expected to be ready for delivery by March 1.

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Maibohm Motors Earns $12,294

RACINE, WIS., Feb. 20—The Maibohm Motors Co. shows net earnings of $12,294.17 for the year ending Dec. 31, 1917, equal to 3 per cent of the outstanding stock. The company now has distributers in 26 states as well as export distributers in Norway, Sweden, Denmark, British West Indies, Australia, New Zealand and Tasmania. The balance sheet follows:

Assets.

Cash	$ 15,832.57	
Outstanding drafts on cars in transit, accounts receivable, notes receivable	18,584.84	
Inventories	67,281.46	
Deposits on material	7,071.87	
Deferred to operation	178,225.59	
Machinery and equipment	41,345.40	
Patterns and designs	56,247.28	
Trade marks and good will	50,000.00	
		$434,589.01

Liabilities.

Current invoices and accrued payroll	$ 123.82	
Reserve for war tax on sales	348.90	
Sales contingent fund	1,062.12	
Dealers' deposits	3,050.00	
Capital stock issued and outstanding	417,710.00	
Surplus	12,294.17	
		$434,589.01

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Lack of Transportation Brings Fuel Oil Shortage

NEW YORK, Feb. 20—Another serious fuel shortage is threatening the industries throughout the East. This time it is a shortage of fuel oil, which is extensively used for the propulsion of ships, in power plants and in industrial processes. Lack of transportation facilities is the chief reason for this shortage, for there is sufficient crude oil at the wells. A large amount of the crude from which the fuel oil is made has come in the past by tank steamers from the Mexican and Texas fields, but these steamers have been commandeered by the Government.

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On the other hand, the railroad congestion has interfered with the transportation of oil by railroads and it is figured that 63,000 additional tank cars are required to make up for the withdrawal of the tank steamers.

The matter is at present being looked into by the oil division of the Fuel Administration of which M. L. Requa is chief. All consumers have been divided into twelve classes and each class given a priority rating. It is stated that just at present only the first five classes are being supplied. A number of oil men attending the annual convention of the American Institute of Mining Engineers in New York expressed the view that if Mr. Requa were given a free hand he would satisfactorily solve all problems connected with the shortage, as he is a practical oil man.

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Truck Relays from Akron to Pittsburgh

AKRON, Feb. 16—The Ohio Forwarding Co. has been formed to haul goods by motor truck between Akron, Youngstown, Newcastle and Pittsburgh. It is expected that 50 5-ton trucks will be purchased first, and that this fleet will be increased gradually to 100, as the business warrants. Regular warehouses will be established at each city.

An innovation will be the use of 5-ton trailers on part of the route to reduce the cost of haulage. Furthermore, the trucks will not run straight through from Akron to Youngstown, but special trucks will be sent from Akron to Youngstown, where the roads are fairly level, others from Youngstown to Newcastle, and still others from Newcastle to Pittsburgh.

Loading will take place in the warehouses, by means of demountable bodies, and will take only 3 or 4 minutes.

Record Crowds at K. C. Show

Truck and Car Exhibitors Well Pleased with Amount of Business Done

KANSAS CITY, Feb. 16—The Kansas City motor car show means more to the Southwest this year than it has ever meant before.

Each night the show has been crowded. To those who came the affair had all the earmarks of the preceding hurrah days of big business and growing sales. The man who thought the show might be a fizzle this year found in it a wonderful object lesson. The effect on the public has been good.

The show is showy. The decorating, by E. W. Campbell of Boston, arranged for by the National Association of Automobile Show Managers, of which Manager E. E. Peake is president, is fine. The show is pretty. The public likes it.

There is an extensive truck exhibit, and all the show publicity lays emphasis upon the business aspect of the passenger car and the economic necessity of the motor truck. The truck exhibitors are well pleased. One big truck deal was made during the show, the Moriarty Motor Co. taking on the Federal.

The show, which for two years has been in the J. I. Case building, is back in Convention Hall. This gives a more showy type of building than the one in the downtown section, but there is about 25 per cent less room. Kansas City, like all other big cities, must solve its show building problem in a permanent way soon. Too many shows have to speculate each year as to where the affair will be held. This uncertainty should be removed and a proper auditorium type building of sufficient size erected in some manner. Kansas City is considering the matter. It could use the building for many things and the town's civic pride should make the task one of not great difficulty.

One or two things exemplify what the show has meant to business. One is that the hotels are packed as never before in their histories—and this is not exaggeration. The Muehlebach began turning down reservations for show week Jan. 4.

The show had a better buying crowd than for several years. This is taken to indicate that the public, influenced by Vanderlipian propaganda, had been holding off and came out of its shell under the influence of the show. Several dealers made real show sales.

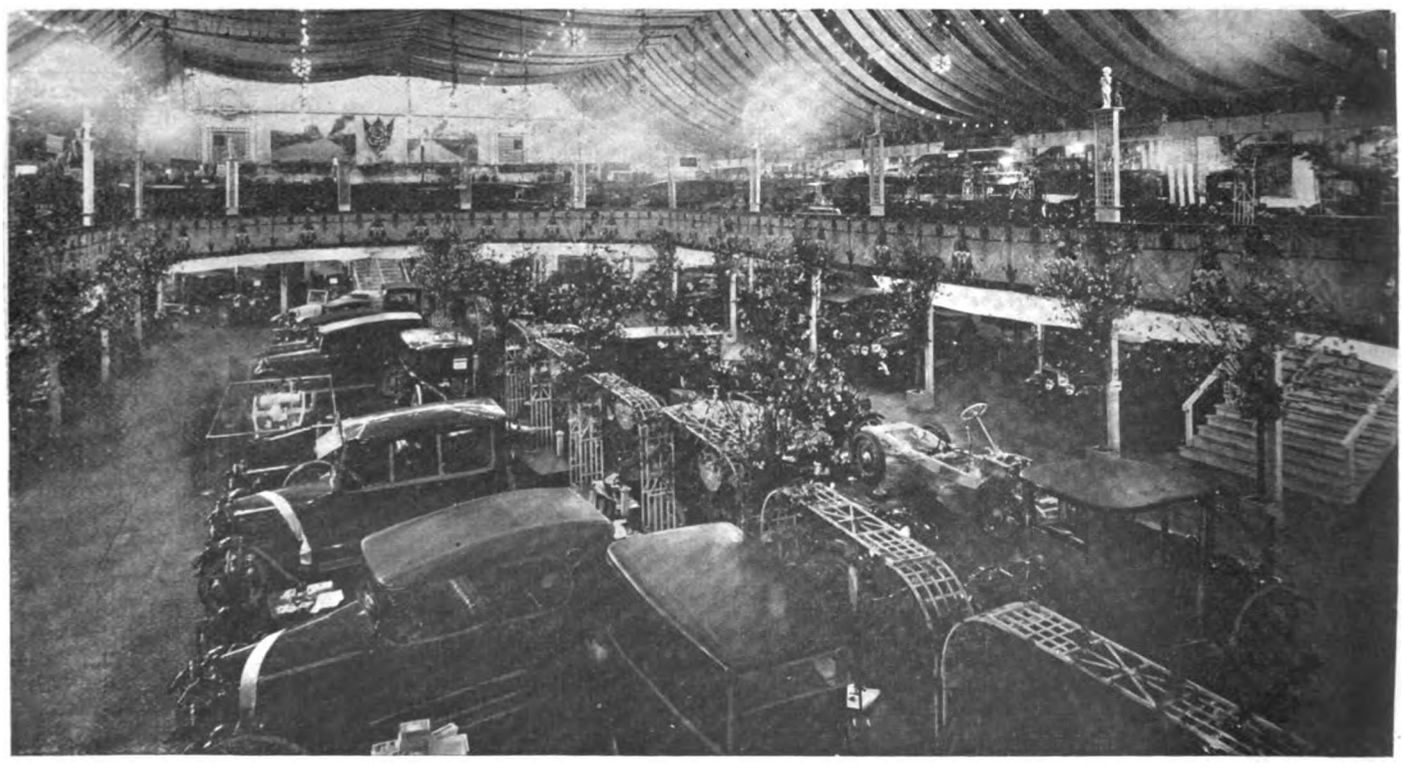
Quite a few dealer contracts were signed. Dealers who came in from the territory signed up for both cars and trucks. There is no stampede to the low-priced cars, although they, of course, are centers of interest. But there is money in the Southwest and the farmer who has the money is just as keen for a $2,000 car as his city neighbor.

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Branch Offices for N. A. D. A.

ST. LOUIS, Feb. 18—The National Automobile Dealers' Assn. will establish branch offices in St. Louis and Washington, each in charge of an assistant secretary. The Washington office will be in the National Automobile Chamber of Commerce Building.

A legislative committee will be appointed for each state to report to the association on pending bills which affect the selling, making or use of cars.



The Kansas City show drew bigger crowds this year than ever before

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Text of the President's Export and Import Proclamation

Following is given the text of the Import proclamation, the export proclamation being identical except for the substitution of the word export for import.

WHEREAS Congress has enacted, and the President has on the sixth day of October, 1917, approved, a law which contains the following provisions:

"Whenever during the present war the President shall find that the public safety so requires and shall make proclamation thereof it shall be unlawful to import into the United States from any country named in such proclamation any article or articles mentioned in such proclamation except at such time or times, and under such regulations or orders, and subject to such limitations and exceptions as the President shall prescribe, until otherwise ordered by the President or by Congress: Provided, however, that no preference shall be given to the ports of one State over those of another."

And whereas the President has heretofore by proclamation dated November 28, 1917, declared certain imports in time of war unlawful, and the President now finds that the public safety requires that such proclamation be amended and supplemented in respect to the articles and countries hereinafter mentioned;

Now, therefore, I, Woodrow Wilson, President of the United States of America, do hereby proclaim to all whom it may concern that the public safety requires that the following articles, namely: All kinds of arms, guns, ammunition, and explosives, machines for their manufacture or repair, component parts thereof, materials, or ingredients used in their manufacture, and all articles necessary or convenient for their use; all contrivances for or means of transportation on land or in the water or air, machines used in their manufacture or repair, component parts thereof, materials or ingredients used in their manufacture, and all instruments, articles, and animals necessary or convenient for their use; all means of communication, tools, implements, instruments, equipment, maps, pictures, papers, and other articles, machines, and documents necessary or convenient for carrying on hostile operations; all kinds of fuel, food, foodstuffs, feed, forage, and clothing, and all articles and materials used in their manufacture; all chemicals, drugs, dyestuffs, and tanning materials; cotton, wool, silk, flax, hemp, jute, sisal, and other fibers and manufactures thereof; all earths, clay, glass, sand, stone, and their products; animals of every kind, their products and derivatives; hides, skins, and manufactures thereof; all nonedible animal and vegetable products; all machinery, tools, dies, plates, and apparatus, and materials necessary or convenient for their manufacture; medical, surgical, laboratory, and sanitary supplies and equipment; all metals, minerals, mineral oils, ores, and all derivatives and manufactures thereof; paper pulp, books, and all printed matter, and materials necessary and convenient for their manufacture; rubber, gums, rosins, tars, and waxes, their products, derivatives, and substitutes, and all articles containing them; wood and wood manufactures; coffee, cocoa, tea, and spices; wines, spirits, mineral waters and beverages; and all other articles of any kind whatsoever, shall not, on and after the 16th day of February, in the year 1918, be imported into the United States or its territorial possessions from Abyssinia, Afghanistan, Albania, Argentina, Austria-Hungary, Belgium, her colonies, possessions, and protectorates, Bolivia, Brazil, Bulgaria, China, Chile, Colombia, Costa Rica, Cuba, Denmark, her colonies, possessions, and protectorates, Dominican Republic, Ecuador, Egypt, France, her colonies, possessions, and protectorates, Germany, her colonies, possessions, and protectorates, Great Britain, her colonies, possessions, and protectorates, Greece, Guatamala, Haiti, Honduras, Italy, her colonies, possessions, and protectorates, Japan, Liechtenstein, Liberia, Luxembourg, Mexico, Monaco, Montenegro, Morocco, Nepal, The Netherlands, her colonies, possessions, and protectorates, Nicaragua, Norway, Oman, Panama, Paraguay, Persia, Peru, Portugal, her colonies, possessions, and protectorates, Roumania, Russia, Salvador, San Marino, Serbia, Siam, Spain, her colonies, possessions, and protectorates, Sweden, Switzerland, Turkey, Uruguay, or Venezuela, except under license granted in accordance with regulations or orders, and subject to such limitations and exceptions as have heretofore been, or shall hereafter be, prescribed in pursuance of the powers conferred by said act of October 6, 1917. The said proclamation of November 28, 1917, and paragraph 111 of the Executive order of October 12, 1917, are hereby confirmed and continued and all rules and regulations heretofore made in connection therewith or in pursuance thereof are likewise hereby confirmed and continued and made applicable to this proclamation.

In witness whereof, I have hereunto set my hand and caused the seal of the United States of America to be affixed.

Done in the District of Columbia this 14th day of February, in the year of our Lord one thousand nine hundred and eighteen and of the independence of the United States of America the one hundred and forty-second.

WOODROW WILSON.

By the President:
ROBERT LANSING,
Secretary of State.

No Alarm Over Export-Import Control

(*Continued from page* 423)

"In restricting motor car exports, the following essential facts should be considered:

"1—A certain amount of tonnage employed to carry needed materials to this country offers outgoing space, part of which should be alloted to the motor car industry, as the third largest manufacturing industry in the country.

"2—Boxed motor cars and trucks are known as measurement cargo, of which each ship must have a certain volume to be properly loaded.

3—"The motor car industry, having contributed largely in the sacrifices brought out by the war should be allowed to use part of the tonnage not required for war purposes, especially 'on deck' space and space on sailing vessels.

4—"If any general restrictions in motor car exports are to be made, both past business and pending contracts should be considered when determining the reduction required in the case of each manufacturer.

5—"These restrictions should be arrived at only after due consideration of these facts: viz., the present output of the more important motor car plants is limited entirely by transportation facilities, and the use of motor cars for business purposes in Australia, South America and South Africa, which countries are important sources of raw materials needed to win the war, should be encouraged as a war measure to the extent of tonnage available.

6—"The building up of a trade in motor cars, or any other commodity, in countries outside the United States is a long and tedious business. The only way to hold an export business is to do continuous business. Whereas, in the United States it takes but a few weeks to change dealers, it is a matter of months or even years in the export business before a change of motor car dealers can be satisfactorily worked out.

7—"To discontinue entirely at this time the selling of American motor cars in export territory would break down and disorganize what it has taken years to build up. It is, therefore, essential, if it can be worked out, to permit the shipment of a quantity of motor cars sufficient to keep relations with dealers alive."

Neither rubber importers nor the tire concerns can see grave consequences as a result of the proclamation. The rubber people have been under government control since last December and it is thought that these new regulations will not have great effect.

There is at present a sufficient quantity of rubber on hand, including such as is now afloat, to last for 3 or 4 months. There has been no difficulty in securing licenses to date and none is anticipated.

Most of our rubber comes from British possessions in the Orient, 135,000 tons of the 170,000 tons imported in 1917 coming from such sources. In 1917, rubber imports were 43 per cent greater than in 1916. During the year 1917, a total of 333,373,711 lb. was imported and of this 215,146,375 lb. came from British possessions.

During the same period, tires to the value of $12,330,201 were exported, England being the heaviest buyer with a total of $2,636,654. Canada was next and France third.

The primary and direct intent of the measure is to increase the tonnage available for the shipment of men, supplies and materials essential in the conduct of the war; it is planned that this shall be done by reducing to the minimum the space alloted for the importation and exportation of raw materials and finished products not immediately essential in the conduct of the war.

Looking on the situation from every angle, it appears distinctly more hope-

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ful than harmful. In the last year, the facilities of the United States for the production of ferro-manganese over which there was the greatest apprehension, have very greatly increased so that our iron and steel producers are practically independent of foreign supplies.

The iron and steel people point out that with a restriction of exports—and it is estimated that between 25 and 40 per cent of our current exports of iron and steel including a considerable quantity regularly licensed by the War Trade Board represents material which might be stopped under existing conditions without embarrassing the prosecution of the war—a corresponding increase in the amount of iron and steel will become available for home consumption.

This is dependent, of course, upon the maintenance of production. At the present time, facilities for production are better than ever before. The railroads are in better condition than for some time and the feeling among the pig iron trade is very buoyant.

That there will be a marked curtailment in the shipment of certain varieties of iron and steel, which during the last 6 months have been exported in large quantities, notwithstanding the license requirement, seems certain.

It is expected that when the full weight of the regulatory measure is felt, the benefits to the railroads will be manifold. In other words, instances have been known, where export licenses have been obtained under what might be broadly styled sharp practice and material has been shipped to the seaboard under priority orders which would not have been given otherwise. It seems likely that railroads will refuse to accept shipments regardless of priority orders unless the shipper can give some adequate guarantee that he will be allowed to export the material offered the railroad for transportation.

This probably will prove a part of the silver lining to the cloud. If exports of raw materials and finished products are to be curtailed, and production is to be maintained, this can only mean an increased supply for home consumption. And if the railroads refuse to accept shipments destined to seaboards, without guarantee of an export license, the transportation channels of the country will be cleared of a certain load and better able to care for present requirements.

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Nelson Co. to Make Jumbo Trucks

SAGINAW, MICH., Feb. 15—Nelson Brothers Co., of this city, has just formed a separate organization known as the Nelson Motor Truck Co. and has begun the manufacture of a 2½-ton internal-gear-driven truck. It is the intention of the concern to add other sizes to the line.

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Klingensmith Denies Ford Price Increase

DETROIT, Feb. 19—Despite the fact that dealers all over the country are advertising an increase in the price of Ford cars after March 1, Frank Klingensmith, treasurer of the Ford Motor Co., denies this.

Tractor Men Need 3,000 Cars

Entire Spring Output Crowded in Factories and Yards Awaiting Shipment

KANSAS CITY, Feb. 18—More than 3000 railroad flat cars are needed right now to move the farm tractors that have been ready for several weeks, and remain in tractor factories, where they are so crowded that all available space within the factory is used. In some factories the stored machines are lined up on the streets in front of the building. So acute has the situation become, that some of the tractor factories will have to close within 10 days, if the goods are not moved. One large tractor maker in Indiana, had only twelve freight cars in the month of January to move his tractors away, and he needed 200.

There is not a tractor factory, which is not being handicapped financially by its inability to ship machines. Even small tractor factories have from $100,000 to $200,000 tied up in completed machines that cannot be shipped.

So acute has the car shortage become, that to-day a telegram was forwarded to Secretary McAdoo, asking that consideration be given to tractor makers in the use of railroad cars. There are farmers in southern Texas and other parts of the South who need tractors for farming, but cannot get them. The production of the 1918 crop is already suffering because of lack of machines. Soon the spring will move northward through the great grain belt, and tractors will be needed in increasing quantities. Unless the railroad situation clears up, the spring crop will suffer.

The Avery company, Peoria, has several hundred machines, which have been ready for shipment for a month, crowded into all available storage space in the factory; the yard is filled and street space. Emerson-Brantingham in Minneapolis has its yard filled, and strings of machines on the street in front of the factory.

IF your copy of AUTOMOTIVE INDUSTRIES *does not reach you on the day it usually arrives, wait a day or two before writing about it. It is on the way. These days the railroads are having a hard time and finding it almost impossible to adhere to schedules because of the extraordinary amount of freight which must be handled. Even the United States mails are delayed. The post offices have had hundreds of expert sorters enlist and poor help has taken their places. So wait a few days before you write us that your copy has not been received.*—AUTOMOTIVE INDUSTRIES.

The Minneapolis Steel & Machinery Co., making the Twin City tractor, has its huge factory space filled with completed parts and lacks room for the proper assembly of machines. The Grey Tractor Co. in Minneapolis has its yard filled with tractors crated for France, but lacks railroad facilities to move them.

The Parrett Tractor Co., Chicago, is well situated for shipping and has not suffered to the same extent as others, but has a large quantity of tractors waiting shipment. Rumely, Laporte, Ind., had only twelve freight cars in January and needed more than 200. There is no relief in sight.

—

Urge Use of Box Cars for Tractor Shipments

MINNEAPOLIS, Feb. 19—Tractor manufacturers and farm implements dealers are pushing a plan to persuade the government to allow their products to be shipped in box cars. At present only grain may be shipped in these cars.

About $60,000,000 worth of farm machinery must be sent out before April 15, if it is to arrive at the farms in time for use this spring, and the only solution of the problem of transportation, according to the National Implement Manufacturers' Assn., is the use of box cars for shipment.

—

Maibohm Prices Increased

RACINE, WIS., Feb. 16—The Maibohm Motors Co. will increase the factory prices of all cars shipped after March 15. Two new body styles, four color options and a new upholstery option have been announced.

The price changes are:

Model	New Price	Old Price	Increase
"A" Roadster	$830	$795	$35
"B" 4-passenger Phaeton.....	1050	975	75
"B" Sedan	1650	1375	275

The new styles are a 5-passenger touring body for the Model "B" chassis, to sell for $1,050, and a two-passenger speedster Model "A" to sell for $830. The color options include deep maroon, powder blue, tourist khaki and battleship gray. An option of Spanish or black upholstery is now given.

—

Regal in Receivership

DETROIT, Feb. 19—The Regal Motor Co. has been placed in the hands of a receiver. At a meeting of stockholders held yesterday it was decided to try and resume production in a short time. As soon as an inventory is taken, the creditors will be called together, and it will be decided whether to liquidate or continue. The Securities Trust Co., Detroit, which has been appointed receiver, believes that at the inventory enough assets will be revealed to warrant continued operation.

The assets of the company are $1,500,000, while the liabilities, exclusive of contingent liabilities, amount to only $600,000. It is possible that the receiver may buy the business and maintain it until recapitalization is accomplished.

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New Automobile Law for Maryland

Tractors Classified as Motor Vehicles—Higher License Fees—New Speed Limit

BALTIMORE, Feb. 19.—Maryland is going to have a new automobile law, which will make a number of sweeping changes in the present law and also provide for many improvements as a protection to the motorists. The entire law has been rewritten and changes introduced to conform with the modern idea. The bill has been introduced into the Senate of the State Legislature and was prepared by E. Austin Baughman in conference with Osborn I. Yellott, counsel for the A.A.A. and the Auto Club of Maryland, and drafted by the state law department.

Provision is made for the abolishing of the horn traps, which are set up in the rural counties. The definition "motor vehicle" has been enlarged to include tractors and traction engines and vehicles with two or more solid tires. The motor Vehicle Commissioner is also given the power to define any disputed cases. No exemption is granted to anyone to use a motor vehicle in Maryland except state, city, counties, towns, or villages, in section 135.

Fees for motor vehicles have been revised as follows: Class A provides a minimum fee of $10 for pneumatic-tired vehicles instead of $5; Class B, solid tires, is raised from $8 to $12 for vehicles having a rated carrying capacity of not more than 1 ton and the increase is from $6 to $9 for each additional ton; Class C, motorcycles, increased from $3 to $5; Class D, dealers, to $25 for the first two sets of tags, an increase of $5 for each set. Additional sets will cost $12 each instead of $10; Class E, motorcycle dealers, increased from $8 to $20 for the first four sets of tags and $5 instead of $2 for additional tags; Class G (new), trailers, provides $5 for each ton carrying capacity; Class H (new), tractors and tractor engines, flat charge $25. Owners must not furnish their own markers.

Section 143 is changed and provides an age limit of 18 years. Persons learning to operate must obtain a permit for $1, and must also be examined and all future applicants for licenses must be examined. Section 144 provides a fee of $1 for operators of bicycles with motor attachments and the same fee for operators of tractors and traction engines.

Section 145 gives the commissioner broad powers to suspend registration of any vehicle which is so constructed or operated as to cause unreasonable damage to the public highway. The penalties are increased from a minimum of $25 to a minimum of $100 and the maximum of from $100 to $1,000 in addition to imprisonment of from not less than 30 days to one year. The law applies to operator and owner alike.

In Section 149 the speed limit of solid tire vehicles weighing 2 tons or less is reduced to 25 miles maximum, 2 tons and not in excess of 6 tons, 15 miles. Over 6 tons, 12 miles. The existing law allows vehicles over 4 tons and not in excess of 8 tons 15 m.p.h., and those over 8 tons 12 miles. The maximum speed in thickly populated sections for all motor vehicles is 15 miles instead of 12 miles, and outlying sections of communities 18 miles. In the open country reasonable care in the operation of the machine is provided, the driver being the judge in that particular. Penalties for exceeding 60 miles an hour are from $100 to $1,000 or imprisonment of not less than 30 days nor more than one year.

—

Record Crowds at Newark Show

NEWARK, N. J., Feb. 16—The Tenth Annual Newark Show opened to-night in the First Regiment Armory with record crowds attending. The exhibit is being staged by the New Jersey Automobile Exhibition Co. and there are 186 cars exhibited by 86 dealers.

—

Goldman Leaves Studebaker Committee

DETROIT, Feb. 18—Henry Goldman has retired from the executive committee of the Studebaker Corp., but will remain a director of the company. Waddill Catchings, of Goldman, Sachs & Co., will succeed him on the executive committee.

—

To Teach Soldiers in Sweeney School

KANSAS CITY, Feb. 15—The Sweeney Automobile School, which has a regular attendance of 2100, has been requested by the government to assist in teaching enlisted men the internal combustion engine, giving them a complete course of the mechanics necessary for automobile, airplane, motor truck and motorcycle.

The facilities of the Sweeney school are perhaps the most complete of any available for this work. At present the attendance of 2100 represents all except two States in the Union. The number of young farmers who are taking courses in mechanics is rapidly increasing. Eleven hundred and two joined the Sweeney school in the month of January. Seven hundred and ninety-six joined in December and the enrollment in February to date is greater than that for the entire month a year ago. The school is running in two shifts at the present time, and the present building, which was occupied some months ago, is not large enough and an addition to increase the capacity one-third is being started.

—

Canada Buys Ford Tractors

MONTREAL, Feb. 18—The shortage of farm laborers in the Canadian Northwest has caused the Dominion government to help the farmers. A thousand Ford tractors have been purchased, and an option secured on another thousand. These will be sold to farmers at cost plus freight charges, at an average of $800. The Ford company cannot begin delivery before the end of March.

Delay 1918 Tractor Demonstration

Uncertainty of Shipments and Railroad Congestion Cause of Postponement

KANSAS CITY, Feb. 18—The question of definite arrangements for the 1918 tractor demonstrations by the National Implement and Vehicle Assn. has been delayed by the committee which has this work in charge. The committee held a meeting here to-day and decided that because of the congested conditions of the railroads and the uncertainty of securing adequate railroad equipment for shipping tractors, it was impossible to decide definitely on any demonstration. No time nor place for holding such demonstration has been selected yet, although it has been decided to hold a tractor demonstration under rigid rules so that complete information regarding the performances of the different machines can be had and an official report published. If conditions change, and demonstrations are possible they will be held.

It is certain that the demonstrations will not go to Fremont, Neb., this year as they have in past years. Cleveland has been discussed as a probable center for the demonstrations, but it is very questionable if sufficient land can be secured for plowing.

A delegation from Salina, Kan., an enterprising city in the western part of the state, advanced the claims of that area for the tractor demonstrations. It is also understood that some centers of Dakota are anxious to secure the demonstrations. It has been suggested that these demonstrations go to the Twin Cities, but the ground is a little rough and hilly, and it is questionable if necessary acreage could be obtained.

—

Miller Rubber Earns $831,271

AKRON, Feb. 18—Net earnings of $831,271 during 1917 were reported at the annual stockholders' meeting of the Miller Rubber Company held recently. A contemplated stock dividend was passed. The following directors were elected: Jacob S. Pfeiffer, William F. Pfeiffer, Frank B. Theiss, C. T. Grant, and J. M. Doran. Jacob S. Pfeiffer was re-elected president, C. T. Grant vice-president, William F. Pfeiffer, secretary and general manager, and Frank B. Theiss, treasurer.

—

Cutting-Larson Adds Trucks

NEW YORK, Feb. 18—The Cutting-Larson Co., Oldsmobile distributer is to handle two lines of trucks and will distribute them over a considerable territory, including New York and the New England States. These are the Master, produced by Master Trucks, Inc., Chicago, and the Bessemer, made by the Bessemer Motor Truck Co., Grove City, Pa.

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Buda Exhibits New Tractor Engine

4-Cylinder Kerosene Burning Model—Making 85 Daily at Illinois Factory

CHICAGO, Feb. 18—The Buda Co. exhibited last week at the Kansas City tractor show its new tractor engine designed especially to handle kerosene fuels. The engine is being used in the latest model of Parrett tractor.

The new job model HTU is a Buda design in nearly all particulars, but incorporates a detachable cylinder head, the first design of this kind to come from Buda. This makes it possible to have engines of different compression for high altitude plowing and also admits of many other good features in construction, such as ample waterjacket spaces in the head, more efficient production of castings, and greater ease in removing carbon.

The engine, a 4-cylinder, L-head block, 4½ by 5½, rated at 32 hp. at 1100 r.p.m., has provision on one front motor arm for an electric generator, and on one rear motor arm for an engine starter. Provision is also made for governor mounting.

To make the use of kerosene more efficient, the spark plugs mounted in the cylinder head are specially waterjacketed; the waterjackets extend 1½ in. lower on the cylinder walls than usual; the pistons are a looser fit; they have cross ribs on the under face of the head to aid in heat radiation; the flywheel is nearly double the weight used in former models of the same size; and the crankshaft bearing area is one-third greater, and the crankshaft approximately 25 per cent stronger than former models with the same piston displacement.

A complete pressure oil system and a cold compression of 65 pounds are used. The engine oil pan is made in two parts, so that the crankcase is really in 3 pieces with horizontal divisions separating them. The object is to have the botton part removable without interfering with the bell housing which encloses the flywheel. It also provides greater accessibility.

The Buda factory in Harvey, a suburb of Chicago, is turning out 85 engines of different models a day, and an addition is being erected to increase capacity. Last fall the company instituted the policy of building only 4-cylinder engines for truck and tractor uses.

$50,000,000 for Tanks

WASHINGTON, D. C., Feb. 18—It became known to-day that fifty million dollars has been appropriated for the purchase of tractor tanks ranging from 12 hp. to 125 hp. The tanks which will be ordered have already been tested by officers of the American and the Allied armies.

New Tractor Engine Developed by Erd Co.

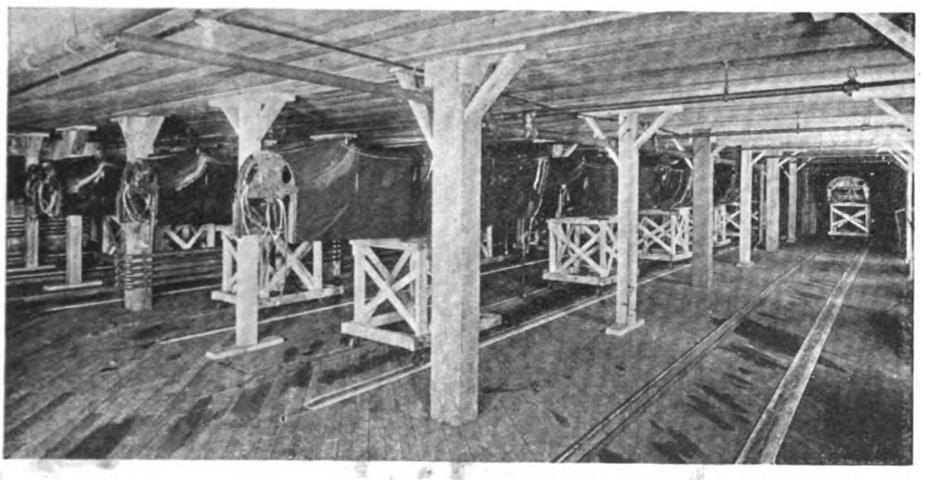
SAGINAW, MICH., Feb. 16—A new Erd tractor engine has been developed by the Erd Motor Co., which will be in production by May or June. The company is erecting a factory addition 404 x 121 ft. that will add 48,000 sq. ft. of floorspace.

This new engine, a 4-cylinder, vertical block design, has the valves carried in the detachable cylinder heads, and the cylinders, 4¾ x 6, are water-jacketed their entire length. The spark plugs are set in a water-jacketed part of the wall. Complete provision is made for fitting starting and lighting equipment and the engine intended for burning kerosene is made robust throughout.

Special attention is given in the pressure oil system, including crankshaft, camshaft and piston pin bearings with oil delivered by pump to the rocker arm for the valves. Specially large bearings are used, the crankshaft bearings being 2½ in. in diameter and the three bearings having a total length of 13½ in.

$277,732,300 for Airplane Bombs

WASHINGTON, D. C., Feb. 18—A bill before Congress calls for appropriation of $277,732,300 for bombs for airplanes.



Factory assembly methods are used by the Pence Automobile Co., Minneapolis Buick distributer. Since last July, 2800 cars have been assembled

Doubles Freight Car Capacity

Minneapolis Company Gets Cars in Parts and Assembles Them in Warehouse

MINNEAPOLIS, Feb. 19—A good example of making one railroad car do what two and one-half previously have been needed to do is found in the Pence Automobile Co., Buick distributer for the four states of Minnesota, North Dakota, South Dakota, and Montana, a territory of approximately 400,000 square miles, or an area practically six times as large as the Boston distributers have in all of the six New England states put together.

Beginning as far back as April, 1917, H. E. Pence discovered that he could not get enough automobiles for his 450 dealers if he relied on shipments by railroad cars, and so decided to begin the assembly of cars in a three-story warehouse that he had in Minneapolis.

This assembly program was carried along slowly, until July, when the 1918 lines started coming through and since than Pence has assembled 2800 Buicks and in the same time has only received 450 by railroad shipments from Flint.

The railroad economy effected by assembling here is indicated by the fact that it is possible to ship the parts for ten Buicks in one 36-ft., small-door railroad car, whereas it was possible to ship only four Buicks in a 40-ft. special railroad car. It is a case of ten cars instead of four in a small railroad car, too small for carrying complete motor cars.

The Pence assembly work is carried on in a three-story brick building 150 by 222 ft. Here twenty-five Buicks per day are assembled by 80 to 100 workmen and when work is at the peak it will be possible to assemble forty cars per day. This warehouse has been converted into a real assembly factory, with special channel metal tracks along the assembly floor to guide the small hand trucks on which the chassis rests while it is progressing along the assembly floor.

The chassis rests on these trucks when it leaves the assembly floor to enter the steam washroom, where all grit and dirt are removed before the chassis pass into the spray paint room where the painting is done, identically as it would be in the factory. From this paint floor the chassis moves into a long three-track drying oven which has capacity for thirty-nine painted chassis at one time. It is a long wood oven, in which atmospheric pressure is used, but provision is being made to use higher temperatures to speed up drying.

On the chassis assembly floor are many other assembly conveniences, such as overhead cranes to pick up the frame and hold it while axles are being fitted, and to turn the frame over and mount it on the assembly truck. There is another crane which swings the engine unit into place at one point on the assembly track.

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Convenient storage spaces are provided for all parts that enter into the chassis as it progresses.

At present only two models are assembled, the small six and the four-cylinder model and these only in touring car models. Runabouts are not assembled, as it would complicate the stock of parts to be carried and generally render the system more complex. The bodies for the sixes are received in unfinished state and the 450 Pence dealers can secure color options, which were impossible from the Flint factory. This aids very materially in the selling of cars by dealers.

Pence aims constantly to carry on hand parts for two weeks' assembly, which is 300 cars. The shipments from the factory are made in units of 80 six-cylinder cars and 120 four-cylinder jobs. In shipping this material carloads of motors are made up, forty to a car load. Twenty-four bodies are loaded into one car. Other car loads are made up of frames, and others of miscellaneous parts. Everything comes from Flint, with the possible exception of frames, which are shipped direct from the frame factory in Milwaukee.

Of the 100 workmen not one was brought from the Buick factory. There was no difficulty in obtaining workmen in the Twin Cities. They are paid on piece work, and each man has a certain part to do in the assembly chain. If one workman gets behind he holds the line of assembly up, but the operations are so timed that except with a green workman there is no delay. The piece-work plan encourages co-operation among the men and if one workman gets behind, due to breaking of a small part, the others assist him, rather than delay the entire assembly line.

Factory loading and unloading facilities are provided in four railroad spur extensions which are alongside of the factory. There are two loading and two unloading spurs with platforms and all necessary equipment. In the entire assembly scheme nothing is lacking, and the job bears the imprint of permanency. Already some other Buick distributers have bevome interested in the scheme, and it promises to make progress.

Shipping Board Calls for Workers

Several Hundred Thousand Men Needed to Produce Fleet for Food Transportation

WASHINGTON, Feb. 18—The U. S. Shipping Board needs men. Although the immediate requirements have been filled, according to Secretary of Labor William B. Wilson, who last week said that there was no pressing present demand, it is stated that next month there will be an urgent need for several hundred thousand men to work in producing the fleet of ships which is to be used in transporting American muscle and American food for the aid of America's allies.

It is urged that mechanics enroll at once with the nearest agent of the U. S. Public Service Reserve of the Labor Department or with the local enrollment agent of the various State Councils of National Defense. They are instructed to retain their present positions after enrolling until they are notified when and where to apply for work. Chairman Edward N. Hurley of the U. S. Shipping Board, who is also president of the Emergency Fleet Corp., says, "We will require 250,000 skilled mechanics to help the other loyal men now in the yards to build ships so fast that supplies can be furnished to our boys in the trenches who are making the supreme sacrifice for their country."

Men who have had experience in the following lines are particularly needed:

- Acetylene and electrical welders
- Asbestos workers
- Blacksmiths
- Anglesmiths
- Drop-forge men
- Flange turners
- Furnace men
- Boiler makers
- Riveters
- Reamers
- Carpenters
- Ship carpenters
- Dock builders
- Chippers and calkers
- Electrical workers
- Electricians
- Wiremen
- Crane operators
- Foundry workers
- Laborers, all kinds
- Loftsmen
- Template makers
- Machinists and machine hands, all sorts
- Helpers
- Painters
- Plumbers and pipe fitters
- Sheet-metal workers
- Coppersmiths
- Shipfitters
- Structural iron workers
- Riveters
- Erectors
- Bolters up
- Other trades
- Cementers
- Crane men

Another Truck Train Bound for Seaboard

BUFFALO, N. Y., Feb. 18—A convoy of about sixty-five military trucks built by the Pierce-Arrow company for the government will leave Buffalo this week for the Atlantic seaboard. The trucks will be driven by men of the Fourth Supply Train from Camp Greene, N. C., with Captain Jack L. Meyer, quartermaster, in charge. There will be 164 men and six officers in the organization.

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Standardization in Factory Buildings

(*Continued from page* 409)

in any number of bays, each 30 by 20 ft. in dimension.

Nos. 5, 6 and 7 are similar, except as to the width of the center aisles, and are suitable for forge shops and foundries.

No. 8 is a multi-story mill type which can be made in any multiple of 16 by 20 ft., and though it is most often built with four stories and basement, it can carry additional stories if desired.

No. 9 is a reinforced concrete multi-story type which can be any multiple of 20 ft. square. A 20 by 20-ft. panel is generally accepted as the most economical in flat slab design, requiring for a given load the minimum of reinforcing steel per square foot.

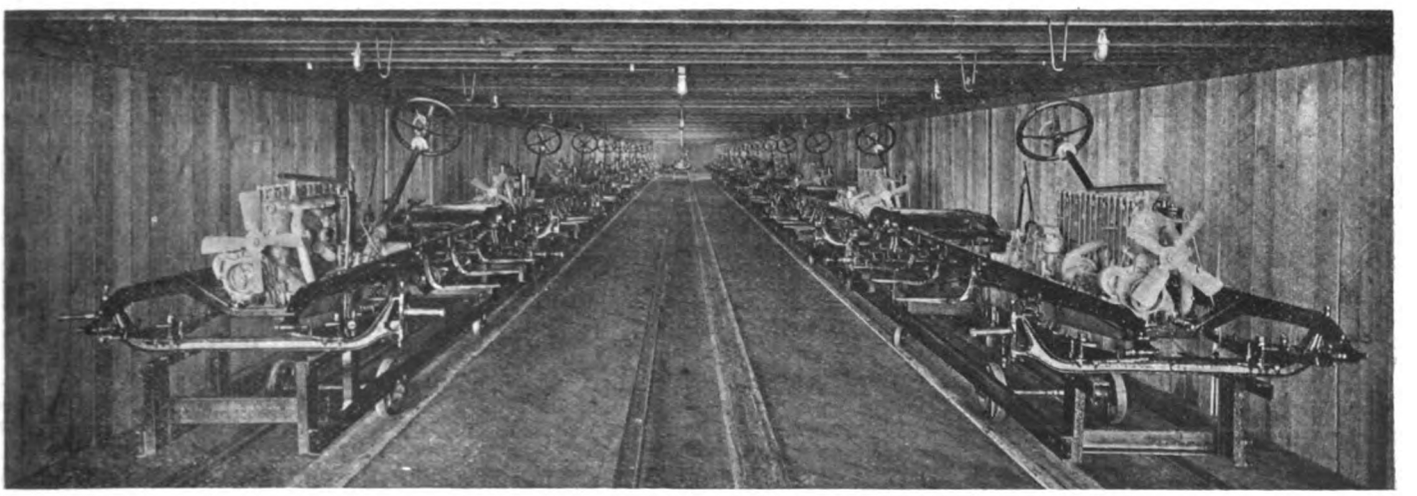
An example of standardized roof construction is found on the No. 4 type plant for the Nordyke & Marmon Co. at Indianapolis. Pyrobar or gypsum tile was used in 10 ft. length of this structure. The 10-ft. idea meant economy in steel roofing supports. This tile is fireproof, fume-proof and non-condensing, and it affords excellent reflection of light from its white surface.

The Nordyke & Marmon building is 300 ft. square and was constructed with 10 ft. of saw-tooth roof sash every 30 ft.

—

George Batten Dies

NEW YORK, Feb. 17—George Batten, president of the George Batten Co., died yesterday. He organized the company in 1891, and had been one of the main factors in its development.



For chassis assembly work, the Pence Automobile Co., Minneapolis, Buick distributer, uses a moving platform where every workman has a certain duty to perform

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Men of the Industry

Changes in Personnel and Position

Three Reo Men Added to Mitchell Company

RACINE, Feb. 18—Three well-known men have been added to the roster of the Mitchell Motors Co. These are: C. W. McDowell, who has been made superintendent of the Four Wheel Drive Division. He was formerly general superintendent of the Reo Motor Truck Co. George W. Kerr, who has been made manager and superintendent of the body plants of the company, was formerly in charge of similar work for the Reo company. C. W. Arthur, who has been made special traveling representative of the company, was also formerly with the Reo company.

—

Bob Lacey has been appointed general sales manager of the Premier Electric Co., Chicago.

—

James A. Harris, Jr., for many years advertising manager of the White Co., Cleveland, has been commissioned a captain in the Quartermaster Corps. He has been assigned to Mechanical Repair Shop Unit No. 305. Millard H. Newton will succeed him in the White Co.

—

Charles Oostdyke has been appointed director of purchases for the Hudson Motor Car Co., Detroit, succeeding A. Barrett. He was formerly purchasing director of the Cadillac Motor Car Co. and later a manufacturers' agent.

—

K. B. MacDonald has been elected vice-president of the Curtiss Engineering Corp., Garden City, N. Y. He was formerly vice-president of the Curtiss Aeroplane & Motors Corp.

—

N. J. Clausen has joined the Curtiss Engineering Corp., Garden City, N. Y. He was formerly a draftsman with the Otis Elevator Co.

—

S. R. Bennett has been promoted to the position of supervisor of the testing departments of the Bosch Magneto Co. He was formerly assistant supervisor.

—

Frank H. Smith has joined the sales forces of the Harry Newman-Stratton Co., Maxwell and Chalmers distributer in Chicago, where he will act as special sales representative in the wholesale department. He formerly was special traveling sales representative for the Studebaker, Lozier, Chalmers and Hal companies.

—

Clark H. Tenant, for many years associated with the iron and steel industry in Milwaukee, has been appointed assistant superintendent of the ordnance plant established at East Moline, Ill., by the Root & Vandevort Co.

—

George N. Graham has been appointed general works manager of the Boone Tire & Rubber Co. He will have charge of both the Chippewa Falls, Wis., and the Sycamore, Ill., factories.

—

J. M. Homs, manager of foreign sales of the Four Wheel Drive Automobile Co., Clintonville, Wis., has resigned to engage in the exporting business in New York. C. S. Thompson will succeed him.

—

F. C. Seeger has been appointed Michigan representative of the Doehler Die-Casting Co., Brooklyn, with headquarters in Detroit.

—

S. E. Knauss has been promoted to the position of assistant-to-the-president of the Harry Newman-Stratton Co., Chicago. He was formerly wholesale representative.

—

M. L. Heminway, formerly sales manager of the Davidson Rubber Co., Boston, has been appointed secretary of the War Service Committee of the Rubber Industry of the U. S. A. His office will be with the Rubber Assn. of America, Inc., 17 Battery Place, New York.

—

Norman G. Wilson has been appointed sales manager of the Philadelphia branch of the Stanley Motor Carriage Co. For the last 2 years he has been in charge of the Bethlehem, Pa., branch of the Packard Motor Car Co.

—

W. H. Oliver, Jr., is now connected with the Taft-Pierce Mfg. Co., Woonsocket, R. I. He was formerly chief engineer of the Hyatt Roller Bearing Co. and recently with the Russel Motor Axle Co.

—

C. W. Price, president of the Auto Devices Co., St. Louis, has resigned, and will head the sales department of the Osgood Lens & Supply Co., Chicago. He will succeed A. C. Fach.

—

O. R. Hardwell, formerly advertising manager of the Chalmers Motor Co., now has Iowa territory for the Willys-Overland Co., for which he is special sales representative.

—

Flechter Co. Appoints Detroit Men

DETROIT, Feb. 15—George K. Parsons has been appointed manager of the Detroit office opened by L. V. Flechter & Co. Frank M. Eldridge, formerly of the Wallace C. Hood Service Bureau, is advertising and publicity manager.

—

R. E. Mills Dies

BLOOMFIELD, N. J., Feb. 18—R. E. Mills, treasurer of the Rajah Auto Supply Co., died suddenly at his home in Montclair, Friday, Feb. 15. It was Mr. Mills who, with his brother, E. B. Mills, founded the present Rajah company seventeen years ago. Mr. Mills was buried at his old home in Canada.

New Companies Formed

Latest additions to ranks of Automotive Industries

Marvel Tractor Co. Ready to Incorporate

COLUMBUS, OHIO, Feb. 18—The Marvel Tractor Co., which has been doing business at 70 North High Street, will be incorporated soon and plans are now being prepared for the erection of a new factory. The Marvel Tractor has been exhaustively tried and found to be successful in many kinds of farm work. For the time being the tractors are being manufactured at the plant of the Jaeger Machine Co., Dublin Avenue.

—

COLUMBUS, OHIO, Feb. 18—J. A. Baker has organized the Baker Automobile Top Co., which has opened a factory at Poplar and High Streets for the manufacture of several kinds of automobile tops. Associated with him are W. L. Moehl and John Windnagel, Columbus.

—

NEWARK, Feb. 18—The Hammered Piston Ring Co., which was recently incorporated in Maryland with a capital of $1,400,000, has purchased the plant of the American Piston Ring Co. of New Jersey.

—

OSHKOSH, WIS., Feb. 18—The Wisconsin Duplex Auto Co., organized a year ago with $500,000 capital by William A. Besserdich, one of the original members of the present Four Wheel Drive Automobile Co., Clintonville, Wis., has completed all details of its organization as an Oshkosh concern. At the annual meeting held here the board of directors was reorganized to give Oshkosh capital full representation. Officers were elected as follows: President W. A. Besserdich; vice-president, H. F. Landeck; secretary, B. A. Mosling; treasurer, J. P. Mosling; director, W. G. Maxcy.

The company has taken over the plant of the J. L. Clark Carriage Co., Oshkosh, and will install new machinery and equipment at once. It will concentrate on a 1-ton truck chassis employing an improved quadruple drive transmission system designed and patented by Besserdich. Arrangements are being made to have the chassis in production by March 15 or April 1.

—

Clyde Cars Earns $41,259

CLYDE, OHIO, Feb. 16—The Clyde Cars Co., manufacturer of the Clydesdale motor trucks, had sales of $1,331,045.91 during 1917. After deducting costs, expenses and taxes, a balance of $41,259.64 was carried to the surplus account. A stock dividend of 12 per cent was declared to stock of record Feb. 4.

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Wire Wheel Corp. Gets $650,000 Shell Contract

NEW YORK, Feb. 18—The Wire Wheel Corp. of America has received a government contract for machining shells aggregating $650,000. Under the terms of the contract, there will be no outlay required for material, as the government will furnish and deliver forgings to the plants. This work will be done at the company's Springfield factory, while the Buffalo plant will take care of the wire wheel business.

Earnings of the company, for the first 4 months after its organization in November, 1916, averaged $100,000 a month, but for the eight months from April to November, 1917, averaged only $69,050, the total for the period being $552,407.

—

24,000,000 Champion Plugs in 1917

TOLEDO, Feb. 16—The Champion Spark Plug Co. manufactured 24,000,000 spark plugs during 1917. This is 4,000,000 more than the goal set by the company at the beginning of the year. December was the most productive month with a total of 2,500,000 plugs.

The company intends doubling its capacity during 1918.

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Boone Factories Finished

CHIPPEWA FALLS, WIS., Feb. 18—The new factory buildings of the Boone Tire & Rubber Co. have been completed, but delays in delivery of equipment make capacity operation impossible for the time being.

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Falls Motors Gets Government Contract

SHEBOYGAN FALLS, WIS., Feb. 18—The Falls Motors Corp. has received a government contract for 2000 motive power units for military trucks, deliveries to begin early in March. On completion of the order, additional contracts will be placed, which will require the operation of the plant at maximum capacity until the summer of 1919. It is stated that the initial lot of 2000 motors will be shipped to the Kissel Motor Car Co., Hartford, Wis., for use in the government military trucks.

The Falls Co. is now filling a government contract, received some time ago, for cylinders and other parts for 5000 Curtiss airplane engines.

—

Sanford Truck to Increase Capacity

SYRACUSE, Feb. 18—At the annual meeting of the directors of the Sanford Motor Truck Co. it was decided to erect a plant addition which will increase the floor space 50 per cent. This is made necessary by the increase in business, unfilled orders at present amounting to $270,000. The capital will be increased by the addition of $100,000 in cash.

—

Wagon Co. in Troy, Ohio

TROY, OHIO, Feb. 18—In an item which appeared some time ago in AUTOMOTIVE INDUSTRIES it was stated that the Troy Wagon Co. of Piqua, Ohio, had received a contract from the French Government for automobile trailers, etc. The Troy company is located in Troy, Ohio, and not in Piqua as was incorrectly stated.

Current News of Factories

Notes of New Plants—Old Ones Enlarged

—

Redwood City Plant for U. S. Aircraft

REDWOOD CITY, CAL., Feb. 18—The United States Aircraft Corp., San Francisco, has bought the plant of the Christopherson Aircraft Co. Extensive improvements will be made and the capacity doubled.

—

New Building for Motor Parts Co.

PHILADELPHIA, Feb. 16—The Motor Parts Co. has moved to a new building at 847 Broad Street, with 25,000 sq. ft. of floorspace. The company recently added an export department to its regular accessories business.

—

To Make 1400 Cars in February

OAKLAND, CAL., Feb. 18—The Chevrolet Co. of California estimates that it will turn out approximately 1400 cars this month. At the beginning of the month there was a total of 1500 cars on order. The company will spend about $1,000,000 in additions and improvements to the present plant.

—

DIVIDENDS DECLARED

The Republic Rubber Co. has declared the regular quarterly dividend of 1¾ per cent on preferred stock, payable April 1, to stockholders of record March 9.

The Michigan Stamping Co. has declared the regular monthly dividend of 1 per cent payable March 1 to stock of record Feb. 15.

The Four Wheel Drive Automobile Co. has declared a stock dividend of 50 per cent. The capital will be increased from $1,000,000 to $1,500,000 at once.

—

Capital Increases

MILWAUKEE, Feb. 18—The Clum Mfg. Co., manufacturing motor car and electrical specialties, stampings, etc., has increased its capital stock from $10,000 to $100,000 to accommodate its increased business and provide for expansion. The plant is located at 23-27 Erie Street. Arthur Denniston is president.

—

NEW YORK, Feb. 18—The Hurlburt Motor Truck Co. is issuing $500,000 worth of 3-year 7 per cent sinking fund gold notes to provide additional working capital. The Hurlburt schedule for 1918 provides for the manufacture of 1800 trucks.

New Reliance Factory Being Built at Appleton

APPLETON, WIS., Feb. 18—The Reliance Motor Truck Co., formerly the Racine Motor Truck Co., Racine, broke ground to-day for the first unit of its new motor truck manufacturing plant, to be 75 x 300 ft. in size, of brick, steel and concrete construction, one story high. The building alone will cost about $30,000 and the equipment an additional $25,000. Contracts call for the completion of construction work on May 15.

—

Metz Concentrates on Government Work

WALTHAM, MASS., Feb. 18—The Metz Co. has sold two of its buildings and will concentrate much of its activities on government contracts in a new building which has just been erected. Although the company will curtail materially its output of cars, it plans to maintain a service of supplying parts for all Metz cars now in use or to be produced for the present season.

—

Piston Ring Insures Employees

MUSKEGON, Feb. 16—The Piston Ring Co. has arranged with the Aetna Life Insurance Co. to take out life insurance covering the 350 men in its employ. Every man will be insured for $500, regardless of the length of time he has been with the company, and $100 will be added annually until the maximum of $1,000 is reached. The company will pay all premiums. When a man leaves or is discharged, the policy will be cancelled. A $500 policy will be given to each new employee.

—

Flechter to Establish Carbureter Service

LONG ISLAND CITY, N. Y., Feb. 18—L. V. Flechter & Co. is planning to establish service stations for their carbureters in all the large cities of the United States. The Neptune Motor Co., of Chicago, Cincinnati, Portland and Los Angeles; Alex Brunner & Son, Newark, N. J., and Burts Supply Agency, Atlantic City, N. J., have already been named to handle service in their respective districts.

—

Omaha Factory for Brictson Mfg. Co.

OMAHA, Feb. 16—The Brictson Mfg. Co. has purchased a 6½-acre site here and will start the erection of a tire factory and reclaiming plant. There are several buildings on the site, which will be used for storehouses. The company formerly had a factory at Brookings, S. D.

—

Western Rope Buys Mueller Foundry

MILWAUKEE, Feb. 18—The Western Rope & Mfg. Co. with home offices at Tulsa, Okla., and a factory here, has bought the Mueller Foundry Co., Cedarburg, Wis., and will enlarge the plant immediately. The Western company, which manufactures gas engines and apparatus for oil wells, has for some time been buying the entire output of the Mueller foundry.

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Industrial Review of the Week

A Summary of Major Developments in Other Fields

Domestic Fuel Demand Becomes Less Urgent

The let-up in the urgent demand for domestic fuel has enabled a partial increase in the filling of industrial requirements in some quarters, though conditions in New England are far from favorable. There is still a great scarcity of steam grades, and cities in the interior are in a bad way for fuel, principally anthracite.

The use of bituminous coal has been advocated in many quarters where formerly anthracite had been burned. Some municipalities have practically suspended their smoke ordinances for the time being, the authorities evidently taking the broad viewpoint that it is better to have a little smoke and some heat rather than compel their industries to shut down and their citizens to freeze.

The general freight situation is showing signs of improvement, and another cause for congratulation is that there are not many supply ships being delayed in New York harbor for lack of fuel.

Inadequate car supply, as ever, is the one bugaboo that the operators do not seem to be able to overcome. The United States Geological Survey shows that during the week of Jan. 26 production for the country as a whole amounted to 66.1 per cent of capacity; and the one dominant factor limiting production is car supply. To this cause were ascribed losses amounting to 26.6 per cent of full-time capacity, as against 7.3 per cent for all other causes combined.

Speaking of this order, now a thing of the past, it is universally acknowledged that though it saved little fuel, it helped considerably to relieve freight congestion. No less a person than Secretary McAdoo was against a continuance of the measure, as he feared that to adhere to the plan would seriously affect the taking up of the next Liberty loan.

Dr. Garfield states that there will be no necessity for the shutting down of industry in the future, as he believes it possible henceforth to rely upon embargoes and the preference in the movement of food and fuel.—*Coal Age.*

A New Service

¶ Herewith AUTOMOTIVE INDUSTRIES *supplies for the benefit of its readers a general summary of important developments in other fields of business. This is rendered possible by the editorial co-operation of leading industrial publications which are recognized authorities.*

By compressing the general industrial situation into this form we hope to give our readers a clear and comprehensive idea of up-to-the-minute developments which they could otherwise secure only with considerable expenditure of time and effort.

McClaren President of Ajax Rubber Co.

NEW YORK, Feb. 16—H. L. McLaren was elected president of the Ajax Rubber Co. at the annual meeting Wednesday. He is also president of the Racine Rubber Co., Racine, Wis., which is affiliated with the Ajax company. Fred E. Dayton was elected secretary and Stuart Webster vice-president. The retiring directors were re-elected for 3 years, and L. T. Vance and Louis C. Detribats will continue as vice-presidents. Harold W. Stimpson was re-elected treasurer.

The regular quarterly dividend of $1.25 a share, payable March 15, was declared at the meeting.

—

Benoist Equips Temporary Plant

CANTON, OHIO, Feb. 18—The Benoist Aeroplane Co. will not build its new plant before next spring. In the meantime a temporary building is being equipped here.

—

2918 Federal Trucks in 1917

DETROIT, Feb. 18—The Federal Motor Truck Co. manufactured 2918 trucks valued at $6,005,000 in 1917, compared with 2442 valued at $4,261,000 in 1916. At present there are unfilled orders on the books which will total $4,000,000, consisting of 300 foreign orders, 1100

Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co.	52	55	+2
*J. I. Case T. M. Co. pfd.	84	86	—4
Chalmers Motor Co. com.	6	8	+3
Chalmers Motor Co. pfd.	25	40	..
*Chandler Motor Co.	80	84	..
Chevrolet Motor Co.	118	121	+1
*Fisher Body Corp. com.	26	35	..
*Fisher Body Corp. pfd.	75	85	..
Fisk Rubber Co. com.	51	55	+1
Fisk Rubber Co. 1st pfd.	98	103	..
Fisk Rubber Co. 2nd pfd.	60	70	..
Firestone Tire & Rubber Co. com.	96	98	— ½
Firestone Tire & Rubber Co. pfd.	96	99	+1½
*General Motors Co. com.	130	134	—5
*General Motors Co. pfd.	83	85	..
*B. F. Goodrich Co. com.	46	47	—1½
*B. F. Goodrich Co. pfd.	93	100	..
Goodyear Tire & Rubber Co. com.	143	145	..
Goodyear Tire & Rubber Co. pfd.	99	101	..
Grant Motor Car Corp.	2	3	..
Hupp Motor Car Corp. com.	2¾	3¼	+ ¼
Hupp Motor Car Corp. pfd.	75	80	..
International Motor Co. com.	14	17	..
International Motor Co. 1st pfd.	40	45	..
International Motor Co. 2nd pfd.	17	20	..
*Kelly-Springfield Tire Co. com.	44	47	— ⅛
*Kelly-Springfield Tire Co. 1st pfd.	75	81	—4
*Lee Rubber & Tire Corp.	13	15	+1
*Maxwell Motor Co., Inc., com.	28	29	—1¾
*Maxwell Motor Co., Inc., 1st pfd.	61	64	—1¾
*Maxwell Motor Co., Inc., 2nd pfd.	22	24	—1
Miller Rubber Co. com.	140	150	—10
Miller Rubber Co. pfd.	95	98	+1
Packard Motor Car Co. com.	98	103	—12
Packard Motor Car Co. pfd.	91	94	..
Paige-Detroit Motor Car Co.	18	19	..
Peerless Truck & Motor Corp.	18	18½	—1½
Portage Rubber Co. com.	112	114	—1
Regal Motor Car Co. pfd.	..	..	..
†Reo Motor Car Co.	17	18½	+ ½
*Saxon Motor Car Corp.	9	11	+ ½
Springfield Body Corp. com.	..	..	..
Springfield Body Corp. pfd.	..	..	..
Standard Motor Construction Co.	9½	10½	..
Standard Parts Co.	..	69½	— ½
*Stewart-Warner Speed. Corp.	56½	59	+6½
*Studebaker Corp. com.	50½	52	+1
*Studebaker Corp. pfd.	91½	97	..
Swinehart Tire & Rubber Co.	..	37	—2
United Motors Corp.	24⅞	25	— ¾
*U. S. Rubber Co. com.	57	58½	+1
*U. S. Rubber Co. pfd.	99	101	..
*White Motor Co.	43	44	+1
*Willys-Overland Co. com.	18½	19¼	+ ⅞
*Willys-Overland Co. pfd.	79	80	+1

*At close Feb. 16, 1918. Listed N. Y. Stock Exchange.
†Par $10 per share.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	Bid	Asked	Net Ch'ge
Auto Body Co.	..	8½	..
Bower Roller Bearing Co.	18½	19½	+1½
Chevrolet Motor Co.	119	121	..
Commerce Motor Car Co.	6	..	..
Continental Motor Co. com.	5¾	5⅞	+ ⅛
Continental Motor Co. pfd.	86	..	..
Edmunds & Jones com.	..	..	..
Edmunds & Jones pfd.	..	..	..
Ford Motor Co. of Canada	178	..	—2
Hall Lamp Co.	..	14½	..
Michigan Stamping Co. com.	12¾	..	+ ¼
Motor Products	..	..	..
Packard Motor Car Co. com.	95	..	—5
Packard Motor Car Co. pfd.	91	..	..
Paige-Detroit Motor Car Co.	17¾	18¼	..
Prudden Wheel Co.	17¾	18½	+2½
Reo Motor Car Co.	17⅜	..	— ⅛

INACTIVE STOCKS

Atlas Drop Forge	..	30	..
Kelsey Wheel Co.	80	89	..
Regal Motor Car Co.	..	26½	..

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domestic orders and a government contract for 700 special trucks.

The statement, in part, follows:

Assets	
Cash on hand	$43,000
Securities	169,174
Accounts receivable	587,689
Plant accounts	537,983
Manufacturer's inventory	1,632,701
Liabilities	
Notes payable	$507,500
Accounts payable	420,000

New Goodyear Cushion Tire

AKRON, Feb. 18—The Goodyear Tire & Rubber Co. is placing on the market a new type of cushion tire designed to give economical service for delivery work. The tire has been in preparation for more than two years and in cross section somewhat resembles an inverted Y, having a fabric reinforced double base fitting a clincher-flanged rim. A metal ring around the center holds the double bases of the tire, preventing buckling and eliminating the possibility of twisting or slipping on the rim. The tread has a practical wearing thickness equal to that of similar size solid tires. The tire is made of a specially prepared rubber compound in which are combined great resiliency and toughness.

Harroun to Have Detroit Factory

WAYNE, MICH., Feb. 18—The Harroun Motors Corp. will shortly open a factory branch in Detroit, on automobile row. R. H. Schmittdiel will be manager.

82,120 Men in Aviation Section

WASHINGTON, Feb. 13—In less than a year the Aviation Section of the Signal Corps has shown a remarkable growth. On April 1, 1917, the complete section consisted of 65 officers and 1120 men; on Jan. 1, 1918, there were 3900 officers and 82,120 men.

Michigan Copper Earns $60 a Share

DETROIT, Feb. 18—Net earnings of the Michigan Copper & Brass Co. for the year ending Dec. 31 were $596,819.41, after deduction of $35,000 for income taxes, $136,000 for excess profits taxes and $126,000 for depreciation. This is equal to $60.20 a share on the $991,350 outstanding common stock.

Assets totaled $2,735,532.85, compared with $2,181,827 at the end of 1916. The surplus, after deduction of preferred stock dividends, was $1,434,009.53. Capital stock outstanding was reduced from $1,114,850 to $991,350 through retirement of the preferred stock during the year.

Summary of Business Conditions and Crops Jan. 23, 1918, as Reported From Twelve Federal Reserve Bank Districts

	District No. 1—Boston	District No. 2—New York	District No. 3—Philadelphia	District No. 4—Cleveland	District No. 5—Richmond	District No. 6—Atlanta
General business	Active	Good; retail trade quiet.	Good	Active, limited only by scarcity of supplies.	Large volume	Fair.
Crops:						
Condition			do	Good	Inactive	do.
Outlook			do	do	Extensive preparations anticipated.	do.
Industries of the district.	Turning more towards Government work.	Active, but hampered by transportation and fuel difficulties.	War industries active; other production retarded.	Decreased output by reason of weather and other conditions.	Running full	Handicapped for coal; some labor shortage.
Construction, building, and engineering.	Little new construction except on Government work.	At minimum	Very little activity	Decrease	Private building negligible; Government work in large volume.	Below average.
Foreign trade	Heavy imports of raw material.	Decreased export movement because of traffic congestion.	Somewhat greater		Restricted	Very limited.
Bank clearings	Increased	Decrease	Small increase	Increase	Large volume	Increase.
Money rates	Firm and steady	Firm	Firm	Firm	Good demand at 6 per cent.	Firm.
Railroad, post office, and other receipts.	Post office increased, railroad decreased.	Increased	Heavy; December shows increase.	Post office receipts increased.	Railroad, irregular; post office, volume large.	Good.
Labor conditions	Fair; considerable unrest.	Demand greater than supply.	Scarce and inefficient	Scarcity and exacting.	In demand at high wages.	Fair.
Outlook	Unsettled	Fair	Unsettled	Improving	Generally satisfactory.	Unsettled, account rapid readjustments.
Remarks	Increasing demands for capital purposes and Government financing, scarcity of coal, and transportation difficulties making business hard to conduct.	Course of business and industry during remainder of winter will depend largely on success of efforts to relieve transportation congestion and fuel shortage.	Coal and transportation situation most acute.		General activity above normal for period of year.	

	District No. 7—Chicago	District No. 8—St. Louis	District No. 9—Minneapolis	District No. 10—Kansas City	District No. 11—Dallas	District No. 12—San Francisco
General business	Good	Generally good	Fair for the season	Good	Good	Active.
Crops:						
Condition	do	Fair		Fair	Fair	Prospects bettered by recent rains.
Outlook	Large acreage wheat	Favorable		More favorable	Encouraging	
Industries of the district.	Necessary industries active.	Busy, as a rule	Active	Active	Active	Very active.
Construction, building, and engineering.	Practically at a standstill	Dull	Slow	Declining in volume	Inactive; seasonal for midwinter.	Decreasing.
Foreign trade					Satisfactory	Large increase.
Bank clearings	Decrease	Increase	Up	Nearly 50 per cent increase.	31 per cent increase over December, 1916	Largely increasing.
Money rates	Firm	Firm	Steady	Steady	Easy	Firmer.
Railroad, post office, and other receipts.	Post office receipts normal.	Increase in post office receipts.	No change		Railroad, increase; post office, 41 per cent increase over 1916.	Increasing.
Labor conditions	Generally satisfactory	Labor scarce	Good	Settled with threatened shortage of farm labor.	Generally satisfactory; some unemployment in unskilled trades.	Unsettled.
Outlook	No misgivings	Generally favorable	do	For general increase of all business.	Promising	Favorable.
Remarks				Prevalent coal and car shortage is serious.	Heavy snow and rain have improved crop conditions, especially wheat; retail trade curtailed; general business satisfactory	Deficient precipitation is at present an unfavorable factor.

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Aviation Not Extra Hazardous

WASHINGTON, D. C., Feb. 18—Following a report from Gen. Pershing that aviation is not an extra hazardous service, Secretary Baker yesterday submitted to the Senate Military Committee a bill to repeal all extra pay allowances in the aviation service, averaging about 50 per cent. The measure submitted by Secretary Baker will also create a new grade of aviators to be filled by specially qualified civilians at $150 a month.

—

To Watch Over Women Workers

WASHINGTON, Feb. 18—The Ordnance Corps will station women welfare supervisors at every plant where women are engaged in war work, one example being at the plant of the Holt Co., Peoria, Ill.

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Kincannon Transmission Elects Officers

BOSCOBEL, WIS., Feb. 18—The Kincannon Silent Transmission Co., organized recently at Boscobel, Wis., by George C. Kincannon, designer and patentee of an improved gearset for motor-driven vehicles, has elected the following officers: President, George C. Kincannon; vice-president, Peter Boebel; secretary, Roy Greenfield; treasurer, Richard Black, and director, Dr. C. L. Jones. For the present the company will contract with outside machine shops for castings, gears, bearings and parts, although it will manufacture these in a short time. Several manufacturers are negotiating for the use of the patents, and contracts probably will be made on a royalty basis.

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Dayton Dealers to Distribute Tractors

DAYTON, Feb. 18—Dayton dealers are preparing to take up the distribution of farm tractors very actively and many of them are at present entering into aggressive campaigns to interest farmers in such equipment.

—

Department to Newark, N. J.

EAST PITTSBURGH, Feb. 18—The Automobile Equipment department of the Westinghouse Electric & Mfg. Co., will on Feb. 15 be removed to the company's Newark, N. J., plant. At the same time the general sales offices of the company will be moved to 110 West Forty-second Street, New York, where the Eastern district sales office will be located. S. D. Levings has resigned as Eastern representative of the company.

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NEW YORK, Feb. 19—The Bourne Magnetic Truck Co. has moved its factory and offices to Fifth avenue and 142d street.

Many New Plants in Cleveland

CLEVELAND, OHIO, Jan. 17—A marked growth in the automotive industries of this city is shown by the building permits obtained in the past year. The following are several of these, following the extent of the use:

Plant	Location	Estimated Cost
Cleveland Welding & Mfg. Co.,	2145 W. 117th Street	$60,000
Cleveland Welding & Mfg. Co.,	2145 W. 117th Street	40,000
Warner & Swasey Co.,	5701 Cedar Avenue	60,000
American Steel & Wire Co.,	Ohio Canal and Harvard Road	25,000
Park Drop Forge Co.,	750 E. 79th Street	60,000
Park Drop Forge Co.,	750 E. 79th Street	36,000
Grant Motor Corp.,	12641 Taft Avenue	65,000
U. S. Tool Co.,	3140-64 W. 106th	25,000
Lang Body Co.,	3086 W. 106th	75,000
Parrish & Bingham Co.,	10600 Madison	80,000
Hydraulic Pressed Steel Co.,	Hydraulic and E. 61st Street	30,000
Hydraulic Pressed Steel Co.,	Hydraulic and E. 61st Street	300,000

Calendar

ASSOCIATIONS

June 5-12—Hot Springs, Va. National Assn. Automobile & Accessory Jobbers.

SHOWS

Feb. 16-23—St. Louis, Mo., St. Louis Auto Mfrs. & Dealers' Assn. Robert E. Lee, Mgr.

Feb. 16-23—Albany, N. Y., Albany Auto Dealers' Assn., State Armory.

Feb. 16-24—San Francisco, Cal., San Francisco Dealers' Assn., Exposition Auditorium. G. A. Wahlgreen, Mgr.

Feb. 18-23 — Syracuse, N. Y. Syracuse Automobile Dealers' Assn., State Armory. Harry T. Gardner, Mgr.

Feb. 18-23 — Nashville, Tenn., Nashville Auto Trade Assn., Hippodrome. Henry B. Marks, Mgr.

Feb. 18-23—Grand Rapids, Mich., Automobile Business Assn., Klingman Building. Ernest T. Conlon, Mgr.

Feb. 18-23—Newark, N. J., N. J. Auto Exhibition, Co. G. First Regiment Armory Claude E. Holgate, Mgr.

Feb. 18-23 — Springfield, Ohio. Springfield Auto Trades Assn., Memorial Hall. C. S. Burke, Mgr.

Feb. 18-23 — Waterbury, Conn., United Shows Co.

Feb. 18-23—Duluth, Minn., Duluth Automobile Trade Association. John J. Lane, Mgr.

Feb. 18-23 — Pittsfield, Mass., State Guard, State Armory. James J. Callaghan, Mgr.

Feb. 18-27—So. Bethlehem, Pa., Fourth Annual (cars 18-23; trucks 25-27), Coliseum. J. L. Elliott, Mgr.

Feb. 20-23—Quincy, Ill., First Annual. Armory. L. B. Bartlett, Mgr.

Feb. 23-Mar. 2—Brooklyn, N. Y., Brooklyn Motor Vehicle Dealers' Assn., 23d Regiment Armory. I. C. Kirkham, Mgr. Passenger cars Feb. 23-Mar. 2; Trucks, Mar. 5-9.

Feb. 23-Mar. 2—Omaha, Neb., Omaha Auto. Trade Assn., Auditorium. Clarke G. Powell, Mgr.

Feb. 25 - Mar. 2—Indianapolis, Indianapolis Automobile Trade Assn., Diamond Chain Work Bldg. John B. Orman, Mgr.

Feb. 25-Mar. 2—Muskegon, Mich. Second Annual. Merrill Auditorium. John C. Fowler, Mgr.

Feb. 27-Mar. 2—Columbus, O., Auto Exhibitors' Co. W. W. Freeman, Mgr.

Feb. 27-Mar. 2 — Burlington, Iowa. Cars, Trucks & Accessories.

Feb. 27-Mar. 6—Boston, Mass., Salon, Boston Automobile Dealers' Assn., Copley Plaza Hotel. Chester I. Campbell, Mgr.

Mar. 1-15—Lyons, France, Third Sample Fair.

Mar. 2-9—Boston, Mass., Boston Auto Dealers' Assn., Mechanics' Bldg. Chester I. Campbell, Mgr.

Mar. 2-9—Pittsburgh, Pa., Automobile Dealers' Assn. of Pittsburgh, Motor Square Garden. John J. Bell, Mgr.

Mar. 4-9—Utica, N. Y., Utica Motor Dealers' Association, Inc., State Armory.

Mar. 6-9—Clinton, Ia., Clinton Automobile Dealers' Assn., Coliseum.

Mar. 6-9—Watertown, N. Y., Automobile Dealers, Inc., State Armory. Arthur E. Sherwood, Mgr.

Mar. 6-9—Mason City, Iowa, Annual Car and Truck. Automobile Dealers' Assn.

Mar. 6-9—St. Joseph, Mo., St. Joseph Automobile Dealers' Assn., Auditorium. John Albus, Mgr.

Mar. 6-9—Sioux Falls, S. D., S. D. Automobile Dealers' Assn.

Mar. 11-16—Cedar Rapids, Ia., Cedar Rapids Auto Trade Assn., Auditorium.

Mar. 12-15—Fargo, N. D., Gate City Auto. Show Co., Auditorium. J. W. Murphy, Mgr.

Mar. 13-16—Raleigh, N. C., Auditorium. John Kelley, Mgr.

Mar. 13-16—Warren, Pa., Warren Automobile Dealers' Assn., Russell Garage.

Mar. 13-16—Peoria, Ill., Peoria Auto. Accessories Dealers' Assn. W. O. Ireland, Mgr.

Mar. 14-16—Fort Fairfield, Me., Reed's Garage. R. F. Reed, Mgr.

Mar. 15-20—Great Falls, Mont., Montana Automobile Distributors' Association. Lexington Garage. A. J. Breitenstein, Mgr.

Mar. 19-23—Vancouver, B. C. Western Canada Automobile Show Assn., Horse Show Bldg. D. A. Hamilton, Mgr.

Mar. 20-22—Houlton, Me., Second Annual, Houlton, Motor Car Dealers' Assn., Bangor St. Exhibition Hall. J. D. Luther, Mgr.

Mar. 20-23 — Holdredge, Neb., Second Annual of Southwest Nebraska.

Mar. 20-23 — Trenton, N. J., Trenton Auto Trade Assn., Second Regiment Armory. John L. Brock, Mgr.

Mar. 25-30 — Bridgeport, Conn., Fourth Regiment Conn. Home Guard State Armory and Casino. B. B. Steiber, Mgr.

Mar. 30-April 6—Hartford, Conn., Eleventh Annual, Hartford Automobile Dealers' Assn., Inc. State Armory. B. F. Smith, Mgr.

Mar. 30-Apr. 6 — Atlantic City, N. J. Second Annual, Garden Pier. S. W. Megill, Mgr.

Apr. 1-6—York, Pa., York Auto Dealers' Assn. T. F. Feiffer, Mgr.

Apr. 6-8 — Green Bay, Wis. Brown County Automobile Trade Assn.

Apr. 6-13 — Red Bank, N. J., Monmouth County Auto. Dealers' Assn., Armory. E. C. Von Kattengell, Mgr.

Apr. 8-13—Reading, Pa. Reading Automobile Trade Assn.

Apr. 9-13—Stockton, Cal., Third Annual San Joaquin Auto Trade Assn. Samuel S. Cohn, Mgr.

Apr. 17-19—Davis, Cal., Tractor Demonstration. University of California.

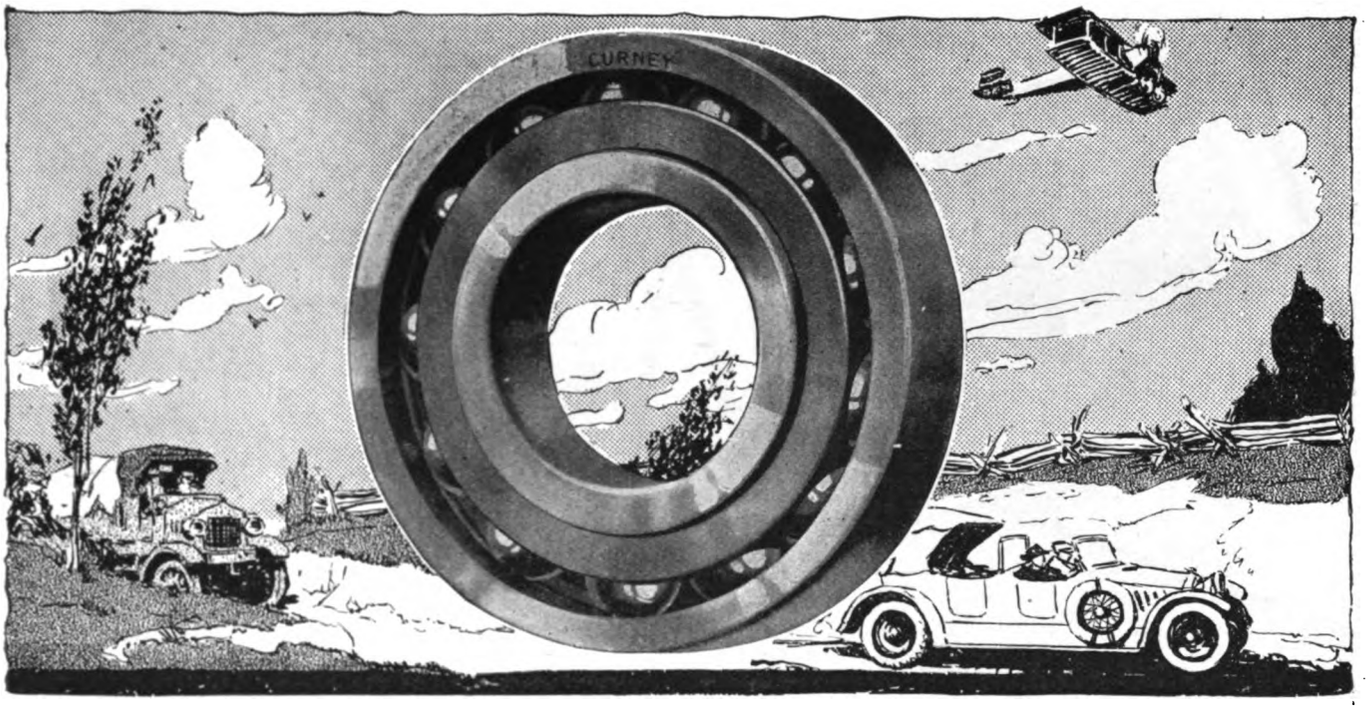
Apr. 17-20—Calumet, Mich., Upper Peninsular Show, Copper County Automobile Dealers & Garage Owners' Assn., Coliseum.

Sept. 23-28 — Chicago, National Accessory Show for Fords, Coliseum.

ENGINEERING

American Society of Heating and Ventilating Engineers.
Mining and Metallurgical Society of America.

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GURNEY BALL BEARINGS

A part you do not see

and on which rests the responsibility of both radial and thrust loads.

Gurney Ball Bearings carry both the radial and thrust loads—***on a single row of balls.*** This permits a lighter bearing without decreasing the factor of safety.

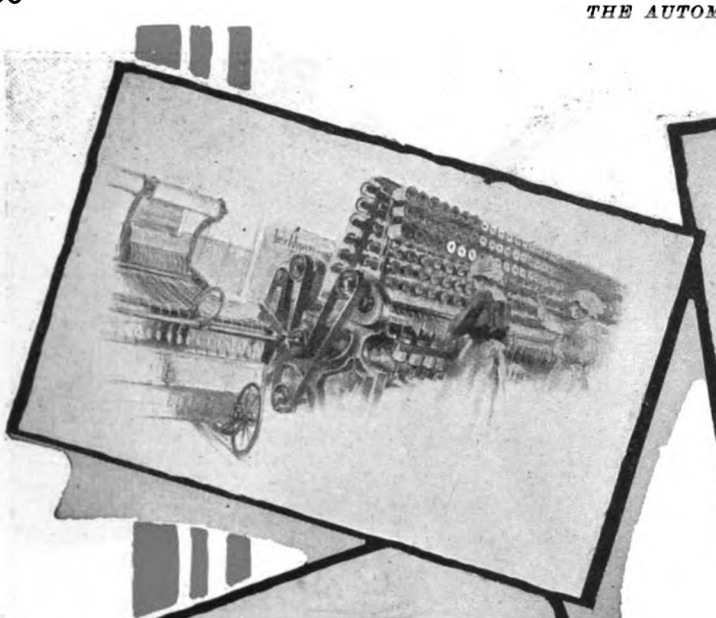
Our experience in ball bearing engineering is at your service.

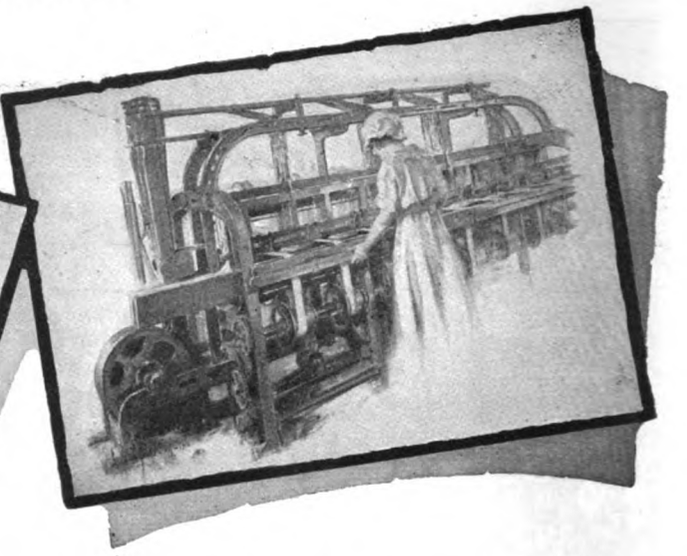
GURNEY BALL BEARING CO.

JAMESTOWN Conrad Patent Licensee **N. Y.**

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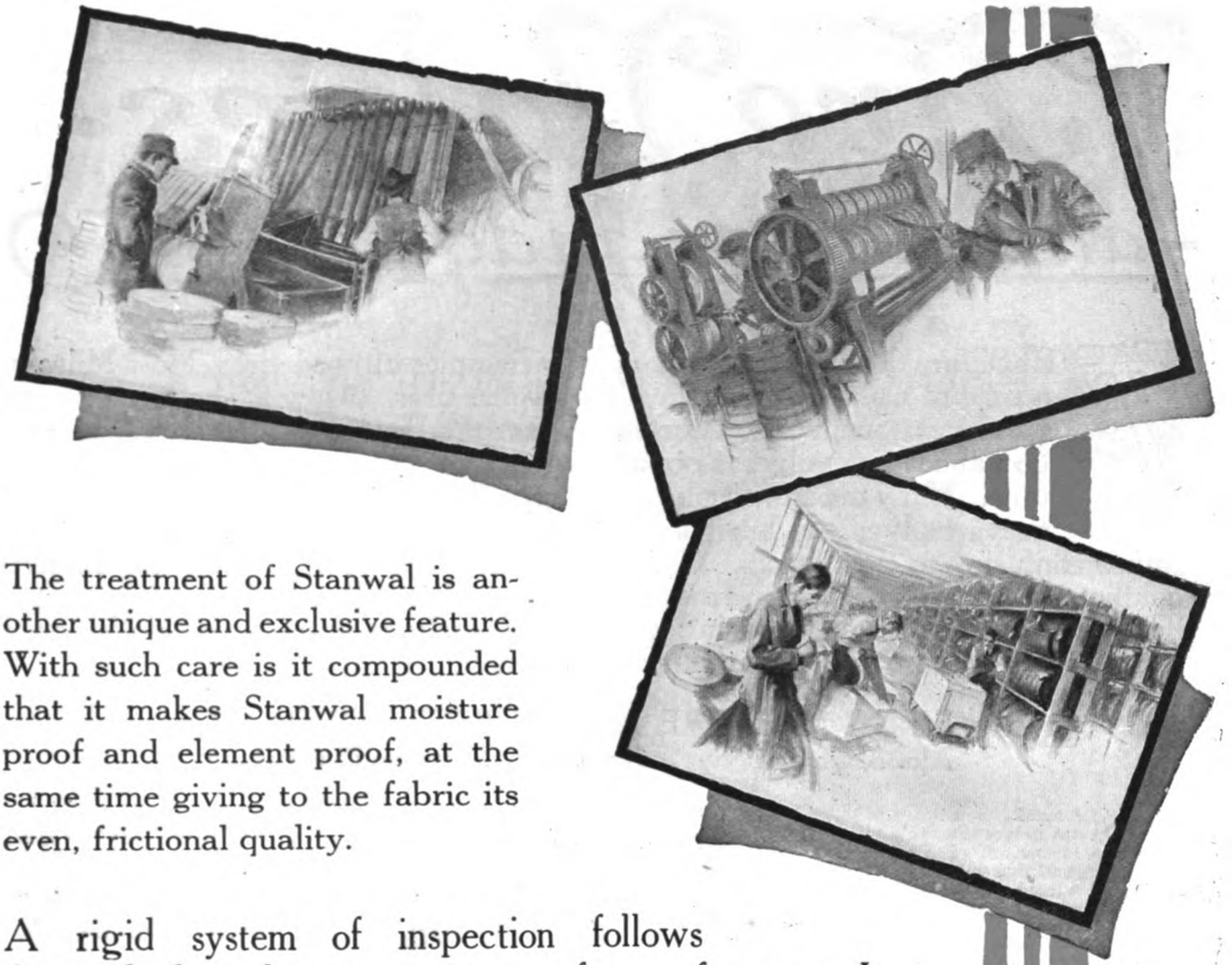


The quality of Stanwal is backed up by the most complete manufacturing equipment known to the brake lining industry. The special heat proof yarn is carded and spun under the direction of our own experts. The weaving is done on our special high speed looms which give to the fabric a uniform solidity.

STANWAL
BRAKE LINING
AND CLUTCH FACINGS

Stanwal is made complete in our own factory. This is a fact worth considering for it places a direct responsibility upon us. It compels us to obtain only the highest grade materials and to enforce those standards of workmanship which alone can insure a product of recognized quality.

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The treatment of Stanwal is another unique and exclusive feature. With such care is it compounded that it makes Stanwal moisture proof and element proof, at the same time giving to the fabric its even, frictional quality.

A rigid system of inspection follows Stanwal through every process of manufacture. In the spinning of the yarn, the weaving, the treating, every foot—every stitch—comes under the watchful eyes of experts.

This thorough system of inspection is a necessary foundation for the guarantee upon which Stanwal is sold.

For we guarantee that every one who uses Stanwal shall be satisfied without regard to cost or loss to us

Standard Woven Fabric Co., Walpole, Mass.

New York Branch and Export Office, 1834 Broadway
Chicago Branch Office, 1430 Michigan Avenue
Detroit Branch Office, 306 New Telegraph Building
Philadelphia Branch Office, 406 Colonial Trust Co. Building

OTHER STANWAL PRODUCTS

Multibestos Brake Lining and Clutch Facing
Stanwal Friction and Insulating Tapes
Splicing Compounds
Cable and Specification Tapes
Moulded Rubber Goods
Stanwal Matting
Stanwal Rubber Heels
Stanwal Fibre Soles

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Tire Values
-and how to judge them-

THESE are days of conservation, a time to make every dollar do its utmost. Some basic information about tire values is opportune. Many different makes of tires are advertised, but in a way rather confusing to car owners. Claims conflict, glittering generalities are the rule. That is why Firestone advertising presents to the public the fundamental principles of good tires, Most Miles per Dollar tires. Below is shown a cross section of a Firestone Cord Tire. This is the tire that is giving car owners the greatest possible efficiency in wear and fuel economy. Each part is briefly described. Inspect the vital units of this construction. You will soon be buying more intelligently, making every dollar do its utmost.

FIRESTONE TIRE AND RUBBER COMPANY
Akron, Ohio Branches and Dealers Everywhere

Tread A touch of your finger tips proves the resilience of a Firestone Cord Tire. And the remarkable mileage of this enduring tread are matters of record in every section of the country.

Cord and Rubber Body Each wall of stout cord in the Firestone Cord Tire acts independently of adjoining cord walls. Firestone construction forms one flexible unit, strong and enduring.

Reinforcement for Sidewall and Bead A special reinforcement that carries the hinge to the widest portion of the tire where the bending action has least effect.



Cushion Stock This section of fine rubber is a shield to the body or "carcass" of the tire. It absorbs road blows. The Firestone method of making it from the purest rubber and of unusual thickness has added materially to its effective performance.

Most Miles per Dollar

Breaker Strip A special open fabric of great strength, filled and coated with pure rubber. Breaker strip spreads road shocks over large area of the cushion and body of tire, preventing stone bruise.

Side Wall Here is the protecting element for the body on each side between tread and bead, a combination of great resilience and resisting power

Piano Wire Bead In every Firestone Cord Tire there is enough piano wire to equip four pianos. This wire is braided into a cable of astonishing strength to form the bead. The bead is the anchorage for the entire structure and must cling firmly to the rim.

Firestone
CORD TIRES

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Important Announcement

The new high-speed steel—Great Bear—is harder and has longer wearing qualities than any other high-speed steel now on the market. This is proved by tests.

Think what this means in increased production, saving of labor at the machines and in regrinding; saving in storage and handling, and decreased investment in cutting-tool equipment.

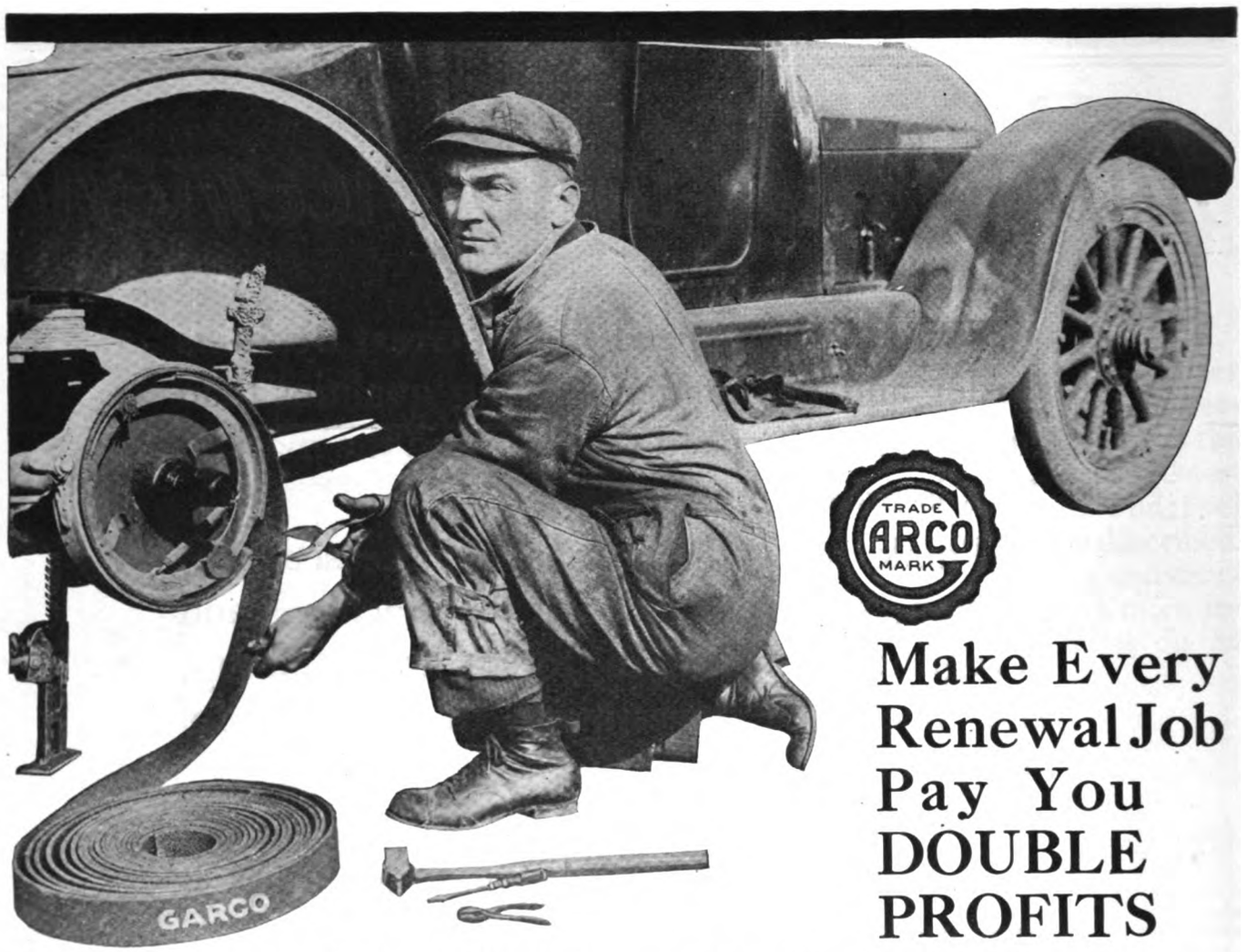
Prove it yourself. Send $1 for sample piece from $\frac{7}{16}$ to $\frac{3}{4}$-inch square, and test it thoroughly in your own plant.

If you desire some other size send us your order for a single piece, or write for further information.

Fulton Steel Corporation
Plant at Fulton, N. Y.
Send inquiries to Sales Office
165 Broadway New York

GREAT BEAR
HIGH-SPEED
STEEL

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Make Every Renewal Job Pay You DOUBLE PROFITS

MOST any brake lining will bring you a reasonable profit on every renewal job. Some kinds that give the *least wear* even pay the biggest profit. But only *once*.

When your customer leaves the choice of brake lining up to you — use GARCO. It will bring you a mighty good profit right there and then. But more than this—it will build customer-confidence that you can cash-in on time after time.

GARCO is solidly woven. It resists wear. It backs your good workmanship through months of the hardest kinds of service. GARCO puts safety into driving that no other brake lining can give.

Your jobber carries GARCO in stock and will be glad to supply you. Put it up to him the next time you are in the market. Ask him to tell you about the brake lining rack supplied free to every GARCO dealer. Get it selling for you now.

GARCO BRAKE LINING

GENERAL ASBESTOS & RUBBER CO. MAIN OFFICES and FACTORIES **Charleston, S. C.**

Branches and Complete Stock: 58 Warren Street, New York **311 Water Street, Pittsburgh**
106 West Lake Street, Chicago

Largest Manufacturers of Asbestos Textile Products in the World

Please mention Automotive Industries when writing to Advertisers

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WISCONSIN AXLE

WORM DRIVE

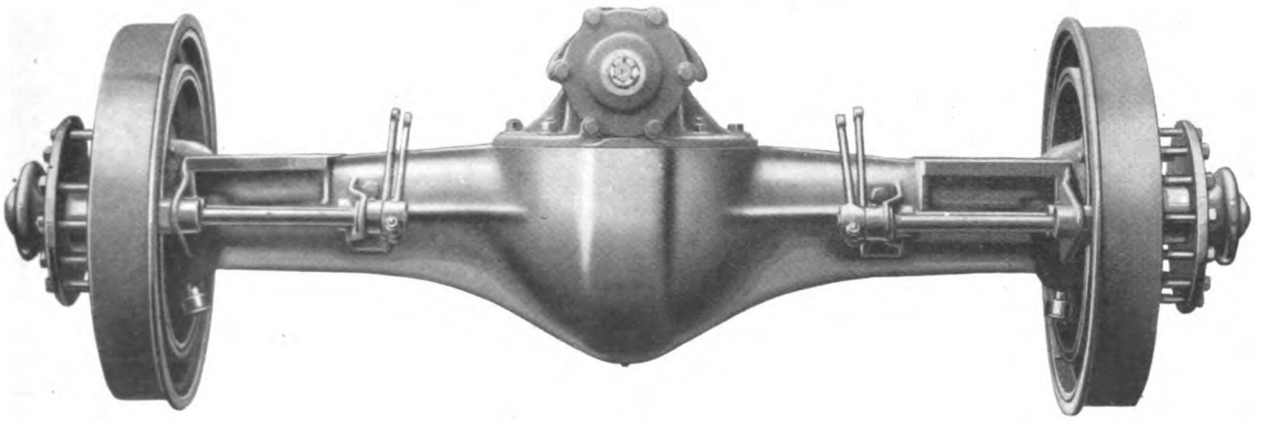
We have the Product—We have the Equipment—We have the Service to Meet the Requirements of a Few Additional Truck Manufacturers During 1918

We urgently advise prompt action to assure against possible disappointment due to general axle shortage. Immediate Deliveries. Protect your output by wiring, writing or visiting us.

Sales Representative of
E. B. Hayes Machinery Corporation
Oshkosh, Wis.

Engineering & Sales Corporation
122 South Michigan Avenue, Chicago, Ill.

4 Models — 2½, 2, 1½ and 1 ton Capacity.



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A Machine Shop that Backs up Your Own

Production unable to keep up with orders—a shortage of labor almost unprecedented—wages so high that never before has the worker's time had such a value—

Here is a situation to make you stop and consider whether you are getting the utmost out of every machine and man in your shop.

And here's a situation in which our machine shop can help you do it. How? By taking off your hands a job we're especially fitted to handle and releasing your men and machines for work that your shop is tuned up to do best.

A lot of things that you can do with your machines will pay you better than finishing bushings and bearings or brass castings. And that's but one advantage in turning the job over to us.

Take the matter of borings, for instance. You sell them as scrap and get the price of scrap. We can keep each lot separate, remelt them and realize more on the uniform remelt than you can from mixed scrap.

Thus we are sometimes even able to supply finished *Lynux* at a price below that of rough castings, and almost always for less than the cost of the rough castings plus your machining costs.

We've Doubled Our Shop Capacity

Our machine shop facilities have always been large. Recent additions have doubled them. Our Detroit plant is now probably the biggest of its kind in the country.

And in our machine shop, the same kind of scientific management and up-to-date methods prevail, as in *Lynux* foundries.

Lynux Alloys for Various Purposes

For bushings, bearings, gears, big castings, little castings—in short, for almost anything in brass or bronze.

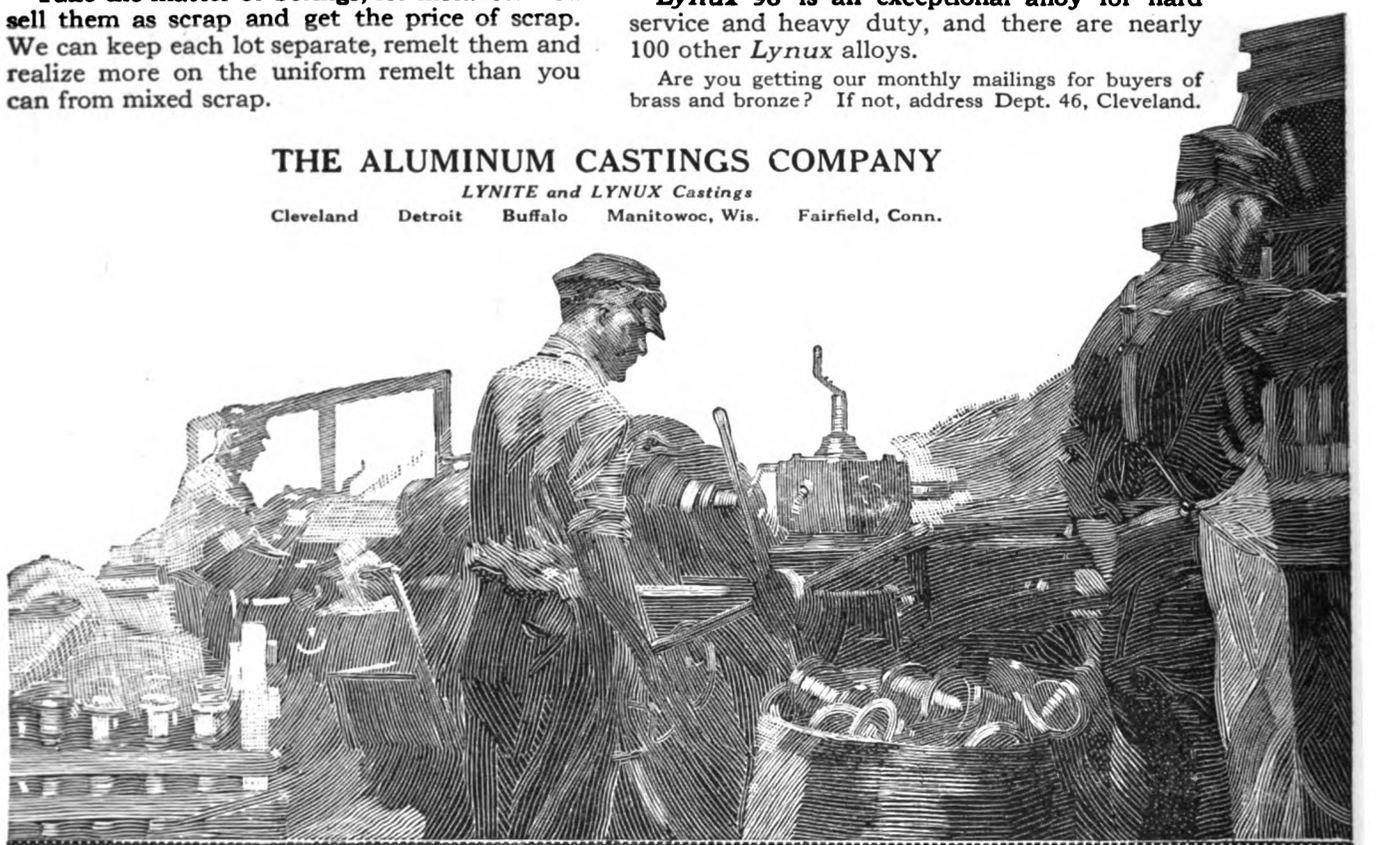
Lynux 98 is an exceptional alloy for hard service and heavy duty, and there are nearly 100 other *Lynux* alloys.

Are you getting our monthly mailings for buyers of brass and bronze? If not, address Dept. 46, Cleveland.

THE ALUMINUM CASTINGS COMPANY

LYNITE and LYNUX Castings

Cleveland Detroit Buffalo Manitowoc, Wis. Fairfield, Conn.



LYNUX BRONZES

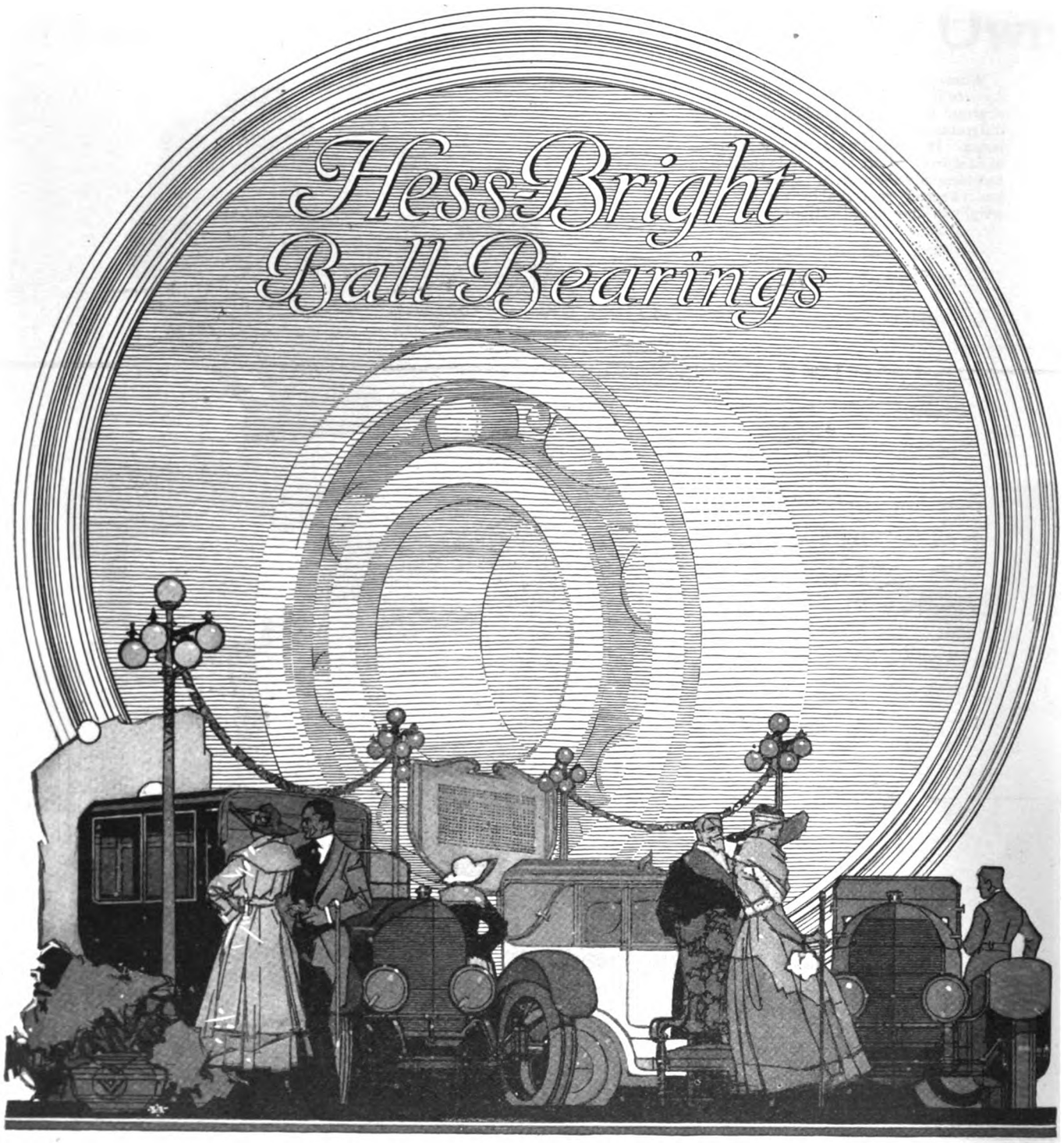
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Where lightness is a requirement, *Lynite* is the ideal metal. *Lynite* is a group of aluminum alloys, made to different analyses for different purposes. It's as strong as many grades of cast-iron, where strength is needed, but weighs only a third as much. It has effected remarkable savings of weight in many applications.



BUSHINGS
BEARINGS

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When you look at the better cars—

NOT every machine is Hess-Bright equipped—not every car has so much quality built into its power plant. But those that have are the very cars that you would mention as among the finest in America.

As you build up to your idea of a motor car you come closer to the Hess-Bright-equipped car. A good thing to remember when you are looking around for next year's motor.

THE HESS-BRIGHT MANUFACTURING CO.

Where Performance takes Preference over Price

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AN EXPERIENCED AUTOMOBILE ENGINEER

says—

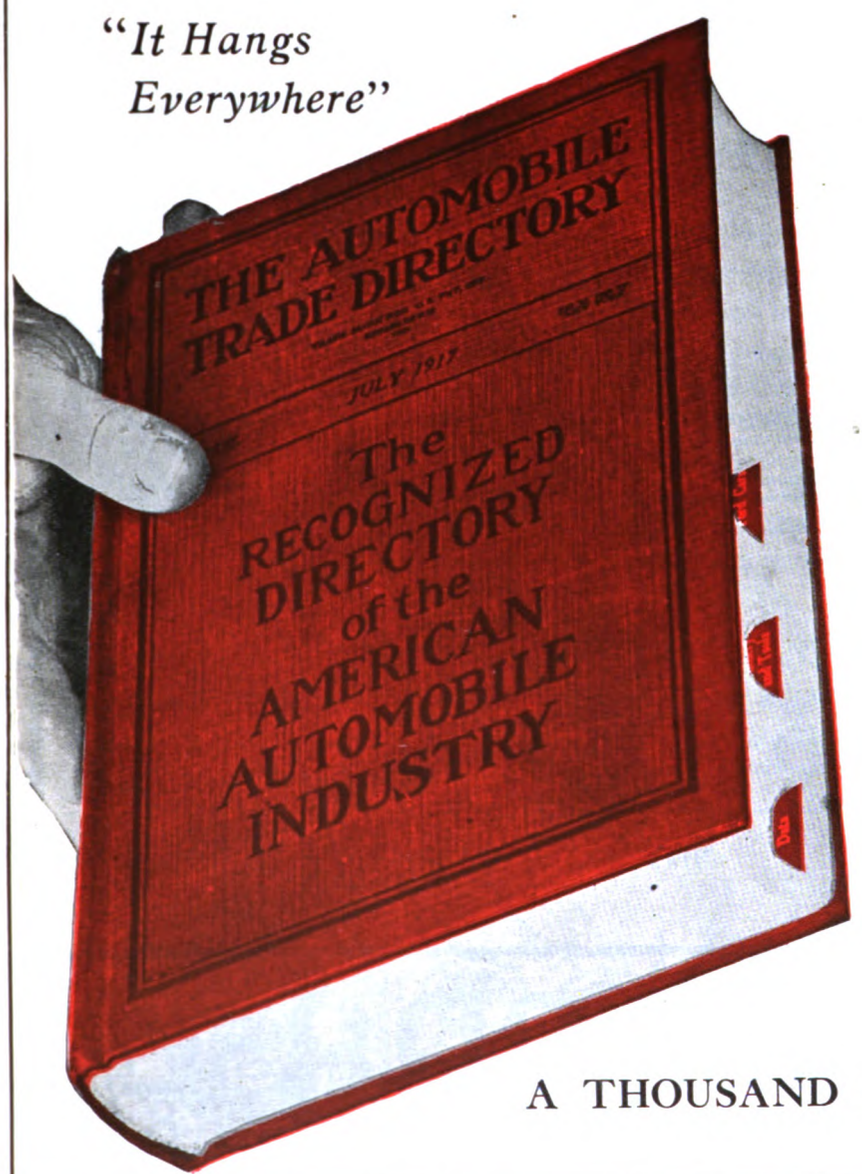
"The information contained in the Automobile Trade Directory, we consider very valuable. The technical data under the heading of 'Tables and Data' is extremely useful and more readily accessible than the ordinary reference book."



L. Ballauf

CHIEF ENGINEER
DORT MOTOR CAR CO.

"It Hangs Everywhere"



At this time of the year Dealers are being asked:—"How much alcohol must I use in my radiator to be safe, or is there anything else I can use as an anti-freeze mixture?" In the hundred or more pages of useful "Tables and Data" to be found in the Red Directory, you will find the answer to this as well as to many other problems that you are called upon to answer.

THE AUTOMOBILE TRADE DIRECTORY
ROBERT WOLFERS, President
243 WEST 39th STREET, NEW YORK CITY

A THOUSAND CATALOGS IN ONE

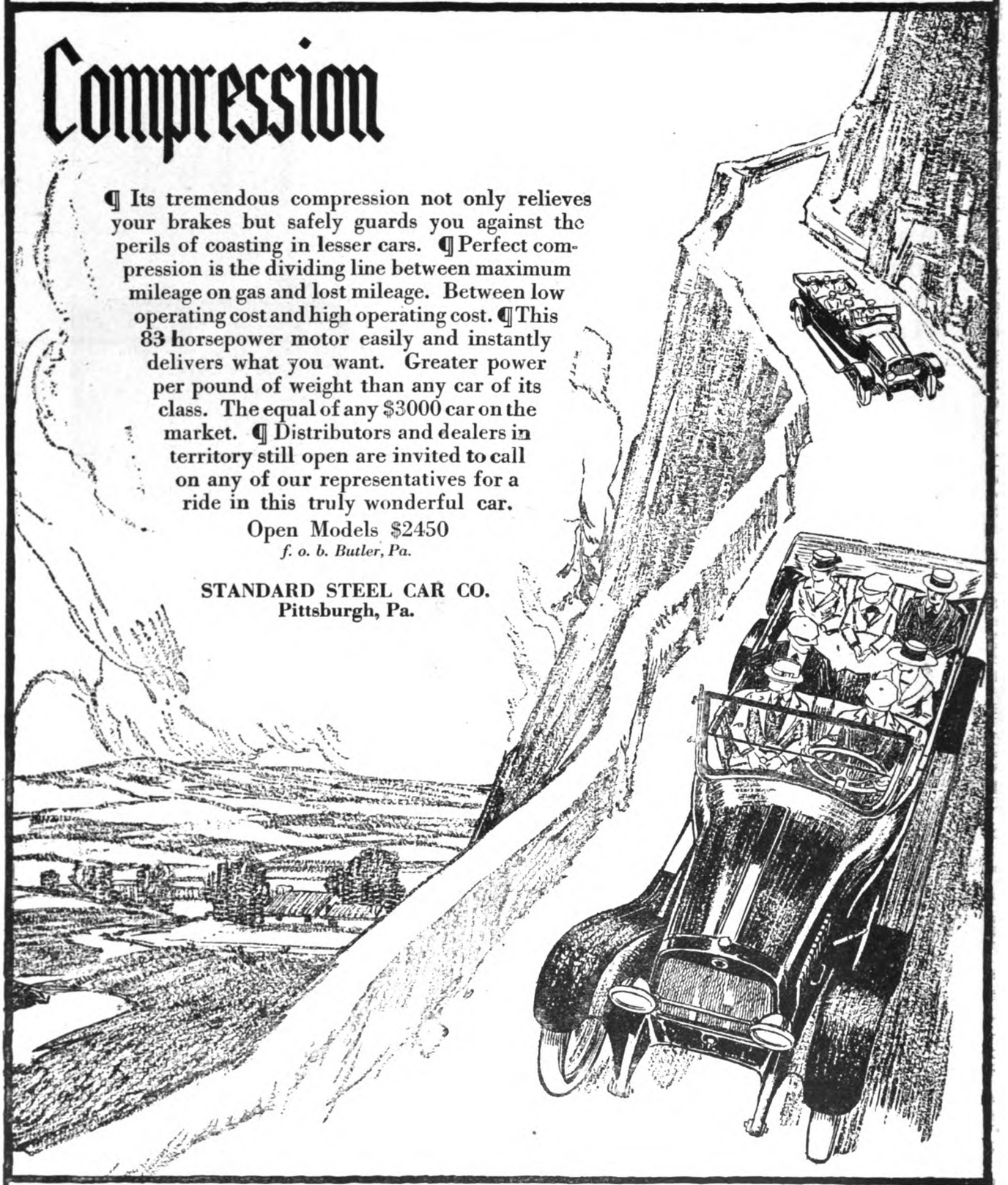
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Compression

¶ Its tremendous compression not only relieves your brakes but safely guards you against the perils of coasting in lesser cars. ¶ Perfect compression is the dividing line between maximum mileage on gas and lost mileage. Between low operating cost and high operating cost. ¶ This 83 horsepower motor easily and instantly delivers what you want. Greater power per pound of weight than any car of its class. The equal of any $3000 car on the market. ¶ Distributors and dealers in territory still open are invited to call on any of our representatives for a ride in this truly wonderful car.

Open Models $2450
f. o. b. Butler, Pa.

STANDARD STEEL CAR CO.
Pittsburgh, Pa.



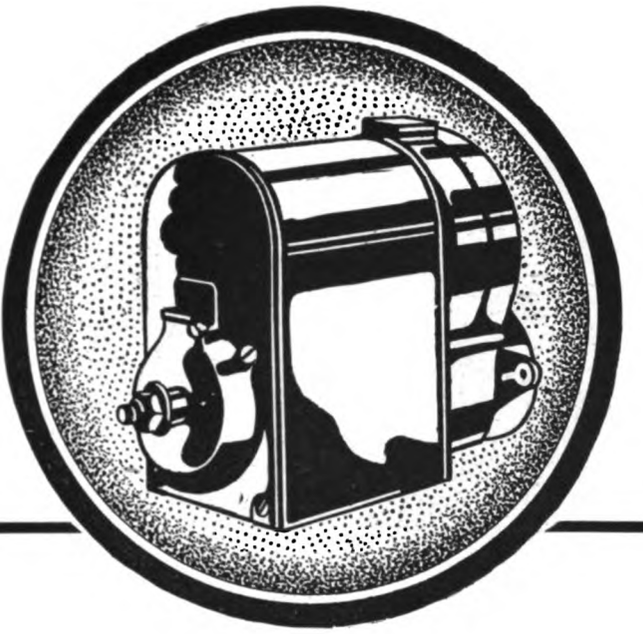
STANDARD "8"

STANDARD "8"

The Magneto Equipped Eight

STANDARD "8"

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"Magnetos are a Mystery to Me!"

"Electricity isn't in my line. With *all* the makers so strong in their claims how am I to judge which Magneto will give me the best service!"

That is the attitude of many car owners toward the magneto question.

Claims are poor things to judge by; *results* are what count, especially results in competitive tests. And since you cannot easily make the tests for yourself, follow the decision of those car, truck and tractor builders who are most particular to use the best.

Truck service, with its heavy, constant strains and shocks, is where the differences between magnetos show most plainly. In the list of 81 truck builders who use Eisemann as standard equipment appear the names which mean most.

THE EISEMANN MAGNETO CO.

Sales and General Offices: 32 Thirty-third St., Brooklyn, N. Y.

Chicago, Ill., 910 South Michigan Ave.
Detroit, Mich., 802 Woodward Ave.

THE

EISEMANN

MAGNETO

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THIS IS YOUR GUARANTEE



that your truck is as near trouble-proof as the rear axle can make it—and that means much. For the rear axle is the vital part between the load and the road and delivers the full measure of the engine's efficiency to the wheels — over rough roads or smooth, up hill or down, through dirt, mud or sand.

The double anchor—the Sheldon shop mark—identifies the hub cap of the truck equipped with the Sheldon Worm Drive, Semi Floating, Ball Bearing-equipped Rear Axle—the utmost in truck axle design.

We will be glad to send you further information.



SHELDON

WORM GEAR AXLES

SHELDON AXLE & SPRING CO. *Makers of springs and axles for heavy duty service for more than fifty years.* WILKES-BARRE, PA.

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It Would Take You A Thousand Years To Get This Experience

NO tests that you alone could possibly make—no ordeals to which you could subject your car, would settle the Spark Plug question so absolutely as it is answered here by this list.

All these manufacturers gave AC plugs the most exacting trials before their engineers—leading experts of the motoring world—decided on

AC SPARK PLUGS

The Standard Spark Plug of America

For race or road—in heat or cold—AC plugs have stood the test. On lightest passenger car or heaviest truck, AC Plugs cover the widest possible range of service most effectively.

We make spark plugs for Ford, Maxwell, Overland and Studebaker cars that insure their highest efficiency.

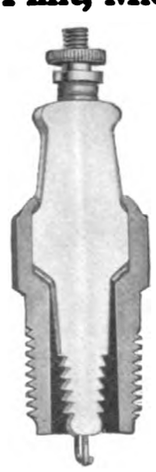
Champion Ignition Company
Sole Manufacturers, Flint, Michigan

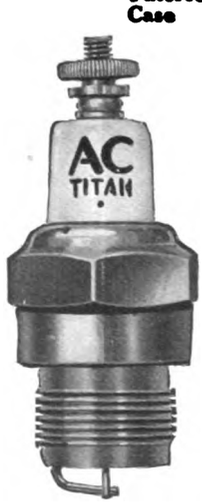
Grilling tests were made by these manufacturers—they decided on AC equipment

Cadillac
Pierce-Arrow
Packard
Marmon
Hudson
Chalmers
Hupmobile
Chandler
Haynes
Chevrolet
Locomobile
Disbrow
Dorris
Premier
Knox
Anderson
White
Daniels
Westcott
Duesenberg
Dort
Cole
Reo
Paige
Peerless
Pilot
McFarlan
Paterson
Case
Buick
Oakland
Oldsmobile
Nash
Kissel Kar
Monroe
Singer
Hatfield
Lexington-Howard
Scripps-Booth
Crane-Simplex
Stearns-Knight
Saxon
Stutz
National
Velie
Stephens
Dodge Brothers
Henderson Bros.
Delco-Light
Murray
Economy
Jordan
Liberty
Jackson
Apperson
Lombard Tractors
Phianna
McLaughlin (Canada)
Gabriel Trucks
Signal Trucks
Maxim Trucks
Acme Trucks
Riker Trucks
Wilcox Trux
Republic Trucks
Four Wheel Drive
Netco Trucks
Sterling Trucks
Diamond T Trucks
Federal Trucks
G. M. C. Trucks
American-La France
Old Reliable Trucks
Gramm-Bernstein Trucks
Menominee Trucks
Brockway Trucks
Wisconsin Trucks
Moreland Trucks
Sandow Trucks
Samson Tractors
Stewart Trucks
La Crosse Tractors
Case Tractors
Advance-Rumely Tractor
Robinson Fire Trucks
Titan Trucks

AC Carbon Proof

For Fords, Overlands and Studebakers





⅞ in. Regular for Maxwells

AC Titan

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The Control of Quality
Point No. 11

Getting the Third Degree

Cups, cones and rollers of a Timken Bearing are heated to just the right red heat before hardening — and this temperature is automatically regulated.

Motion of the parts in the furnace is so timed that a single trip through the heat brings the temperature of every piece up to just the proper point.

Heat is neither judged by the eye nor regulated by the hand.

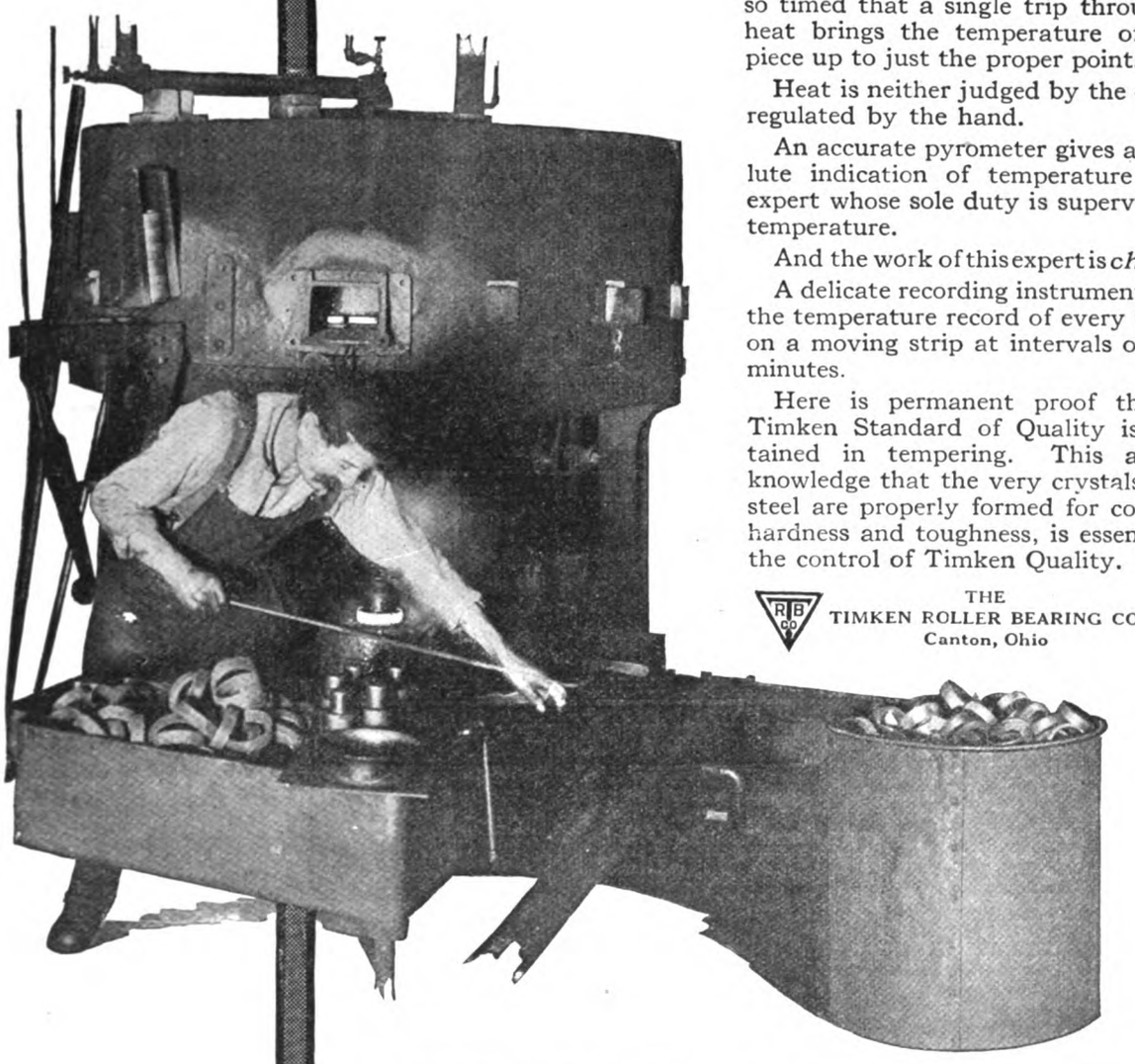
An accurate pyrometer gives an absolute indication of temperature to an expert whose sole duty is supervision of temperature.

And the work of this expert is *checked*.

A delicate recording instrument prints the temperature record of every furnace on a moving strip at intervals of a few minutes.

Here is permanent proof that the Timken Standard of Quality is maintained in tempering. This absolute knowledge that the very crystals of the steel are properly formed for combined hardness and toughness, is essential for the control of Timken Quality.

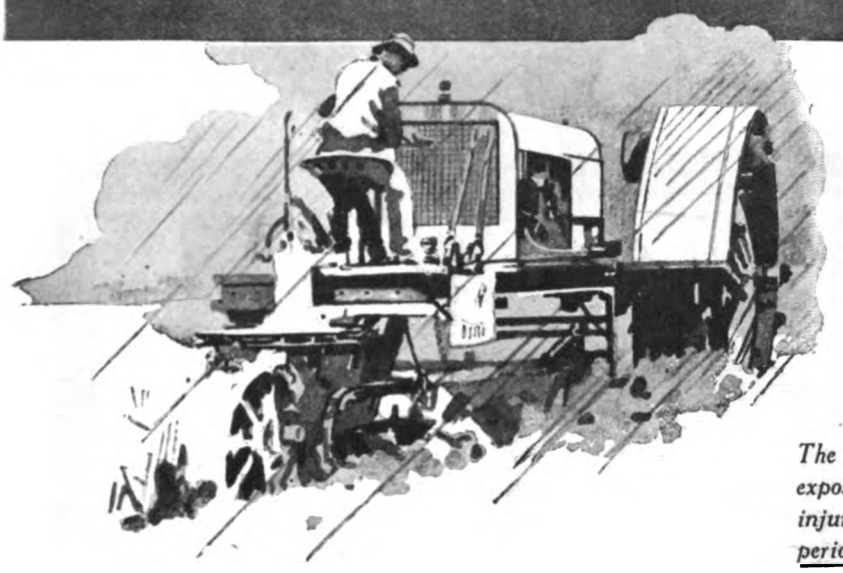
THE
TIMKEN ROLLER BEARING CO.
Canton, Ohio



TIMKEN
BEARINGS

Please mention Automotive Industries when writing to Advertisers

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The Tractor Must Withstand Rust and Wear

The Farm Tractor is machinery. It cannot be exposed to all weathers, without sustaining vital injury, unless its finish is of a kind vastly superior to that of ordinary agricultural implements.

Let Us Help You Find a Way

Our "Better-the-Finish" Laboratory is devoted exclusively to the study of finishing problems.

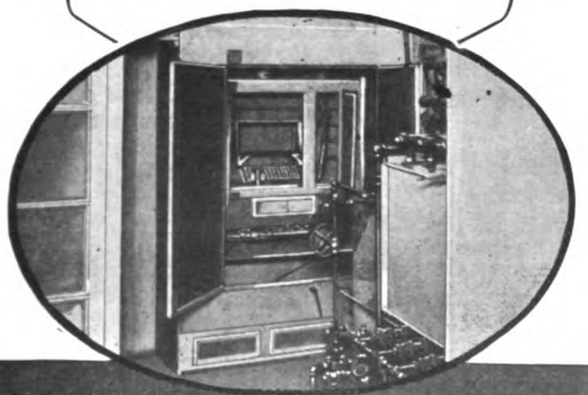
All devices that can aid in such work are here. Actual tests are made under conditions as nearly as possible duplicating those in your own workshops.

Hundreds of different problems, involving a large variety of requirements, have been correctly solved in this Laboratory. It has saved many manufacturers time and labor, and besides has given them exactly the proper finish for their products.

Let us help you find a way to improve your finishing methods—at our expense.

Manufacturers handling government work should bear in mind that our experience in co-operating with firms handling similar work is at their disposal.

The experimental japanning ovens where goods can be baked at temperatures up to 500 F.



Tractor manufacturers who desire a reputation of permanence for their products would do well to consider this fact seriously.

To obtain the proper finish does not mean necessarily to spend more money, but to adopt the proper finishes and methods.

These can be determined in two ways—i. e., by finding them out for yourself at the expense of time, money and numerous failures; or, by consulting those who have already made a thorough study of the subject and can help you to a successful conclusion.

HILO

Enamels—Japans—Varnishes

The "HILO" trademark stands for more than high quality finishes. It stands for "Finishes That Fit The Case!" With 54 year's experience in solving all kinds of finishing problems, and an experimental laboratory constantly devoted to perfecting finishing methods, we stand ready to fill your exact requirements.

Write for our Bulletin No. 1 on Black Enamels and Japans. It will help you, whether you buy from us or not.

MOLLER & SCHUMANN CO.

54 years making Hilo Enamels, Japans, Varnishes

443-451 Marcy Avenue Brooklyn, N. Y.

Branch Office: 110 N. Desplaines Street, Chicago, Ill.

Pacific Coast Representative: The Brininstool Co., Los Angeles, Calif.

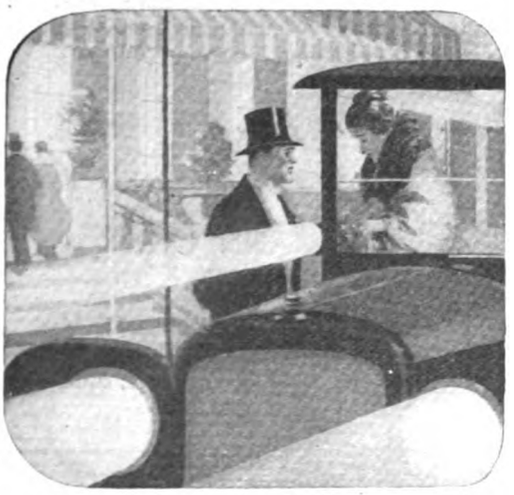
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Discriminating people want it because it is always dependable

Auto-Lite

Starting, Lighting & Ignition



Dominant in the Automobile Industry

There are many kinds of automobile engines—

And many varieties of motor cars—

And many different engineering theories—

All the *more* creditable to Auto-Lite that a vast majority of cars are equipped with it.

We originated the six volt principle, separate unit, now accepted as the world's standard for high efficiency.

We specialize upon this one and *only* product.

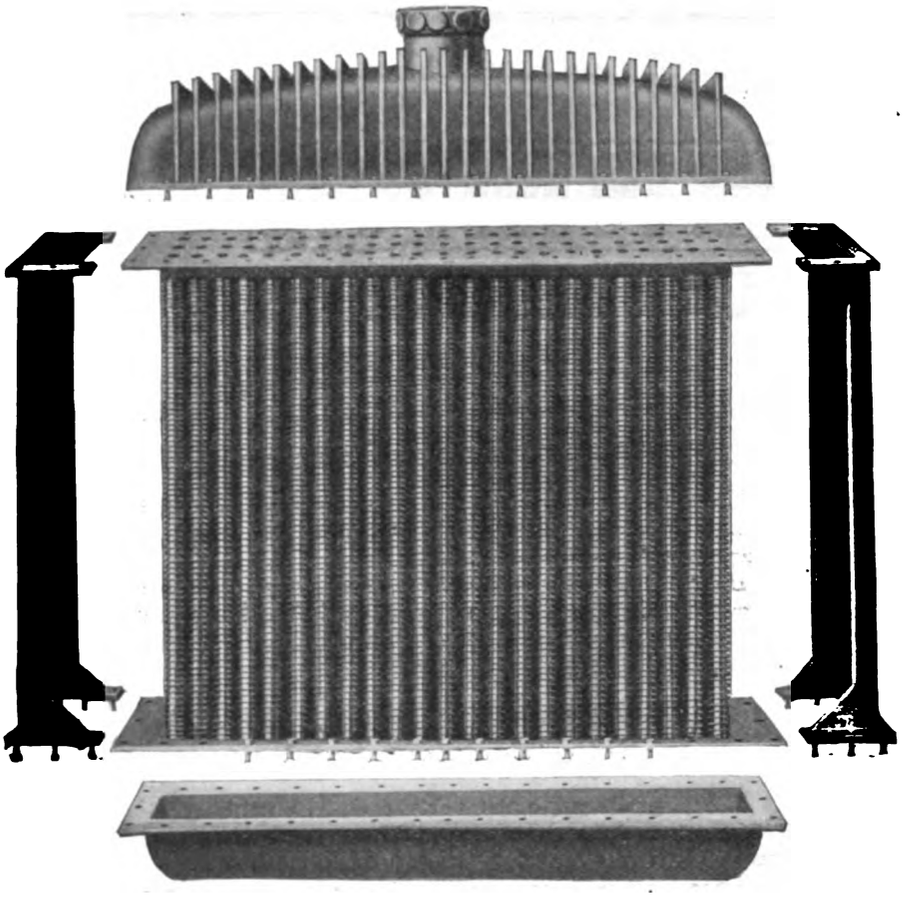
Because Auto-Lite *is* so superior, the demand has made us the world's largest company devoted exclusively to building electric starting, lighting and ignition systems for motor cars.

Make sure Auto-Lite is on the next car you buy.

Electric Auto-Lite Corporation

Head Office and Factory, Toledo, Ohio **Detroit Sales Office, 1507 Kresge Bldg.**

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The Fedders Tubular Radiator conforms to the U. S. Government specifications for heavy duty trucks,

—with certain added refinements to bring it up to Fedders standards.

We furnish complete, or tubes with header plates, or tubes only, cut to any length.

We are now in position to take on more business providing for prompt deliveries.

Fedders Manufacturing Company, Inc.
BUFFALO, NEW YORK

FEDDERS

TUBULAR and DIAMOND CORE RADIATORS

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SUNDERMAN
Vacuum Carburetor

$6

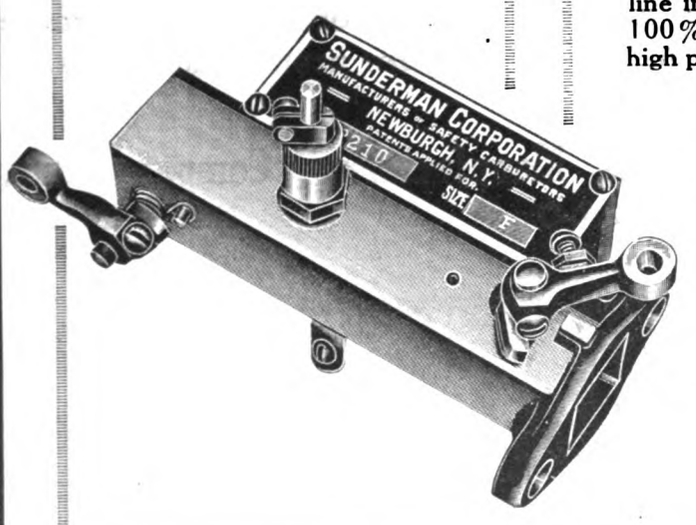
F. O. B.
Newburgh

$8 and $10 for other than
FORD or METZ

Help Your Customers to Save

That's your duty, Mr. Dealer. Every Car owner wants to save—you must show them how. The SUNDERMAN CARBURETOR will save for them without sacrificing anything.

Start NOW



Install a Sunderman When You Overhaul Your Car

With the first breath of the spring breeze every owner begins to figure on putting his car in good shape for the new season.

By all means do so this year, Mr. Motorist. New cars will be scarcer than last year and you'll have to do more yourself with the old car to make it run sweetly.

A Sunderman Carburetor Will Do Wonders for You

When you scrape the carbon out of your cylinders, grind the valves and put in new piston rings, **finish the job—install a Sunderman Carburetor.**

Then you will get the final answer to complete motor enjoyment with absolute economy.

More Power at a Lower Cost—More Speed on Less Gasoline

The Sunderman Carburetor works on the soundest, scientific principle—that of breaking up the gasoline globules into infinitely minute particles, thus releasing the power that is bound up in coarser mixtures and lost in the combustion chamber.

The low and high speed jets insure an economical but always adequate supply of quickly explosible gas, governed by the suction of the cylinders.

The result is a saving of from 30 to 50% of gasoline in all motors—a power increase of from 42 to 100%. Think what this means in these days of high prices.

As a by-product you get a greater flexibility—a more rapid acceleration—quicker pick-up—better idling, and an Herculean hill-climbing power that in itself is worth more than the purchase price.

Owners—Ask Your Dealer or Order From Us To-day

Dealers—*We'd much rather have YOU take these profits—Write us, and we'll show you how to cash in on our advertising.*

Sunderman Corporation

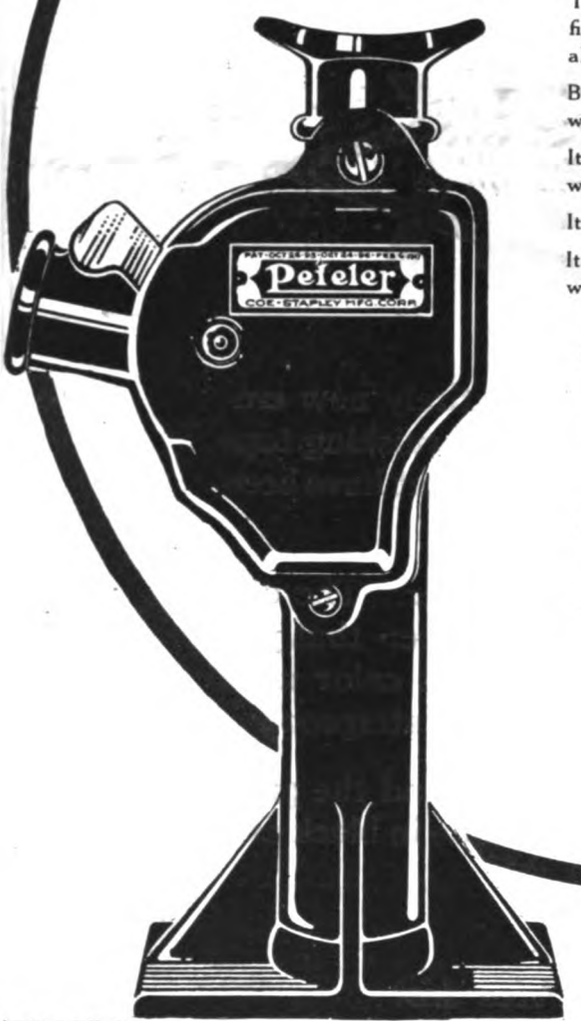
5 Chambers Street, Newburgh, N. Y.

Western Office: 403 Kresge Building, Detroit

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It pays to handle "The Best Jack in the World"

The new Peteler Jack, a marvel of mechanical ingenuity, simple as a pocket knife, compact, easy of operation and tremendously powerful—will vitalize your business from the ground up.



Think of it—$6 for the best jack in the world. Well proportioned, finely finished, distinctive in appearance—it will almost sell on looks alone. A brief demonstration proves its genuine capacity for work.

By means of the long telescoping handle it can be shoved into place without crawling under the car or even kneeling.

Its stroke is so short that the overhang of the car cannot interfere with the movement of the handle.

It raises 3/8" to the stroke—much faster than any other jack.

It has no danger point—can be raised to the limit of the lifting bar without fear of failure.

Peteler AUTO JACK

It raises the car easily; a turn of the handle operates a lever which reverses the action and the car comes down—step by step.

When all the load is off—a slight lift of the handle allows the lifting bar to drop the remaining distance—the jack can be withdrawn and stowed away in the tool box.

It is built to raise 3000 lbs.—a half ton of overstrength.

It is built of the finest materials throughout.

$6 for the best jack in the world.

And the price allows you a most liberal profit. Write today.

Coe-Stapley Mfg. Corporation

Factories: Bridgeport, Conn., and Brooklyn, N. Y.

Executive Offices: 115 Broadway, New York

COE-STAPLEY

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DRIDEK—

With the Leather Finish

TRADE DRIDEK MARK REG.

DrideK with its leather finish, is an entirely new creation, based on many years' experience in furnishing tops and upholstery for the majority of the cars that have been put on the market.

DrideK looks as well as the best of leather. The distinguishing features in the wear of DrideK are: that you cannot scratch the finish; that it retains its color until entirely worn out; and that it is absolutely waterproof.

The product is unquestionably superior, and the price is within reach of your specifications. Made in black and many attractive colors.

Send for Samples and Price List

L. J. MUTTY COMPANY

Boston, Mass.

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Strangling the Periodicals

Congress at its last session passed a hasty postal law increasing the postage on periodicals from FIFTY TO NINE HUNDRED PER CENT.

Some periodicals will be killed—all will be restricted in circulation and crippled. There will be fewer readers, and the habit of reading curtailed. The great function of periodicals is to assist in the spread of ideas—by printing the achievements in the world of thought, culture, and science.

Thus to shut out farm journals—as these zone rates will—will lessen the productive power of our country by millions of dollars through loss of better methods. Shut off trade journals and you decrease the manufacturing power by more millions. Shut off the religious papers and there are shut off channels that have raised millions of dollars for distressed humanity. Shut off the great periodicals of the home and there is throttled an avenue that has given expert instruction to hundreds of thousands of mothers and saved their babies to health and citizenship.

These national periodicals are printed in the big cities—and the first zone, the cheapest zone, is in or near those cities; there are many educational opportunities near cities, and the cities will read anyway. Small towns and distant districts depend to a large extent upon periodicals; thus this law increasing periodical postage where it is most needed shuts off opportunity where needed. It penalizes periodical readers.

Repeal this law. Repeal this FIFTY TO NINE HUNDRED PER CENT periodical postage increase. Sign the petition below and mail it. Put a cross mark in the square—save the periodicals and the work that they have done and are doing for national education and patriotism.

SIGN BELOW.

CUT OUT. MAIL TO CHARLES JOHNSON POST, Room 1417, 200 FIFTH AVENUE, NEW YORK CITY

PETITION TO CONGRESS—Sign Here!

The spread of education, of culture, of scientific knowledge and advancement, and of our vast internal merchandising and manufacturing has been, and always is, vitally dependent upon the freest and cheapest circulation of periodicals. The penalties resulting from any restriction on the freest possible circulation of periodicals will be destructive of the best interests of our economic life and the opportunities of developing our best citizenship.

The postal amendment passed by the last Congress increasing the postage on periodicals from FIFTY TO NINE HUNDRED PER CENT will throttle or destroy our periodicals at a time when the widest and most extensive circulation of publications is essential to the patriotism, education, and upbuilding of our country.

Therefore, I the undersigned, do most earnestly demand the repeal of this burdensome periodical postage amendment.

Name.....

City or County.....

Street Address.....

State.....

Periodicals mean much in your life. If you will help by a few arguments with your acquaintances and an occasional letter in a spare moment, put a cross mark here.

Will you help in securing the repeal of this iniquitous law? ☐

CUT OUT. MAIL TO CHARLES JOHNSON POST, Room 1417, 200 FIFTH AVENUE, NEW YORK CITY

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"WHITNEY"
COTTER TYPE
TRANSMISSION CHAIN
For MOTOR TRUCKS and TRACTORS

Our years of experience in chain making combined with the care taken in the various processes of manufacture and our rigid system of inspection make "Whitney" Chains accurate, strong and reliable.



"Whitney" Chains are "doing their bit" on the battle fronts of Europe, where dependability is the all-important factor and where failure may spell disaster.

THE WHITNEY MFG. CO., Hartford, Conn.

Chains Keys and Cutters Hand Milling Machines

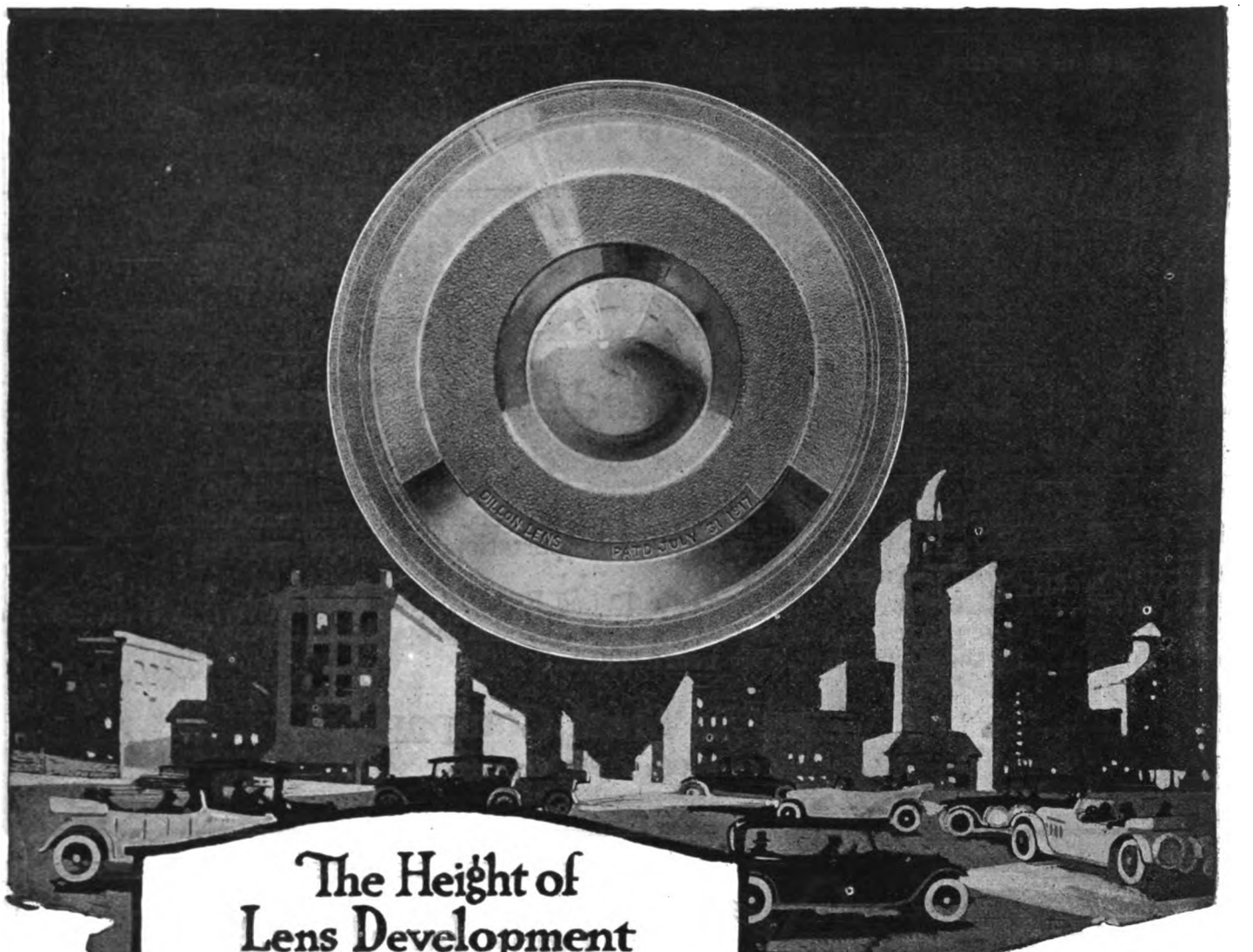
Are Your Needs *Similar?*

FIFTEEN Manufacturers have indicated to our CONTRACT WORK DEPARTMENT that they could use to advantage information as to where they could place the following lines of surplus manufacturing work:

Castings (steel, brass, bronze or aluminum)
Dies
Tool
Metal Stampings
Punch Press Work
Screw Machine Work
Machine Parts
Gear Cutting
Grinding
Cam Cutting
Bar and Clutch Work
Forgings
Drop Forgings
Lathe and Milling Machine Work
Patterns (wood & metal)
Plating
Automobile Stampings
and other lines.

In this connection you can consult with profit our ***Contract Work Department***, page 93 in this week's issue.

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The Height of Lens Development

THE Dillon Multi-Vision Lens marks a new era in lens performance. Not only is it a radical departure in design, but it is evolutionary in results.

The central bull's-eye, for instance, is an exclusive advantage of the Dillon. This bull's-eye has an important function—that of concentrating and magnifying the light on the road. This light is made glareless by the light from a carefully determined proportion of clear glass above the bull's-eye. The clear glass at the bottom provides the necessary front and side lighting.

The Dillon is the only lens made that gives you TWICE the lighted area, by projecting a SQUARE path of light. It is also the only lens made that projects entirely beyond the rim.

In no respect is the Dillon excelled and any of its chief features alone make it supreme in its field.

Write for literature, or send cash, check or money order, together with make and model of your car if you cannot obtain Dillon Lenses.

National Distributing Co.

Exclusive Distributors for the Dillon Multi-Vision Lens

Oliver Building,
Pittsburgh, Pa.

Dealers—

Get in touch with your jobber or write us at once. Liberal proposition, exclusive talking points, selling co-operation, national advertising—everything you need for success.

DILLON MULTI VISION LENS

$3.50 per pair

Any Size—Anywhere in U.S.A.

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Steel for Service

Speed Up Production

is the order everywhere in manufacturing plants engaged in making munitions or turning out other sinews of war.

Work in all industrial lines in any way connected with our national welfare is being carried on at high pressure. The utmost is demanded of men and of machines.

Machines equipped with gears made from

Carnegie Rolled Steel Blanks

are not likely to be idle due to broken gears. Even if a concern has a gear in its stockroom for replacement, losses will be considerable; if it has to go outside the factory it is dependent upon the product of a rushed plant and uncertain transportation, and losses may run into thousands of dollars.

Gears made from Carnegie Rolled Steel Blanks wear three to seven times as long as cast steel gears, and if properly heat treated by the gear cutter, they never break.

Carnegie Steel Company

General Offices: Pittsburgh, Pa.

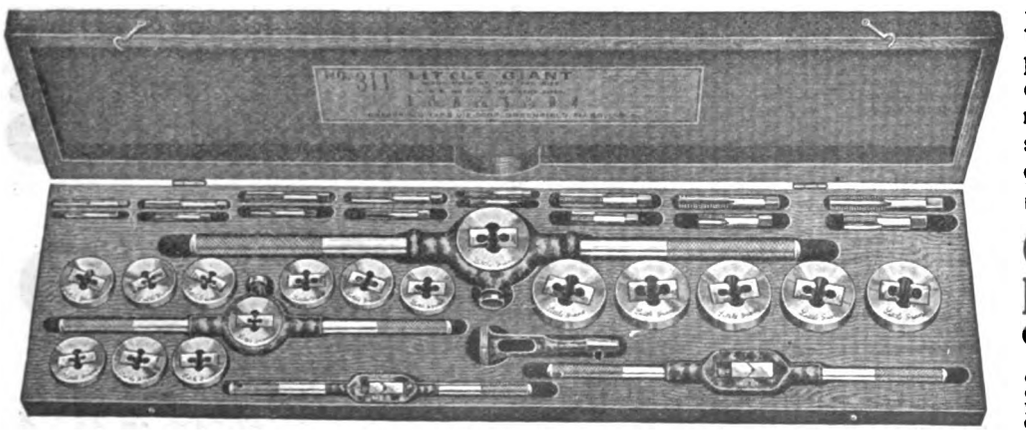
1001

REG. U.S. PAT. OFF.
GTD

Look for the GTD trade mark when you want the best Taps and Dies

Every garage and repair shop should be equipped with "LITTLE GIANT" Combination Screw Plates. Furnished both in U.S. and S.A.E. Standards.

Each die is contained in its own collet and adjusted to size. There is also a Bit Brace Die Holder for cleaning up battered threads in out-of-the-way places.



If you are a manufacturer, garage or repairman—or a car owner who makes his own repairs—you can be supplied from our big established line.

Write today for the No. 37 Catalog

Greenfield Tap & Die Corporation
Greenfield Mass.

New York, 28 Warren St.
Chicago, 13 S. Clinton St.
Canadian Factory: Wells Brothers Co. of Canada, Ltd., Galt, Ontario.

Please mention Automotive Industries when writing to Advertisers

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PARK-FORGED

COUNTER BALANCED CRANK SHAFTS

Patented July 10, 1917



Quick Get-a-way
Higher R. P. M.
Reduced vibration
Smoother running motor
Eliminated bearing troubles

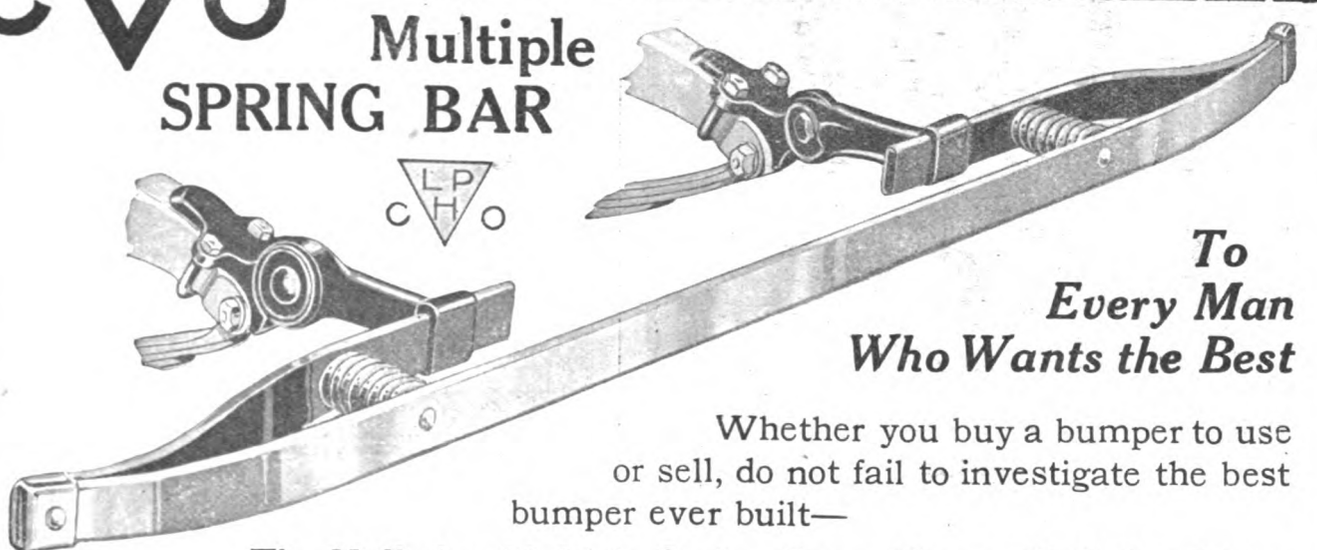
We have shipped 60,538 Counterbalanced Crankshafts to Feb. 15, 1918

The Park Drop Forge Co.
Cleveland

LPH CO

HALLADAY BUMPERS

Multiple SPRING BAR



To Every Man Who Wants the Best

Whether you buy a bumper to use or sell, do not fail to investigate the best bumper ever built—

The Halladay Multiple Spring Bar with any Halladay fitting

L. P. HALLADAY CO., Streator, Illinois

DISTRIBUTORS:

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NORMAN COWAN CO., 433-435 Rialto Bldg., San Francisco Cal., Pacific Coast Distributors.

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LADISH DROP FORGINGS

When you put your faith in the strength of LADISH Drop Forgings, and their dependability, you build on a foundation of rock.

The mass of factory and organization behind them passes on its strength and stability to the product.

We are equipped to handle any size orders for drop forgings, of either alloy or carbon steel.

Send us your blue-prints and receive our estimate on your requirements.

Ladish Drop Forge Co.
Cudahy Wisconsin
(Suburb of Milwaukee)



CONSERVATION

Get the full output of your engine, develop its maximum power and don't contribute to the waste of gasoline.

Avoid inefficient, weak ignition systems which cause waste; Bosch Magneto Ignition is effective, reliable ignition.

Correspondence Invited.

BOSCH MAGNETO CO., 220 W. 46th St., New York
Chicago San Francisco Detroit
Service Stations in Every State



WIRE WHEELS

HOUK TYPE
for 150 makes of cars. Write for full information and prices on wire wheels for any make or model of car.

DEALERS!

Wire Wheels are *sellers!* Get particulars of wire wheel service and sales agent's propositions.

Ford distributors and accessory dealers should write for special service and sales proposition for HOUSE type Wire Wheels for *Ford* cars.

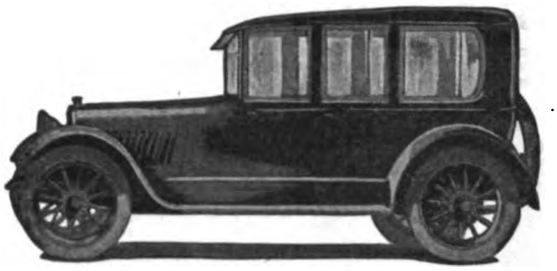
Wire Wheel Corporation *of* America
(Successors to Houk Mfg. Co.)
835 Eleventh Ave., at 57th St., New York



HOUSE TYPE for Fords

List price for set of 5 wire wheels, 4 inner hubs, 4 hub caps, hub cap wrench, spoke nipple wrench, 1 hub dust cover for spare wheel, $50. White, black, red. Color optional.

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Save Money Without Sacrificing Appearance

In this time of nation-wide economy, are you finding ways of cutting costs—and still retain quality? One item of saving—and it's no inconsiderable part of motor equipment either—is

GLASS

We have a mighty acceptable substitute for polished plate; and whether you use it on closed cars, windshields, clock faces, oil gauges or what-not, you will find it optically perfect. It looks well, too—and of course it's very moderately priced.

Write us your requirements, and let us tell you why this glass will serve your needs so well, why it costs less—and all about it.

AMERICAN WINDOW GLASS CO.

World's Largest Producer

General Offices, Farmers' Bank Building
Pittsburgh, Pa., U. S. A.

THE SCHATZ "UNIVERSAL" Annular Ball Bearing



Materials of the Highest Possible Quality

Workmanship Which Establishes a New Standard

"The Super-Bearing"

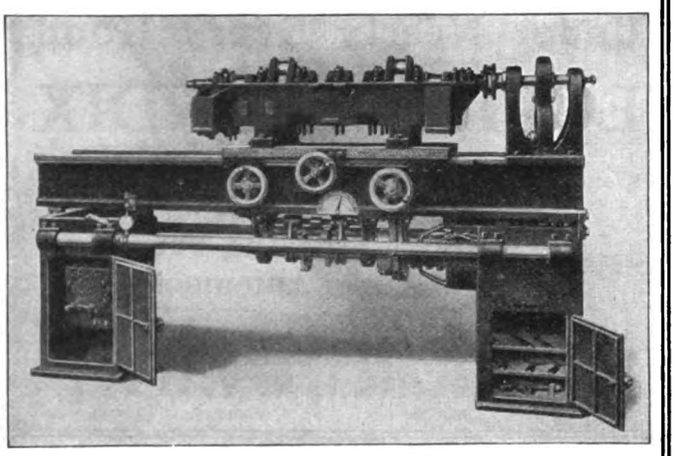
Three Area Contact
High Thrust Capacity
Unimpaired Annular Efficiency
Matchless Safety
An International Triumph



Internationally Standardized

Catalog for Engineers

THE FEDERAL BEARINGS CO. INC.
26 WILLIAM ST. POUGHKEEPSIE N.Y.



four men in a corner

Four men, with one Carwen Dynamic Balancing Machine, a couple of cheap static-balancing fixtures, and a drill press, will do the work of 100 to 200 men using the forms of apparatus heretofore employed for balancing motor crankshafts.

That is for quantity production—say 100 crankshafts per 8-hour day.

One man, doing the entire job alone, will balance about 20 crankshafts a day, using the Carwen method.

No unusual skill is required. To break in a new operator takes but two or three hours.

Figure what the saving means on your production.

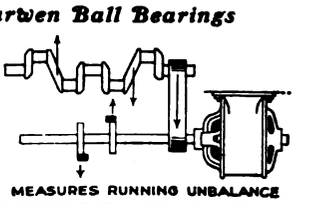
The Carlson-Wenstrom Co.

Erie Ave. at Richmond St.,
Philadelphia, Pa.

Makers also of Carwen Ball Bearings

We gladly demonstrate.

Have you received your copy of the booklet?



MEASURES RUNNING UNBALANCE

CARWEN

Dynamic Balancing Machine

(AKIMOFF PATENTS)

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Under Nearly Every Hood

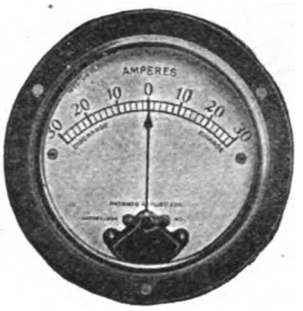
ECLIPSE-BENDIX DRIVE

Transmits Starting Power on 153 Makes of Automobiles

ECLIPSE MACHINE CO.
ELMIRA, N. Y.

Misinformation Worse Than None

The Ammeter on your dash or cowl has only one purpose—to give you *accurate* information *all the time* regarding the condition of your electrical equipment.



Weston

Model 354 Ammeter

is built by the Company whose leadership in the manufacture of electrical indicating instruments is recognized the world over. Without qualification, it is superior in accuracy, durability, reliability, to any other Dashboard Ammeter. Better be sure yours is a Weston Ammeter. *Write for full information.*

Weston Electrical Instrument Co.
8 Weston Ave., Newark, N. J.
23 *Branch Offices in the Larger Cities*

Dyneto
REGISTERED TRADE MARK

Electric Starting and Lighting Systems

SINGLE UNIT and TWO UNIT Equipments

Booklet on Special Ford Equipment

DYNETO ELECTRIC CO., Syracuse, N. Y.

HAMILTON MULTOMETER



13 Accurate Records—measures individual mileage for four tires in service and two spare. Gasoline and oil consumption — car speed — trip mileage —season mileage — indicates necessary adjustments at end of each 500 and 1000 miles.

Made by the same men who make The Hamilton Watch, "The Railroad Time-Keeper of America."

The Hamilton Corporation, LANCASTER, PA., U. S. A.



STOP!

DETOUR to RIGHT

This sign can be seen perfectly with an E & J Spotlight No. 94, and the dangerous ditch that will upset you can also be avoided.

The E & J Spotlight has been approved by more drivers than any or all of the others.

See your source of supply or write the

Edmunds & Jones Corporation
437 Lawton Ave., Detroit, Mich.

MOTOR AGE

"THE CAR OWNER'S WEEKLY"

PUBLISHED AT CHICAGO.

Central location and frequent issue mean you get the news without delay.

The most popular weekly motoring magazine—devoted to the interests of the motor car owner and containing news of general interest alike to the dealer and the manufacturer.

If you are interested in new car and accessory descriptions, racing reports, touring data, and questions and answers that appeal to the motorist, subscribe to:

MOTOR AGE

Mallers Bldg. Chicago, Ill.

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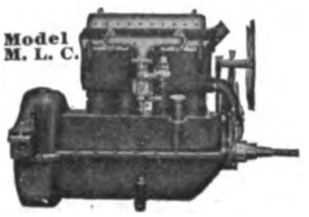




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"THE MASTER MOTOR"

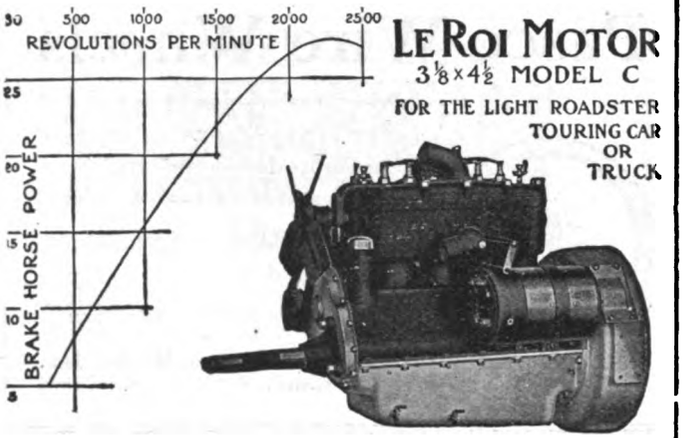
There are BEAVER motors in a variety of sizes, suitable for TRUCKS, TRACTORS and PLEASURE CARS. Several new sizes for 1918 have been brought out and tested this summer. It will be worth your while to write us for full information on our line.



4-Cylinder—4-Cycle

BEAVER MFG. CO.

Milwaukee Wisconsin



LE ROI MOTOR

3⅛×4½ MODEL C

FOR THE LIGHT ROADSTER TOURING CAR OR TRUCK

Used by leading manufacturers of best-known American-made light trucks.

The business of manufacturing Le Roi Engines, formerly conducted by Milwaukee Machine Tool Co., is now carried on by

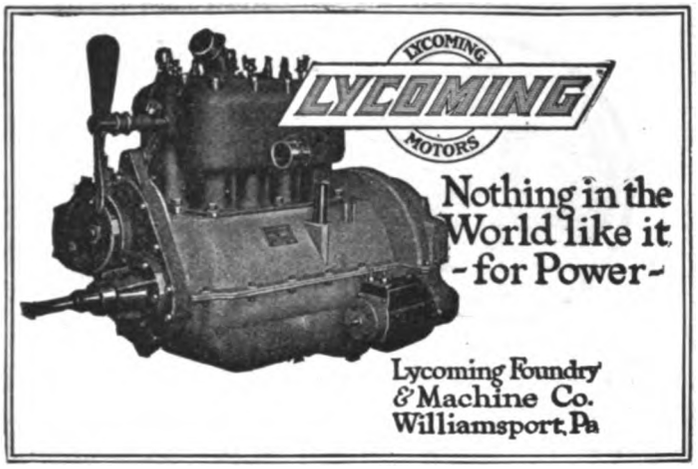
LE ROI COMPANY

Mitchell St. and 60th Ave.

MILWAUKEE, WIS.

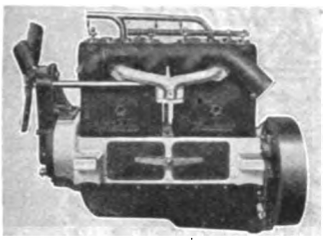
Write for Complete Information

CABLE LE ROI MILWAUKEE



Nothing in the World like it -for Power-

Lycoming Foundry & Machine Co. Williamsport, Pa



Waukesha

4-CYLINDER MOTORS

For Trucks and Tractors

Sizes 3¾ x 5¼ to 4¾ x 6¾

WAUKESHA MOTOR CO.

WAUKESHA, WIS.



PERFORMANCE

That's what the truck prospect is interested in most of all. If he knows your truck is powered with a Wisconsin Consistent Motor, a big step has been made in its sale. Wisconsin Motors are champions of the world on road and speedway—why not link their reputation to your product?

Write for specifications of different types and sizes.

WISCONSIN MOTOR MFG. CO.

Station A, Dept. 310 Milwaukee, Wis.

DISTRIBUTORS:

New York Branch: 21 Park Row, T. M. Fenner, Factory Rep. Pacific Coast Distributor: Earl P. Cooper Co., 1428 Bush St., San Francisco, Cal., and 1310 S. Los Angeles St., Los Angeles, Cal.



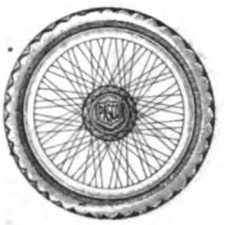
America's Standard

Continental Motors

Detroit Michigan

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Pasco Wire Wheels



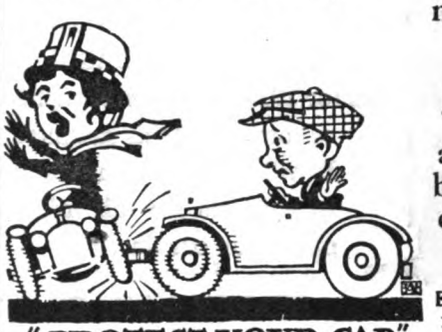
have three exclusive patented features which give a stronger web, a more dependable Hub Cap, and a greater factor of safety.

Pasco stands for strength, safety, economy and beauty.

Dealers write for proposition

National Wire Wheel Works, Inc.
Geneva, N. Y., U. S. A.

It parries the blow,— and what's more, the



Hartford BUMP ABSORBER —more than a Bumper

absorbs the bump, prevents damage and expense.

"PROTECT YOUR CAR"

Edward V. Hartford, Inc.
144 Morgan Street
JERSEY CITY, N. J.

The Tireless Lubricant

TRADE MARK REGISTERED IN UNITED STATES PATENT OFFICE
NON-FLUID OIL

is always on the job; starts lubricating the instant your car moves—unlike grease which must first be softened by frictional heat.

Every particle of NON-FLUID OIL in bearing or gear lubricates until entirely consumed. Does not melt and leak out nor harden and permit gears to channel through it.

Use "K-00 special" grade for gears; "K-000" for bearings.

Your dealer has it in the orange can with trade mark as above.

Send for a copy of "Lubrication of the Motor Car."

The New York & New Jersey Lubricant Co.
165 Broadway, N. Y. City

The Original Double Arm SHOCK ABSORBER W&C For FORD CARS

SAY W&C

to your dealer.

He knows the only shock absorber for Fords that does more than you expect.

Dealers: Write for territory.

P. H. WEBBER & COMPANY
HOOPESTON, ILLINOIS

Sexton's

CASTOR MOTOR OIL

Keeps your motor young with a perfect film of oil around *all* working parts.
Greater viscosity—perfect heat resistance—two to three times more mileage—

At your dealer's

Send for Booklet A-108

SEXTON OIL CO., North Chicago, Ill.

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The MATERIAL for SHIMS

Extract from Military Truck Specifications

"The main and connecting-rod bearings shall be provided with laminated metallic shims, made up of sheets of equal thickness. The shim sheets shall be not more than 0.002 in. thick."

Laminated Shim Co
533-541 CANAL ST.
NEW YORK



CHASE Leatherwove
'Tis like the hide in most respects In some respects 'tis better

The long-wearing, rich-appearing motor-car upholstery that can be used to better advantage than genuine leather.

L. C. CHASE & CO., BOSTON
NEW YORK DETROIT CHICAGO
Leaders in Manufacturing Since 1847

SPEED POWER

Standard Equipment on
Packard
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Pathfinder
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The GUARDED Opening
BURD High Compression Rings

BURD HIGH COMPRESSION RING CO.
Rockford, Illinois

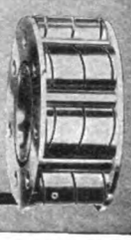
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VULCAN QUALITY
AUTOMOBILE SPRINGS
SPRINGS IN STOCK FOR ALL CARS
90,000 Springs. 588 Types.
6—FACTORY BRANCHES—6
St. Louis, Mo. 1402 Chestnut St. Minneapolis, Minn. 1024 Hennepin Ave.
Reading, Pa. 533 Franklin St. Ft. Worth, Tex. 708 Commerce St.
Sumter, S. C. 29 Caldwell St. Richmond, Ind. Colonial Bldg.
FACTORY RICHMOND, IND.
JENKINS VULCAN SPRING CO.

Cored Bars
HIGH SPEED
NON-GRAN
BEARING BRONZE
For Bushings
AMERICAN BRONZE CORPORATION
BERWYN, PENNSYLVANIA
Sole Manufacturers of Non-Gran and Largest Exclusive Manufacturers of Bearing Bronze in the World


BALL THRUST BEARINGS
RETAINERS FOR CUP AND CONE, THRUST AND MAGNETO TYPE BALL BEARINGS.
Western Office, FORD BLDG., DETROIT
THE BEARINGS COMPANY OF AMERICA LANCASTER, PA.


HYATT QUIET BEARINGS
Hyatt Quiet Bearings are appreciated by everyone who drives a closed-car.




This Illustration Shows WHY Hoover Steel Balls are recognized throughout the world as the finest in construction. The Hoover chrome steel, hard surface, tough center ball, provides for steel contraction and expansion and allows for fatigue in service. Breakage is eliminated. In five years, with millions of Hoover steel balls in service, there has not been a single report of breakage. That a majority of mechanical engineers recognize the scientific correctness of Hoover Steel Balls is proved by the fact that 95 per cent. of all motor cars are Hoover equipped.
HOOVER STEEL BALL CO., Ann Arbor, Mich.
HOOVER
Steel Balls

NEW DEPARTURE
BALL BEARINGS

Strength
Stamina
Service

The New Departure Manufacturing Co., Bristol, Conn.
Conrad Patent Licensee


Long Life Bushings In Spite of Neglect
Oil-less
"NIGRUM" (Impregnated Wood)
"BOUND BROOK" (Graphite-and-Bronze)
Bushings
Trade Mark Reg. U. S. Pat. Off.
All genuine Graphited Oil-less Bushings have always been made at Bound Brook, U. S. A.
BOUND BROOK OIL-LESS BEARING CO.
Bound Brook New Jersey
Specialists in the manufacture of Oil-less Bushings for more than a third of a Century


SKF
BALL BEARINGS
See our advertisement in February 14, 1918

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Kales Stampings

Let us figure on your
SHEET METAL STAMPINGS
We have the plant and the equipment and we know how. Send us your blueprints. Sent for our list of Special Washer Dies.

KALES STAMPING COMPANY
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LIGHT AND HEAVY METAL
STAMPING



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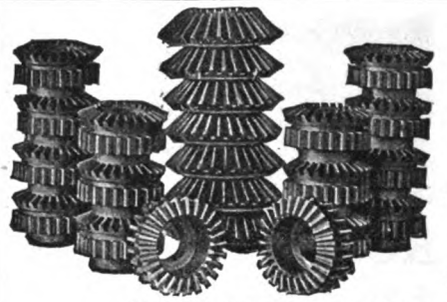
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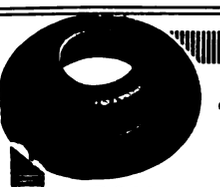
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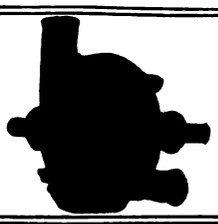
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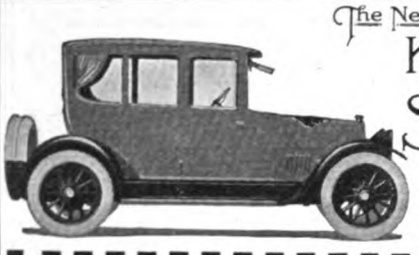
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CLEARING HOUSE

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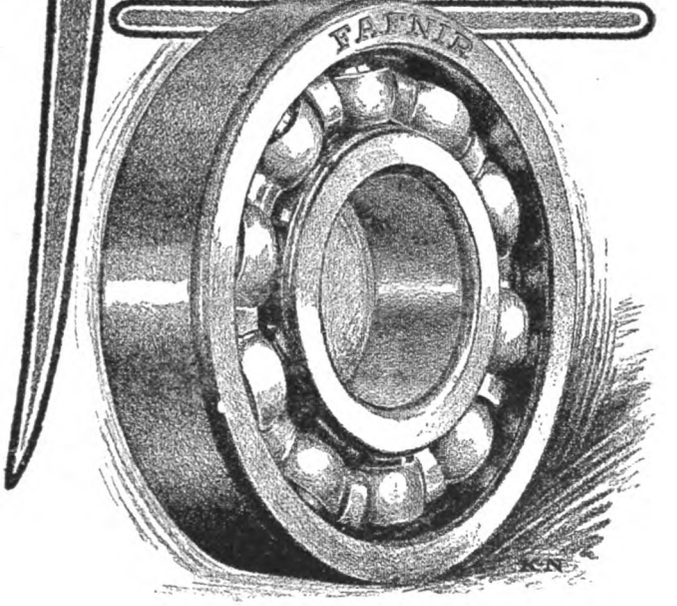
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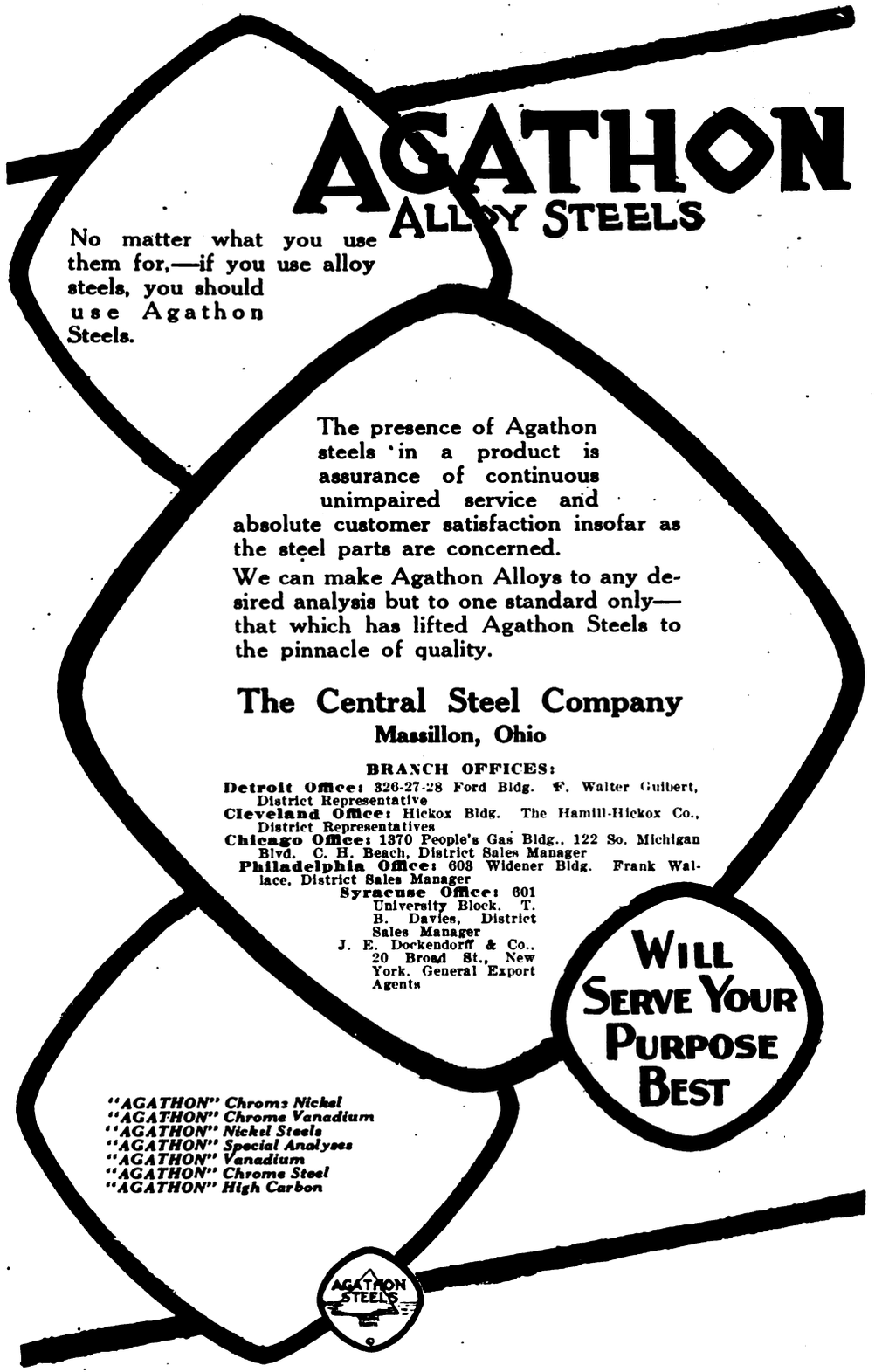
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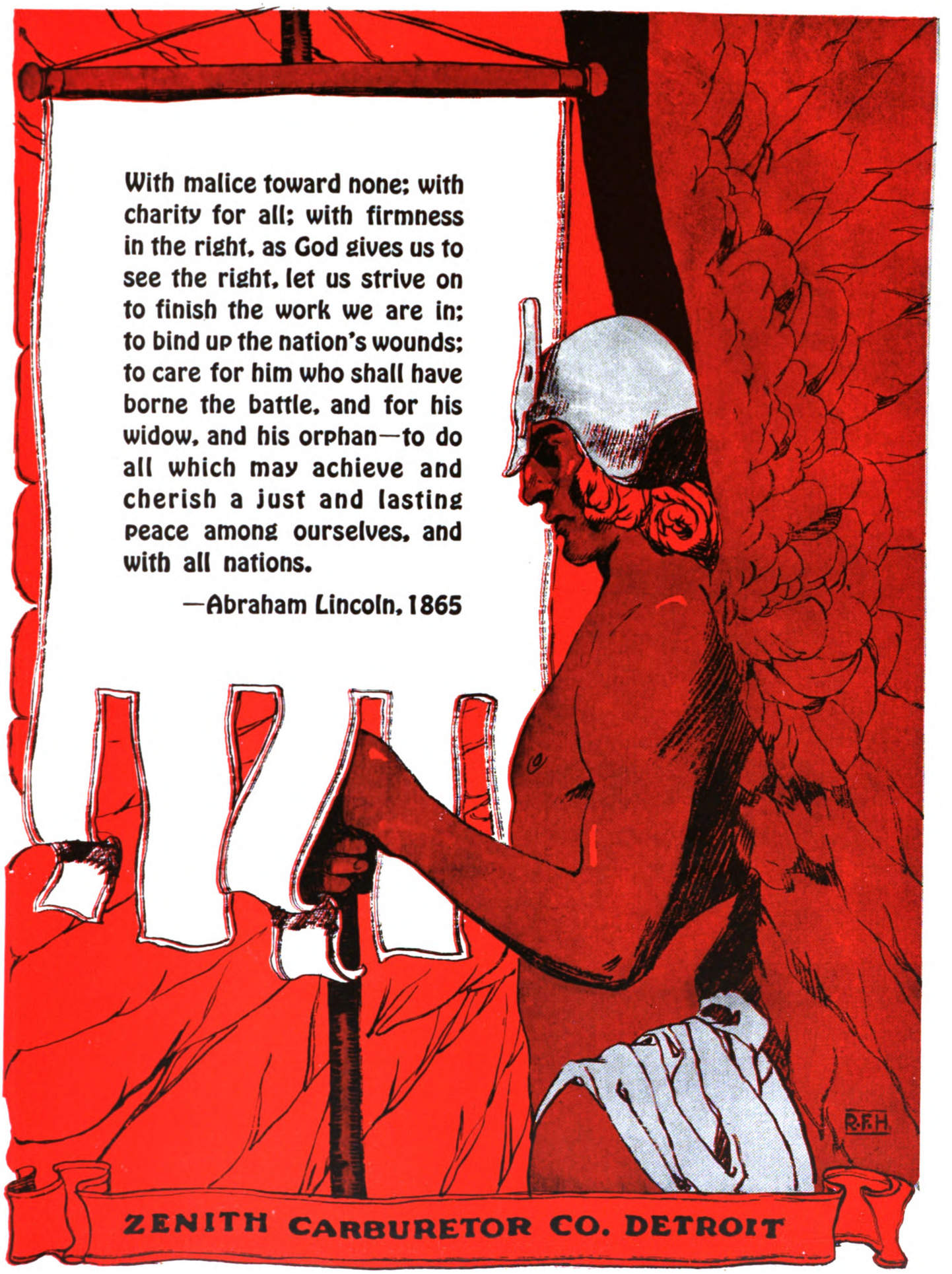


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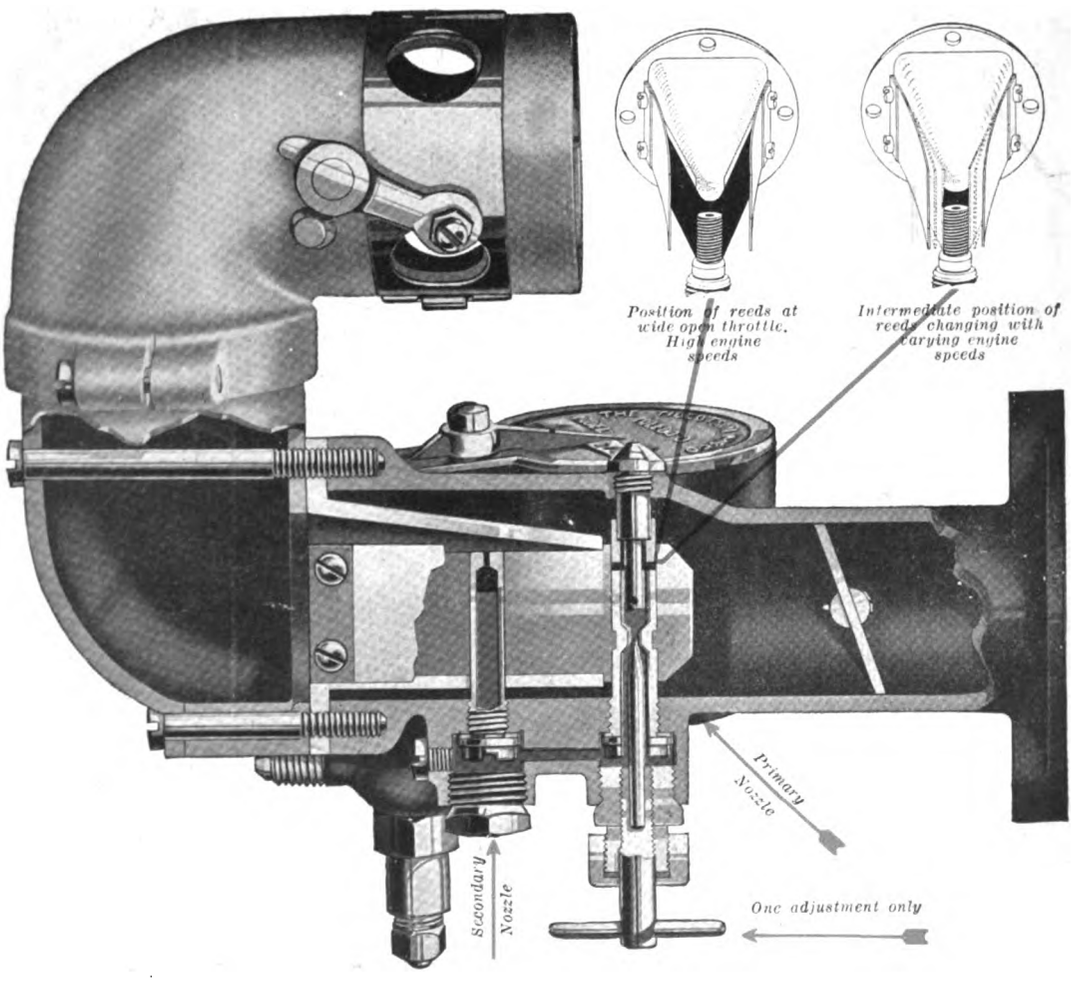
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Toledo Ohio



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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Vol. XXXVIII
No. 9

NEW YORK, FEBRUARY 28, 1918

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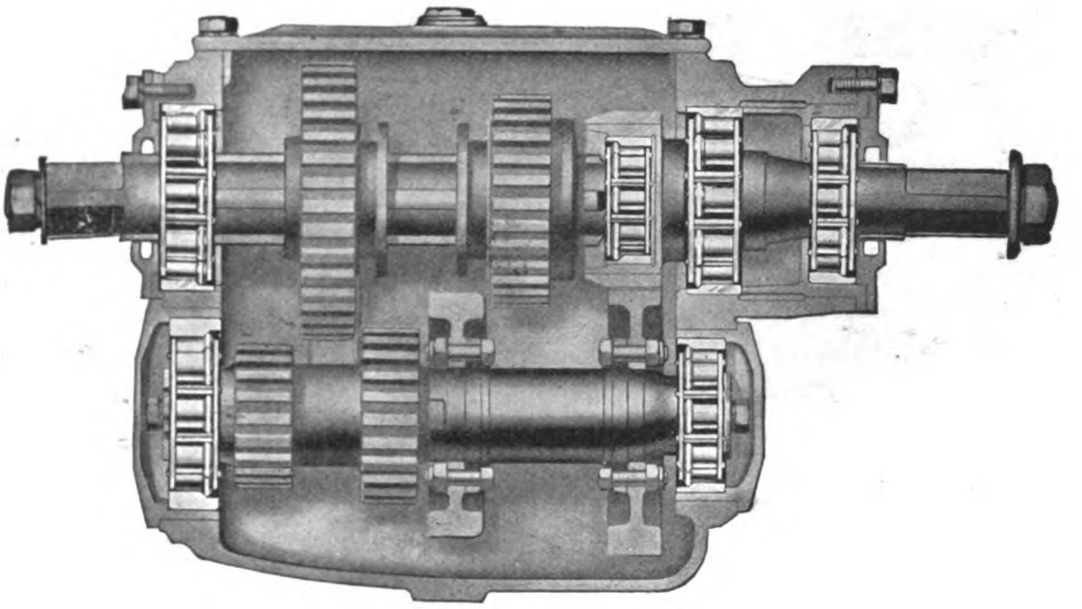
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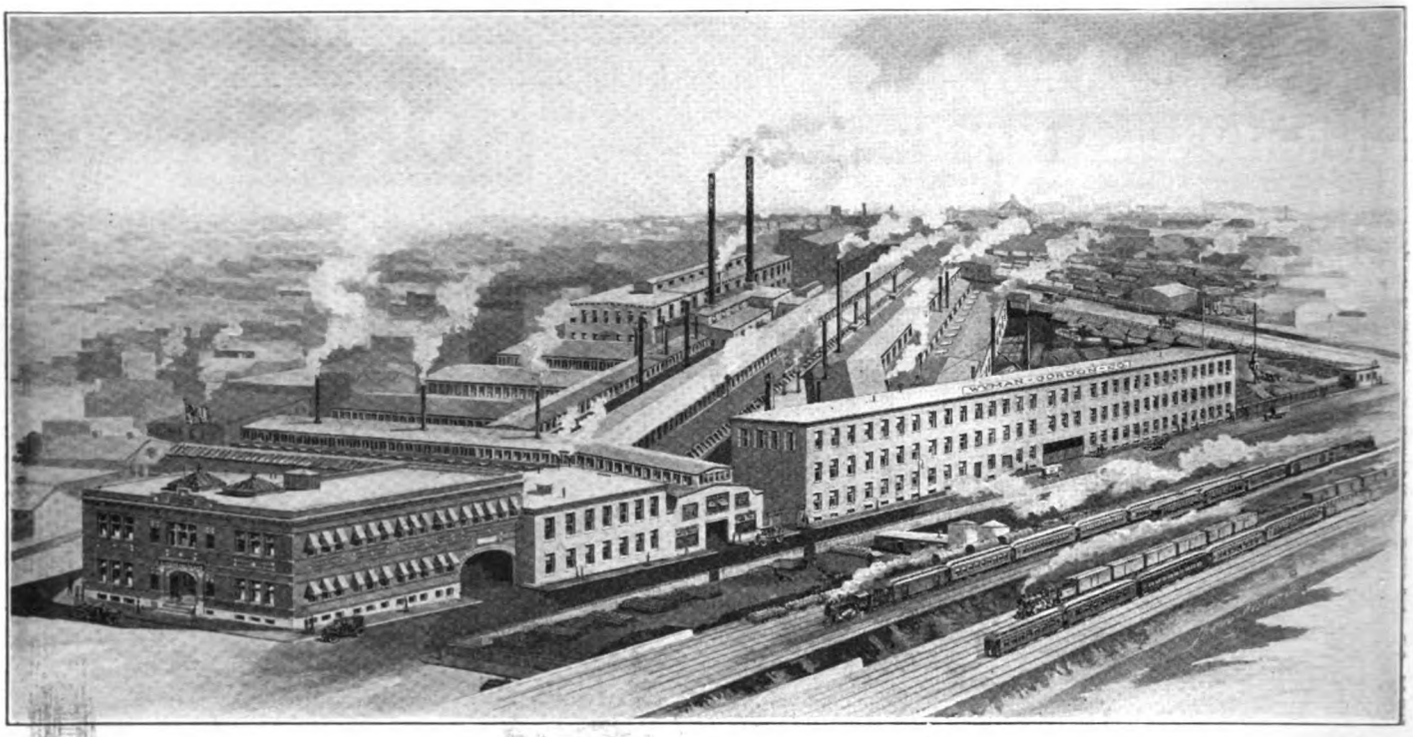
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AUTOMOTIVE INDUSTRIES
THE AUTOMOBILE
THE CLASS JOURNAL COMPANY
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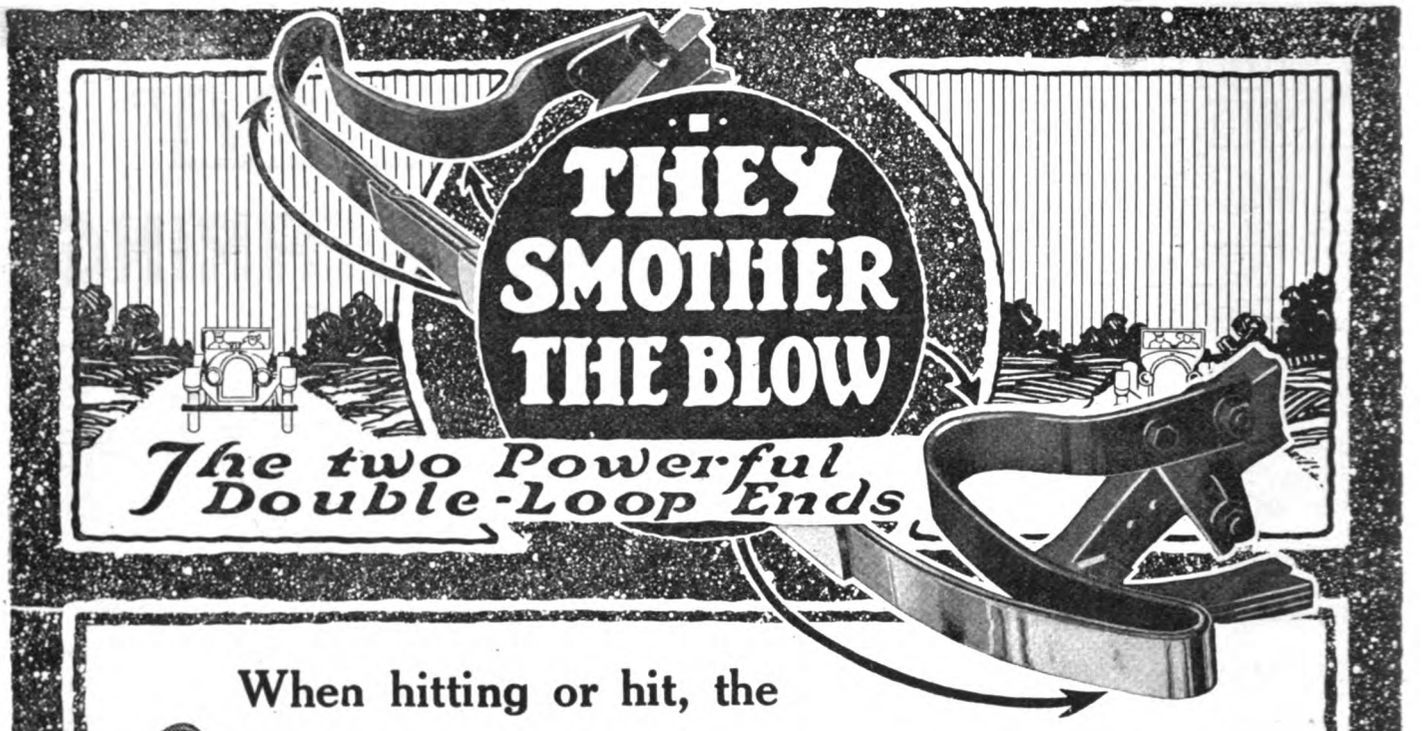
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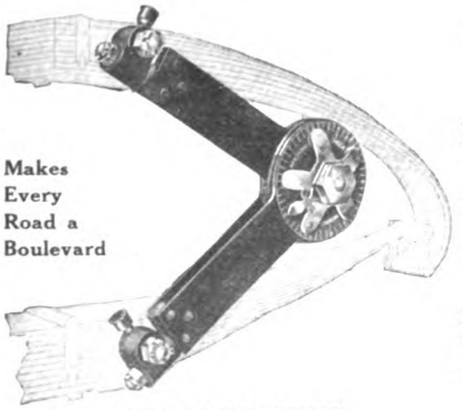
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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XXXVIII NEW YORK—THURSDAY, FEBRUARY 28, 1918—CHICAGO No. 9

New Methods of Chassis Lubrication

Designs for Minimizing Attention and Increasing Life of Parts—Advantages and Disadvantages of Oil and Grease Lubrication—Oil-less Bushings—Direct Feed and Wick Feed Systems

By Cornelius T. Myers

WHEN we speak of chassis lubrication we refer to the lubrication of such minor parts of an automobile as spring bolts, brake connections, universal joints, radius rod connections, steering rod joints, etc., which form connecting links between the more important units of the chassis. Lack of proper lubrication at these points is not immediately evident in the performance of a motor vehicle, whereas lack of lubrication in the engine, gearbox or axles makes itself felt in a very short time; hence, comparatively little attention has been paid to the lubrication of chassis parts and their durability and efficiency have suffered.

These parts also are in more or less inaccessible locations, as a rule, and the importance of their proper lubrication has been lost sight of. Rightly, the lubrication of these parts should have been more carefully considered, in the light of the important function performed by them, and especially on account of their comparative inaccessibility. Wear at these points is almost always due to improper or insufficient lubrication, and this wear is responsible for squeaks, rattles, emphasized vibration, and break-down to an extent only appreciated by an experienced garageman. The summation of small amounts of wear in many parts accounts for many chassis troubles, quite a few of which have been wrongly interpreted in the past. Major parts of the complete machine have been called upon to work under improper conditions and their design often has been adversely affected by these conditions.

Important Units Receive Attention

In gearboxes we have an instance of careful thought for lubrication in an inaccessible position. The details have been carefully worked out so that, under ordinary conditions, one filling with moderately heavy oil per year will suffice for satisfactory service. The same comment applies to rear axles, so far as the lubrication of parts in the housing is concerned. The general plan in these two instances is that of retention of lubricant and exclusion of dirt, to which method the design and operation of these parts lend themselves.

The lubrication of engines has been given careful and constant attention until very reliable systems have been developed. These systems are all based upon a continuous wastage of lubricant and the partial exclusion—partial removal—of foreign matter. It is upon this principle that the lubrication of most chassis parts must be handled, involving more or less continuous flow of lubricant. The more continuous this flow when the vehicle is being operated, the more efficiently will the bearing surfaces be lubricated, other things being equal. This being the case, care must be exercised to see that dirt or other non-lubricating matter is not picked up and led to the bearing surfaces.

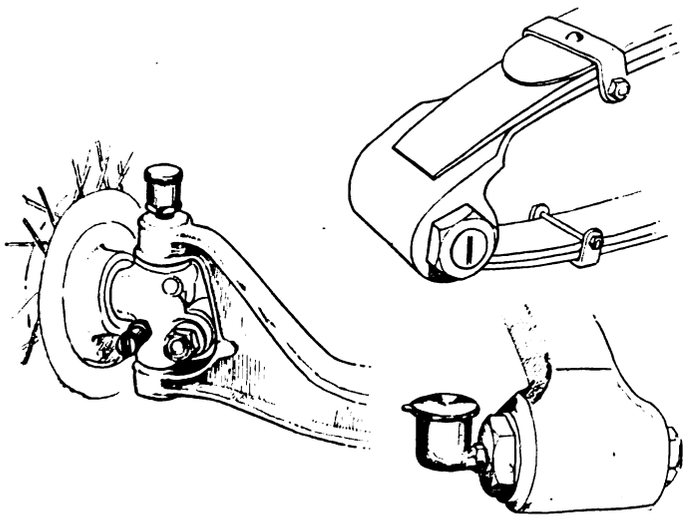
Choice of Lubricant for Chassis Parts

The most important consideration in the design of the chassis lubrication devices is the choice of lubricant. Shall grease or oil be used? Each has advantages and drawbacks.

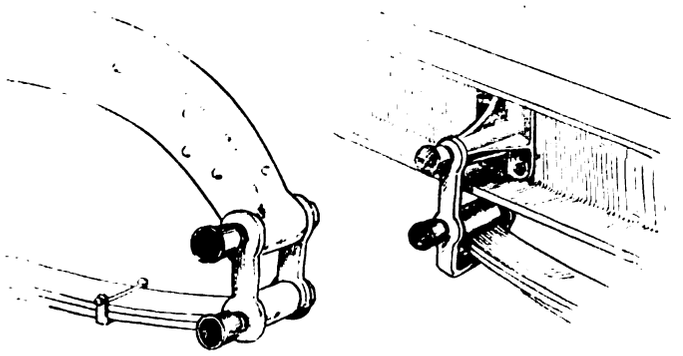
Grease is stiff enough, as a rule, to be more cleanly than oil and not flow over painted surfaces near the grease cups. It lends itself to compact and simple design of cups integral with spring bolts, and its firmness allows grease cups to be set at an angle or even in an inverted position, which is often very convenient where holes for the cups must be tapped in restricted locations. Some claim that grease will support heavier bearing loads, but the difference is probably more apparent than real. Grease can be forced by hand screws from the cups to the various surfaces. In hot weather the heavier greases are possibly more cleanly to handle than oil with the ordinary chassis fittings.

On the other hand, grease must stand under heavy in-

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Upper right-hand corner—Oil spring bolts on Franklin car, filled with waste. Below—Oil cups on steering knuckle and spring bolts of Premier



Oil cups with spring-retained caps on spring bolts of new Nash car

dictments. It is a splendid dirt carrier, and the methods of handling it expose it to dirt at every turn. We are all familiar with the open grease pail in garages, and with the dirty grease paddle which is scraped over the edge of the pail. We all know of dirty fingers lending their share to the contents of the refilled grease cup, which often catches no small portion of the dirt accumulated on the outside edges of the cup or its stud.

Another important consideration in the use of grease is that most greases are full of inert matter, which makes them more or less stiff and heavy, but which has a negative qualification as a lubricant. The heavy body of most greases is commonly thought to give them greater capacity for maintaining a lubricating film between the wearing surfaces, but this is not so, for in almost every case the stiffer the grease the poorer its lubricating value and its load-sustaining qualities, the inert filler acting as much in the nature of an abrasive as a lubricant.

Grease does not readily spread itself in a film over the wearing surfaces, especially if it is applied when they are loaded or when cold. This offsets the apparent advantage of being able to force grease out of the cups, for it often juts out at the opposite end of a bearing without actually spreading over that bearing, the appearance of the grease being a misleading sign that the bearing is properly lubricated. If all parts of a bearinng are not lubricated the dry parts will soon accumulate dirt or inert matter and start a cutting action.

When very cold it is almost impossible to force grease through small drilled holes and channels. It is therefore difficult to know when a grease-filled bearing is even getting the lubrication designed for it.

Grease on painted surfaces is hard to remove in washing a car.

Oil the Best Lubricant

Oil, as a lubricant, has great advantages over grease, but it is not always as cleanly and its proper application to chassis bearings has required more painstaking design than has usually been given to it. These things have militated against its use, especially on passenger cars, but the advantages that follow are appealing more and more to designers and to users.

Oil will maintain as heavy a bearing load as grease, and with less friction.

Oil fed to one properly located point in a bearing will soon spread over the entire bearing surface.

Oil will flow through a very small hole, and it can be conducted a considerable distance by means of capillary attraction and surface tension.

Oil will carry much less dirt than grease, and it is not nearly so much exposed to dirt when in bulk or when being applied.

Oil contains no inert matter to clog holes and channels.

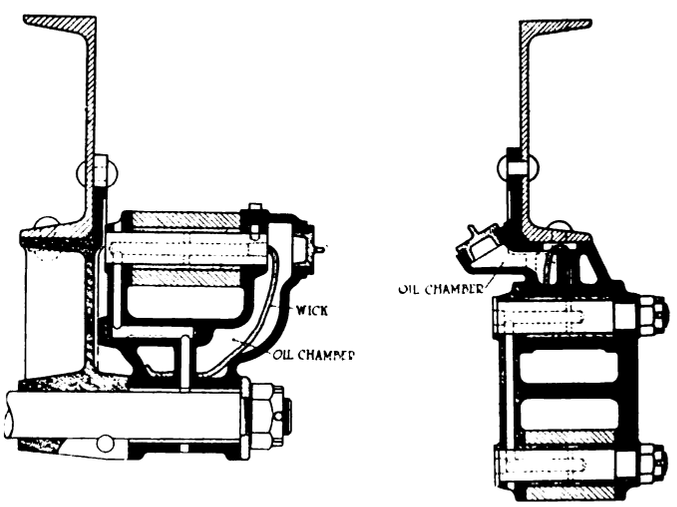
The oil used in the engine can be used in the chassis oilers, eliminating the necessity for carrying two kinds of lubricant.

Oil is more easily applied than grease.

A flow of clean oil tends to clear a bearing of any dirt which it may contain, and a bearing arranged for oil lubrication can be flushed and cleaned with gasoline or kerosene.

Oil for Chassis Lubrication

Up to a few years ago grease was almost universally used for chassis lubrication. In 1912 the writer had oil cups installed on some of the GMC trucks, and in 1913 designed and built an experimental truck on which oil was used at almost every point. This truck is still operating on the original pins and bushings, which show only a trace of wear. More recently we have seen a slow but steady increase in the use of oil, which seems now to have gained a very fair headway on both trucks and passenger cars. The severe service to which motor trucks have been put has proven the advantages of oil over grease, and it is in truck design that the greatest progress has been made in the use of oil. The court of last resort on the reliability, and hence the desirability of almost all features of chassis design, is the repair shop—our service stations and garages. It is here in particular that lubrication failures are noticed and the most reliable



Magazine wick feed shackle and shackle bracket as used on Fageol truck

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evidence secured. The most notable instance of passenger car chassis lubrication with oil was the outcome of extensive garage experience.

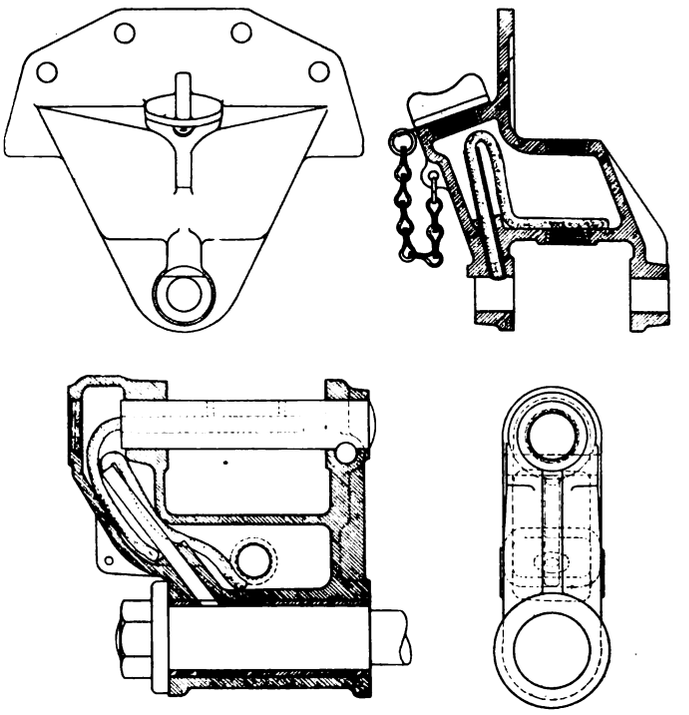
In the past 3 years so-called oil-less bushings of various composition have come into considerable use for spring bolts, pedal shafts, brake shafts, etc. Some are made of hardwood impregnated with lubricant, some of brass or bronze with inserts of graphite or other lubricant, some of a lubricant impregnated woven material, resembling brake lining, fitted inside a steel shell which holds it in shape. When properly selected and applied they have in most instances been quite serviceable, and showed a notable improvement at points which have heretofore not had much, if any, lubrication, because they have been difficult to reach.

The writer considers these bushings in the light of a palliative and not a solution of the problem of lubricating such points, because they contain a very limited amount of lubricant which must suffice for the life of the bushing. These oil-less bushings are well adapted to eyes in levers and rods which usually get no lubrication at all, such as the eyes in clutch throw-out levers, brake levers, etc. A better way of lubricating these points, however, is to arrange that the drip or seepage from other bearings is led to them.

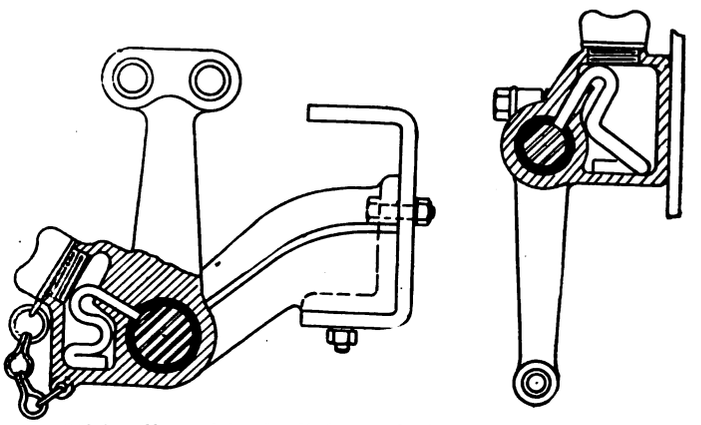
That oil lubrication of many chassis parts has been adopted by quite a number of well-known builders shows that experience is being heeded, and attempts to improve reliability are being made. As *reliability* is the large word in all automotive design we can expect further improvement in details for the use of oil.

This brings us to the consideration of the methods to be used in handling oil as a chassis lubricant. There are two general methods: 1—Direct feed. 2—Wick feed.

1—The direct feed method can be divided into two systems: *a*—The individual point; *b*—The central supply.



Above—Front spring front bracket of Class B war truck, showing chain-held filler plug and pipe for wick. Below—Rear spring rear shackle on Class B war truck, showing separate feeds for spring bolt and shackle bushing



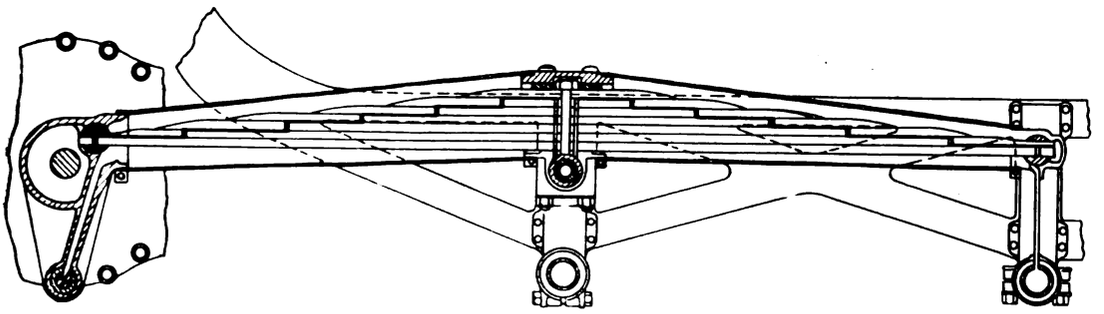
Wick oiling of brake linkage shafts on Class B war truck

Individual Feed System

The individual point system consists of small oil cups applied in the place of grease cups, with the necessary modifications to insure gravity feed. This is crude and open to the objections that dirt can enter the bearing with the oil, that but a small amount of oil is carried at each point, and that the oil is quickly drawn from the cup. This means that frequent attention (almost daily) is necessary, oil is wasted, and it sometimes drips and makes the neighboring parts somewhat unsightly.

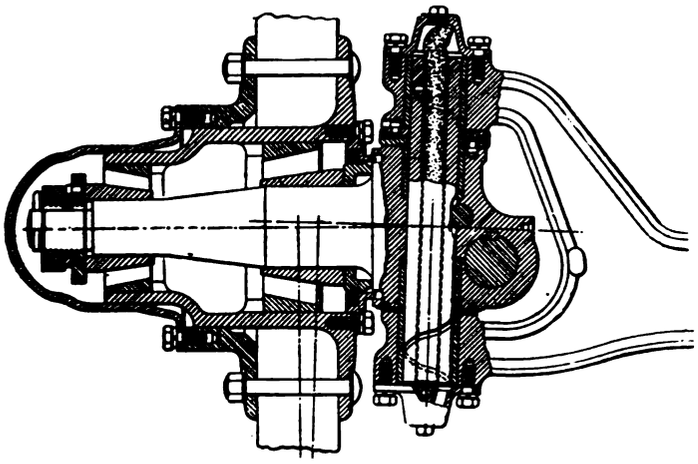
Various types of oil cups have been used to minimize the outflow of the oil they contain. Those most popular are small brass cups, ⅛ in. pipe tap size, with a snap lid, and which contain a thimbleful of wool or cotton waste held in by a wire screen. Any such cup, however, is objectionable because it can be, and often is, easily knocked off, leaving the shank jammed in the tapped hole. They are so small that the loss of one sometimes goes unnoticed for some time, and then replacement is delayed because the machine seems to run all right without it. In this system the brackets for pedal shafts, rocker shafts, etc., are simply drilled and countersunk to receive a drop or so of oil from a squirt can when the spirit moves the man in charge to be over-curious and discover them.

The only instance of the central supply system is that embodied in the Fergus car. In this chassis oil is led from the motor by pipes to four central supply points—the fulcrum pins of the cantilever springs—and from these

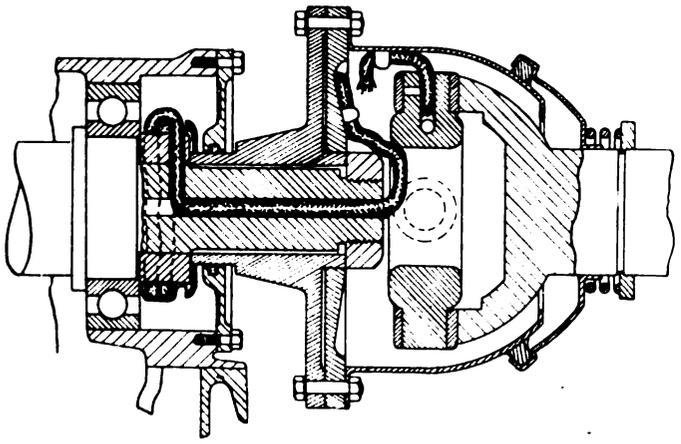


Fergus cantilever spring enclosed in a leather boot and provided with oil channels for a regular system of oil circulation

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Wick lubrication of knuckle pin bearings on Class B war truck



Myers' system of wick lubrication for universal joints

is distributed to springs, spring bolts, steering and brake connections and levers. Only a few of these cars have been placed on the market, and the system has not been adapted to any other car, so far as the writer is aware. This is possibly due to the fact that it does not lend itself readily to our more or less standardized chassis design. The oil, being supplied by a pressure from the engine, is liable to a considerable loss due to leak or breakage, with consequent danger of exhausting the supply in the engine and the nuisance of a considerable flood of oil. The system, however, courts development.

Feeding Oil by Capillary Attraction

The wick feed method can also be divided into two systems at present, viz.—the individual point and the magazine feed, which latter is really a development of the former.

The individual point system was first used by the writer in 1913 (on the truck to which reference has been made) and consisted of small wick oilers applied in place of grease cups, certain of the chassis parts being designed to lend themselves to this kind of lubrication. The results obtained were so satisfactory that the writer became a firm advocate of oil for chassis lubrication. From 1914 to the present we have seen more and more use made of this system, which is quite effective. The wicks feed oil slowly but speedily when the machine is in motion, and the oil supply is conserved so as to last much longer than with the direct feed cups. The large number of points to be oiled, however, make it likely that some will be overlooked; and the small wick oilers are open to the same objections as the direct feed oilers—they get damaged or lost and are not often replaced promptly.

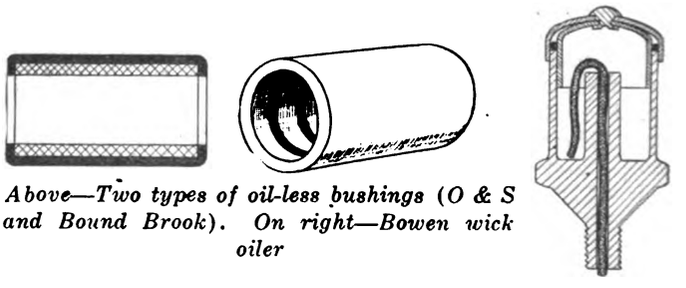
In 1915 the writer conceived the idea of improving the chassis lubrication by a magazine system using oil carried so as to require a minimum of attention, both as to the number of points and the number of fillings; which would feed clean oil as needed to the bearing surfaces; and which would not be liable to damage under careless handling. The first opportunity for carrying this out came in 1916, when it was incorporated in the design of the Fageol line of motor trucks.

Magazine System for Oiling Chassis Parts

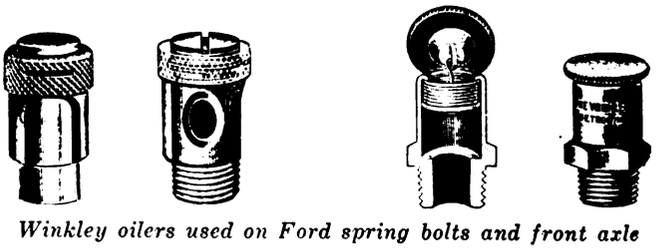
The main feature of this magazine system was a series of hollow brackets and shackles for the spring bolts and rocker shafts. These brackets held oil which was wick fed to the various bearing surfaces by capillary attraction, there being no direct gravity feed. Felt wicks about ¼ in. in diameter, dipping to the bottom of the pockets, carried the oil to the top of the pockets and then through drilled passages to the bearing surfaces. In some cases after reaching the initial bearing the oil flowed to another nearby and then to the springs, which were kept from rusting and from stiffening. The rear spring shackles are hollow and contain oil fed by wicks to the spring bolts and to the shackle bar. The pins of the front shackle are fed in series from the bracket above. The knuckle pins and the steering connections on the front axle were designed to take large steel oil cups with wick feed. The cored brackets hold oil enough to last from 6 weeks to 2 months; the supply in the cups will last about half as long. The brackets are closed by large pipe plugs, the cups by swivel caps with registering holes near the wall of cups.

The scheme was further developed in the Class B war truck, where the brake levers and brackets, shackles and shackle brackets are cored and the oil is wick-fed to the bearing surfaces. The filling holes are closed with large wing plugs permanently attached by chains to prevent loss. The knuckle pins in the front axle are oil lubricated by wicks leading oil from wells at the bottom of the pins up through the pins themselves, and fed to the bushings and thrust washers.

The method of lubrication has many advantages. It requires almost no attention—once a week for the cups and once a month for the brackets at the most. There are but very few oil cups, they are not exposed to damage, and the cups are large (¼ in. or ⅜ in. pipe tap) and strong. They are well protected, as they are only used on steering connections, rear axle brake camshafts, steering gear, pedal shafts, etc., which points are not exposed to collision. Dirt cannot enter bearings with

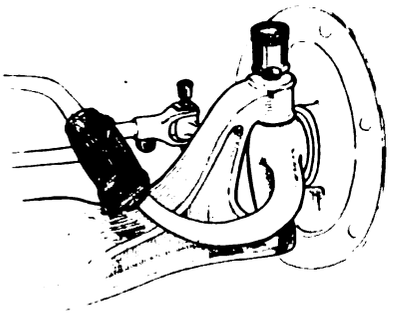


Above—Two types of oil-less bushings (O & S and Bound Brook). On right—Bowen wick oiler

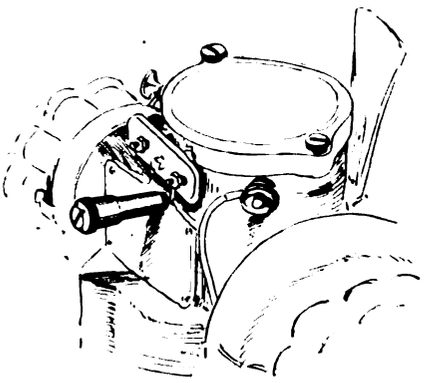


Winkley oilers used on Ford spring bolts and front axle

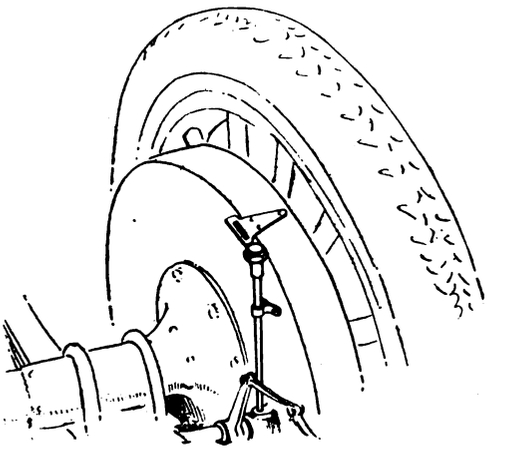
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Oil cups on spring bolts and steering connections of Kissel car



Oil cup on Packard governor housing



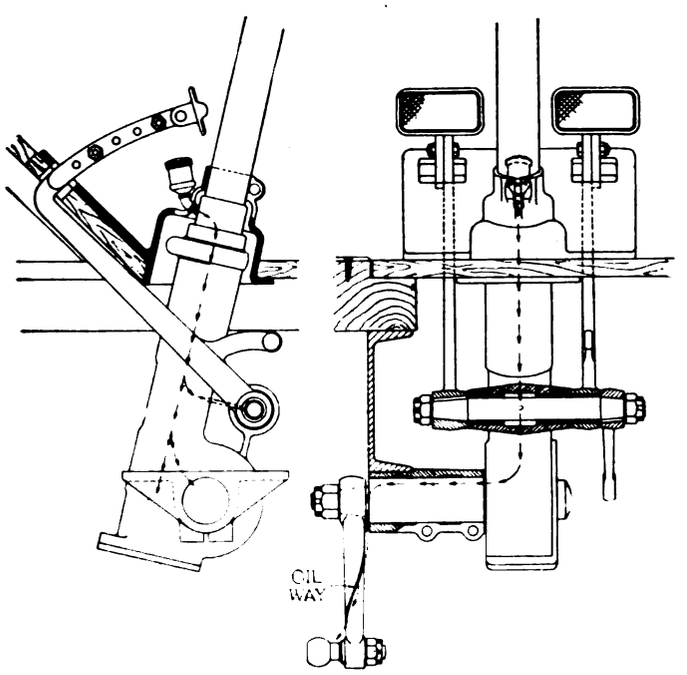
Oil cup on Packard brake camshaft raised to convenient height

the oil, even if the oil is dirty or if dirt enters the brackets and cups when being filled. Under the action of vibration and the movement of the lubricated surfaces the oil feeds slowly and regularly whenever the machine is in motion, but stops when the machine stops. This renders every bit of bearing surface continuously effective and prevents wear, squeaks, rattles and rust. The same oil used in the engine can be used in cups or brackets. This insures a good lubricant, and one which is light or heavy as the weather is cold or hot. So little oil is used that the expense is very small—less than grease when grease is applied as often and as carefully as it should be. The cups and pockets can be easily and quickly filled, and it is not a messy job; they can also be cleaned with gasoline and a squirt gun.

Control of the Feed

The main disadvantage is that at some points the oil is apt to feed more freely than necessary and coat the surrounding parts, unless care is taken to get wicks of the proper material and properly fit them in the holes. Rapid feed would be particularly objectionable from a passenger car standpoint, but care in design and fitting will obviate this. Cotton wicks and wicks loose in the drilled holes feed quite fast. Felt wicks, especially when snugly fitted, reduce the feed. If a very fast feed is desired a couple of fine wires, twisted and used as a wick, will give a surplus of oil at the expense of more frequent filling of the cup or pocket.

Where there is a great deal of vibration, as on axles, the rate of feed is accelerated. This is also the case where there is a great deal of motion between the lubricated surfaces, as is often the case with front spring bolts. The location of the final outlet hole to the bearing surfaces, too, has an influence on the feed, which is slower when this hole opens on the load side of the pin than when it opens on the free side.



A series feed from a wick oiler. Oil is supplied to the thrust bearing, the screw and nut, the trunnions and rocker shaft of the Ross steering gear, and the slight leakage is conveyed by a spiral channel on the steering arm to the ball joint. A branch feeds the pedal shaft bearings and the leakage goes down to the clutch release lever and oils its clevis

Feeding Oil by Wicks

Objection has been made to feeding oil by wicks in cold weather, on account of the increased viscosity of the oil. It is true that the flow will be reduced if some means is not taken to offset very severe weather; but the system lends itself remarkably well to this condition, as the oil can be thinned down with kerosene. If engine oil is used at the chassis points, lighter oils are commonly used in cold weather, anyway. The lubrication afforded by grease in very cold weather is almost negligible, because it is almost impossible to force the grease to the bearing surfaces.

In all trials of the magazine system that have come to the writer's notice, its reliability, efficiency and durability have been well proven. The upkeep cost is practically nil. Operating cost and attention are reduced to a minimum. The first cost of brackets is somewhat greater, but there is a saving on fittings, so that the net cost is a little more than the old grease cup system of lubrication. For trucks the increased cost is not important, compared with the advantages secured. This should also hold for passenger cars, but up to the present the writer knows of no applications in this field. The improvement and modification of the details of design will obviate objections to this system as a production proposition, for it tends toward simplicity and not complication, and it is susceptible of considerable development as to detail.

The magazine system is applicable to the front axle, spring bolts and shackles, steering gear, starting crank, fan, pedal details, etc., and it lends itself to what might be called series lubrication—the seepage or surplus oil from one bearing being led to another and thence to a

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third or even fourth; as in a steering gear, oil can be successively used on the thrust collar, the actuating mechanism and the trunnion bearing, and then led out and down the steering arm to the ball joint on the drag link.

The lubrication of universal joints has always been an unsatisfactory proposition. Oil is the best lubricant, but great difficulty has been encountered in retaining oil in the casing of the joint for more than a short time. Hard grease is easily retained, but is a poor lubricant at these points, especially in cold weather. A medium grease is most used, but it is far inferior to oil for the same reasons as were given for other chassis parts. One of the illustrations herewith shows a method devised by the writer for magazine lubricating a universal joint by drawing small amounts of oil intermittently from the gearbox, clutch case or rear axle. If the oil ultimately escapes, as it will in the ordinary joint, it will be in very small amounts and will make little difference. It can be so arranged that a part of the escaping oil will lubricate the slip joint. This is very important, especially with machines that use the Hotchkiss drive, where there is a considerable movement at the slip joints. Unless this point is well lubricated, a serious end thrust will be put upon the universal joint and on the bearings behind it in the gearbox.

Advisability of Spring Lubrication

There is some difference of opinion as to the advisability of lubricating a spring. The magazine system leads the surplus oil from the spring bolts to the spring leaves. This prevents rust and eliminates squeak. It maintains the flexibility of the spring at approximately that given it by the spring maker, depending upon the amount of oil led to the spring, its distribution between the plates, and the manner in which the plates are formed and fitted. When the flow of oil to the spring bolts is properly regulated, there is not sufficient oil led to the leaves of the spring bolts to destroy its interleaf friction, for the high spots between the leaves break through the oil film and there is metal to metal contact—but without squeak and without accumulation of rust.

Labor Shortage Calls for Automaticity

To-day in every line we need devices that require the minimum of attention and serve their purpose with the greatest reliability. The passenger car and motor truck of the immediate future must offer these advantages, for they will be called upon to serve more constantly and there is surely going to be a shortage of chauffeurs and garage help. Women now drive their cars and should be able to care for them, when necessary, with but little assistance. Women will be called upon more and more to handle delivery cars and light trucks, relieving the shortage of men as they are called in greater and greater numbers to our armies. The men left in the garages will have less time to pay attention to detail, for they will have to look after more machines. The little troubles that so often cause annoyance and breakdown are largely due to lack of lubrication, and as a fighting nation we cannot afford them. By the provision of lubricating devices as described they can be avoided.

Strenuous Tests of the Class B War Truck

WHEN the first samples of the Class B truck were completed they were subjected to the severest kinds of tests to bring to light any possible weaknesses. Roads and trails resembling as closely as possible the shell-torn highways behind the front in France were selected. Some of the tests are illustrated herewith







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Opposition to Standardized Trucks

Disagreement Among Manufacturers Interested—Effort to Sidetrack Standardized Models—Arguments Advanced by Both Sides

WASHINGTON, Feb. 27—It is not surprising that the national significance of standardization of war apparatus such as trucks, aviation engines and tractors should not be duly appreciated by the entire industries producing such apparatus when it is remembered that many of these great industries have since their inception been engrossed with necessary expansion to meet imperative demands from waiting buyers.

War has injected new imperative factors into standardization as a needed war weapon, and it will be some time before the national and international significance of war standardization and great post-war standardization is appreciated.

The economic fundamentals underlying such are not as fully appreciated as they will be 12 months hence.

Significance of Shipping Tonnage

The significance of shipping tonnage, and the simplifying of the maintenance of war apparatus on the other side in view of shortage of skilled labor, as well as shortage of man-power and shortage of foods, are major considerations that must be analyzed in the light of the world aim.

The arguments pro and con regarding the program of standard war trucks by the Quartermaster Department have filled Washington with rumors for several weeks and these arguments are broad and deep in their ramification of the industry, more so than is appreciated by many.

Much Accomplished by Exchange of Views

Fortunately, an industry such as the automobile and truck industry has been schooled in the get-together plan of making progress, and while those holding counter views are yet far from coinciding in action, the exchange of views has already accomplished much, and the continuance of such frank exchange of views should soon clarify the atmosphere in official Washington on this standardized truck problem.

It has been generally recognized for some months that the motor transport requirements of our army should be pooled to give the highest efficiency and to eliminate duplication of effort and other waste. A movement toward this co-ordination was started several weeks ago.

Reports were to the effect that all motor truck activities of the army, except aviation trucks, would be pooled under the control of the Quartermaster Motor Transport Division, which has fathered the standardized truck program and would obviously carry the standardization idea into the other corps of the army. Recently, other rumors became current.

There have been reports that other appointments to control the co-ordinated activities of the army would be made in which the standardized truck program would undoubtedly suffer.

Those deeply endeavoring to interpret the spirit of the war and post-war program of standardization see in the present line of standardized trucks advantages as follows:

Advantages of Standardized Trucks

1. They believe that those manufacturers and others allied with them are really injuring themselves by opposition to the standardized truck program, because this program is so logical and so necessary to the success of our motor transport service, and that opposition will only result in injury to truck makers opposed to standardization if they attempt to satisfy the truck requirements of our army in France with various individual makes. Many of these will find themselves during the war so congested with war work as to have to neglect the commercial field, and in this way allow competitors to gain in their control of this market.

2. That standardization of military motor trucks is essential, because it simplifies and will soon speed up production. It reduces duplication of effort in engineering designs as well as in securing trucks and maintaining them. It reduces very materially the number of different parts to be carried in stock in the foreign repair depots.

3. That production of the standardized trucks, which has already started on the Class B truck has been delayed only because of fuel shortage and will soon be in full swing.

4. That the standardized trucks have proven their practicability, sturdiness and economy by the test drives to which the sample trucks have been subjected since they were manufactured.

Reasons for Opposition

5. That some opposition to the standardized program is due to what might be termed an insufficiently complete analysis of the influence of standardized trucks during the war and after it on the manufacturers building them as well as those not building them.

6. That the standardized trucks have produced opposition because they can be made as cheaply and possibly more cheaply by $500 than the various makes of trucks on the market; this refers to the 5-ton standardized Class B truck, as compared with the average 5-ton truck.

7. That opposition to the standardized trucks is fur-

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ther induced by the fact that repair parts costs will be 50 per cent lower on the standardized B truck as compared with some 5-ton trucks.

8. That truck assemblers will be able to make the standardized trucks for commercial use as cheaply or cheaper than they can produce their trucks, and that the assemblers can point to the low repair parts costs and to the fact that the Government has found the standardized trucks worthy and thus create powerful competition.

9. That despite having called in truck makers and others to aid in drawing up the forms of contract which provide for 10 per cent profit for the assembly or manufacture of the standardized trucks, the contract and the profit are not to the liking of some manufacturers who would like 15 per cent profit.

Would Create Competition

10. That because certain passenger-car companies have been given contracts for trucks they will continue to make these trucks after the war and thus provide additional truck competition.

11. That the truck makers and others opposed to a standardized truck program have a plan by which they hope gradually to reduce the importance of the standardized truck, and that that plan includes the appointment of some motor car manufacturer antagonistic to standardized trucks as civilian in charge of a pooled motor transport service and the appointment of another civilian with like policies in charge of the Quartermaster standardized trucks with a view of gradually allowing the standardized program to be curtailed and become an insignificant factor.

Concretely, those not entirely in sympathy with the standardized truck program see the reasons for their attitude as follows:

Reasons Against Standardization

1. That the standardized truck program cannot be fulfilled in the time anticipated and that we will not have the requisite number of trucks for our army unless we use the various makes of trucks available.

2. That the engineers who designed the standardized trucks were granted too much freedom and incorporated many expensive and useless designs.

3. That the standardized trucks of all types are many months behind their original schedules of delivery.

4. That the upright steering post and other features of the trucks will make them impractical.

5. That the Ambulance Corps, which was given considerable consideration in designing the Class AA trucks, they report, refuses to purchase them.

6. That the standardized trucks are more expensive than other makes and consume more fuel.

7. That it is unwise to pause in this emergency and design and manufacture standardized war trucks when we already have many manufacturers with designs, completed tools, machines and factories and organizations ready to produce the various makes of trucks now on the market in quantities to meet our immediate military needs.

It is impossible at this time to vouch for the arguments of those holding varying views on how standardization will in reality evolve and work out in practice not only during war, but after the war, as all parties concerned are not available.

All that is desired is the broadest and most profound analysis of the facts in the case.

The motor transport section of the Quartermaster Corps has denied the report that the Ambulance Corps has disapproved and will not purchase the Class AA trucks. It points to the records established by the sample standardized trucks for proof of fuel economy.

It denies the reports of many months' delay in the production program, admitting that there has been some delay with the Class B truck caused by fuel shortage, but claims this truck will be produced in small numbers this month and will be in large production in March.

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Trader Carbureter For Heavy Fuels

R. V. TRADER & CO., McKeesport, Pa., have developed a carbureter which they claim will operate successfully not only on kerosene but also on fuel oil, the cheapest liquid fuel known. According to Messrs. Trader, the evaporation of kerosene or other heavy fuel depends upon three factors, namely, the surface over which the fuel is spread, the temperature and the rapidity of air circulation. In the following the effects of each of these three factors is gone into at some detail.

Speedy evaporation may be secured by spreading the fuel over a very large surface exposed to the air. This will be readily understood when it is reflected that a small amount of kerosene in an open test tube will lose very little by evaporation in a given time, whereas if the same quantity of fuel were spread over a large surface, say 10 ft. square, it would be evaporated almost instantly. The evaporation may also be accelerated by heating the fuel, or the mixture of fuel and air, or by preheating the air, but the temperature must necessarily be high.

Another way of speeding up the evaporation is to carry off the vaporized fuel as quickly as it formed. This statement may easily be verified experimentally by placing a pan with the fuel in a chamber where the air is motionless and another pan with fuel in a blast of air. The latter will be emptied of fuel much sooner, owing to the fact that the vaporized gases are carried away from the surface of the liquid fuel as rapidly as formed.

In the Trader kerosene carbureter an attempt has been made to meet these three conditions of rapid evaporation. The small quantity of fuel which is ejected from the nozzle at each stroke is spread evenly over the large surface of a rapidly revolving disk. It is there heated by warm air which passes over the surface of the disk in a direction transverse to the motion of the fuel, thus carrying the gases evolved away rapidly.

The main air supply for this carbureter is taken from a stove on the exhaust pipe. The air passes from this stove into the throat of a small air turbine, where it is directed against the turbine blades, revolving the assembly of turbine motor, disk and shaft. This warm air revolving in the turbine housing is in direct contact with the disk and evaporates the fuel spread thereon by the nozzle; it then passes around the circumference of the disk over the circular, exhaust-heated hot spot on the casing of the disk. The theory is that the combustible mixture passes this hot spot at such high speed that it will not be appreciably heated, but should any drops of liquid fuel pass around the edge of the disk, owing to their greater inertia they would be thrown against the hot spot, where they would immediately be turned into vapor. The mixture enters the throttle passageway through a throat directed so that the air from the auxiliary air valve at high speeds will surround the gas in its passage to the manifold.

The Trader kerosene carbureter should preferably be used with a cast-in manifold. A carbureter suitable for a four-cylinder, 3¾ by 5¼ in. engine at normal speed in truck service will have a disk speed of from 600 to 2800 r.p.m. and the disk area is 12.56 sq. in. The temperature of the air entering the main inlet is said to be about 200 deg. Fahr. at low speed and not much above 225 deg. at higher speed. Of course, the evaporation of the kerosene materially reduces this temperature.

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The Benz 230-Hp. Aircraft Engine

Forced Lubrication by Means of a Gear Pump—Gasoline Pump Delivers Fuel to Carbureter Under Pressure

(*Continued from February 14 issue*)

THE dimensions of the inlet and exhaust valves are the same, so that the weights are identical, each valve weighing 1.25 lb. The lift of the inlet valve is 0.465 in., and the lift of the exhaust valve 0.443 in., while the clearance of inlet tappet is 0.009 in., and the exhaust 0.015 in.

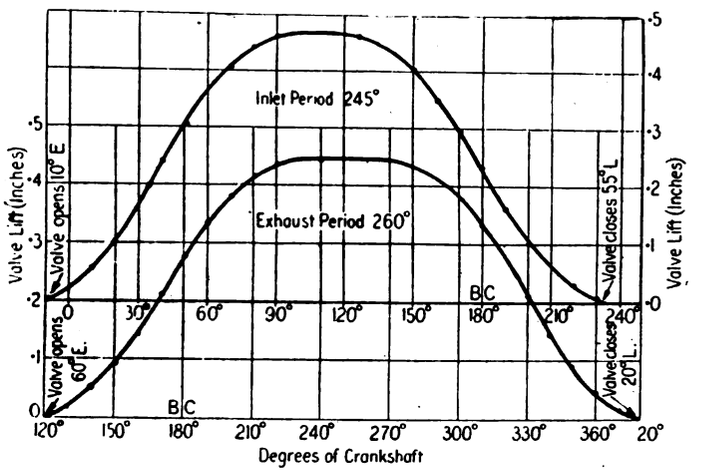
The hollow camshafts run in three plain phosphor bronze bearings of much the usual form. They are 53 mm. outside diameter, split on the camshaft axis and held together by wire rings on either side to allow the camshafts to be easily assembled in the crankcase. They are located by grub screws inserted from the outside of the casing.

The camshafts are driven by straight-tooth gears, in the usual manner, through an intermediate wheel that meshes with the crankshaft pinion. The gearing is arranged in the orthodox casing formed at the rear end of the crankcase, and the camshaft gears are bolted to the flanges on the camshafts, drilled to provide a vernier adjustment for setting the camshafts.

The half compression cams on the exhaust camshaft are engaged by lateral movement of the shaft, effected by a two-start square-thread screw of 24-mm. pitch, operated by a small lever at the rear end of the crankcase. The camshaft is returned to its normal running position by a spring inside the front end of the shaft. The half compression cams open the exhaust valves at 35° E. and close at 22° L.

Crankcase

The crankcase is shown in the general arrangement drawing of the engine, and it will be noticed that the method of cooling the interior of the crankcase and sump indicates that this point has received careful consideration. In the top half of the crankcase six of the seven main bearing housings are so cast that the webs form air passages transversely across the engine, and two of these passages form the air intakes for the two carbureters—an arrangement similar to that adopted on the 160-hp. Benz engine.



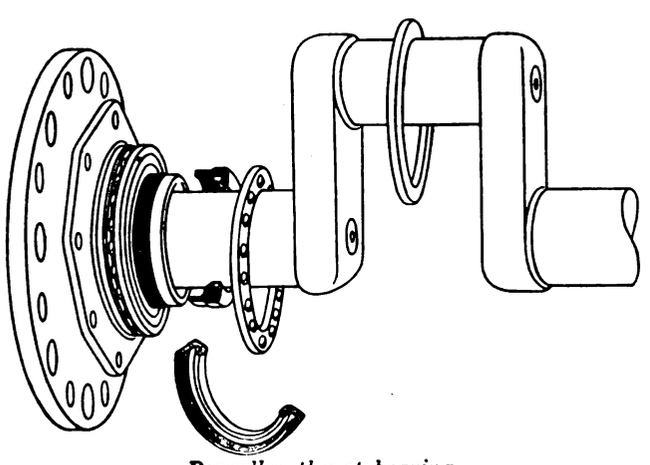
Valve lift diagram

The bottom half of the crankcase is extended to form an oil sump, and is of rather unusual design. The lower portion is cooled by eighteen 30-mm. aluminium tubes arranged transversely across the chamber, the air being collected into the tubes by a large louvred cowl of sheet aluminium, attached to the induction side of the engine. A corresponding but reversed cowl is fitted on the exhaust side. Breathers are also fitted in the top half of the crankcase; the simple type of wire spring clip fitted to the breather lids will be noticed.

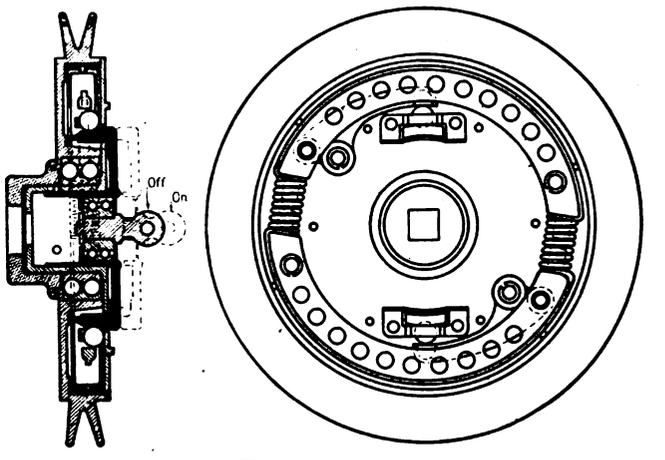
Carburetion System

Two separate carbureters are fitted, each feeding three cylinders. These are attached by flanges to the side of the top half of the crankcase.

By reference to the drawing of the carbureter it will be seen that the pilot jet is formed by an extension of the brass tube into which the main jet is screwed. This combined jet is screwed obliquely into the bottom of the float chamber casting, and not, as is usual, into the body of the

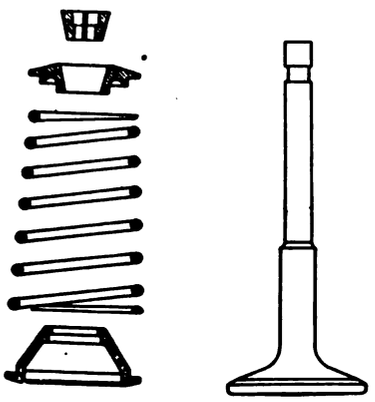


Propeller thrust bearing



Wireless drive

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Valve and spring

carbureter. Attachment of the float chamber to the body of the carbureter is effected by two bolts.

As already mentioned, the main air intake passages are cast in the crankcase between the webs of the main bearings, air entering each carbureter through two ports in the end of the throttle and also through the air passage at the base of the carbureter below the jets. At full throttle most of the air is taken through the air ports in the throttle above the jets, but when the throttle is closed for slow running the main jet is completely cut off and all the air is taken through the passage containing the pilot jet. When tested, the slow running of the engine proved to be very good.

The design of the air intake ports in the end of the throttle is shown in one of the drawings, which illustrates the throttle in half and full positions. The ports are so designed that the gasoline-air ratio remains practically constant over a wide range of throttle opening up to nearly half throttle; the last movement of the throttle, however, causes no increase in fuel flow, but, on the contrary, a slight decrease. The body of the carbureter around the throttle is water-jacketed, and is connected by an arrangement of steel piping to the delivery of the water pump, and also to the lower water connections at the bottom of the water-jackets between each pair of cylinders. The arrangement is clearly shown in the side view of the engine. No compensating arrangement is fitted for high altitude control.

The design of the branched induction pipes is interesting; they are built up of aluminium tubes with cast aluminium-flanged bends, and weigh only 2.625 lb. each complete with connections. The internal diameter of the induction pipe is 58 mm., and the connections between the flanged bends of the induction pipes and the cylinders, and also between the bottom ends of the induction pipes and the carbureters, are made with rubber ring joints secured by wide band clips. These joints when loosened, being more or less flexible, allow any one of the cylinders to be removed without disturbing the other joints of the induction branched pipes. The Royal Aircraft Factory test report computes the petrol consumption at 150 pints per hour, or 0.65 pint per brake-horsepower hour.

Lubrication

Forced lubrication of the crankshaft and connecting-rod bearings is effected by a small high-speed gear pump working submerged in the reservoir formed in the bottom of the sump. The pump is virtually a triple one with three functions, and its details are fully illustrated herewith. It works diagonally in the sump, and is driven through a long shaft by a gear that meshes with the distribution pinion on the rear end of the crankshaft.

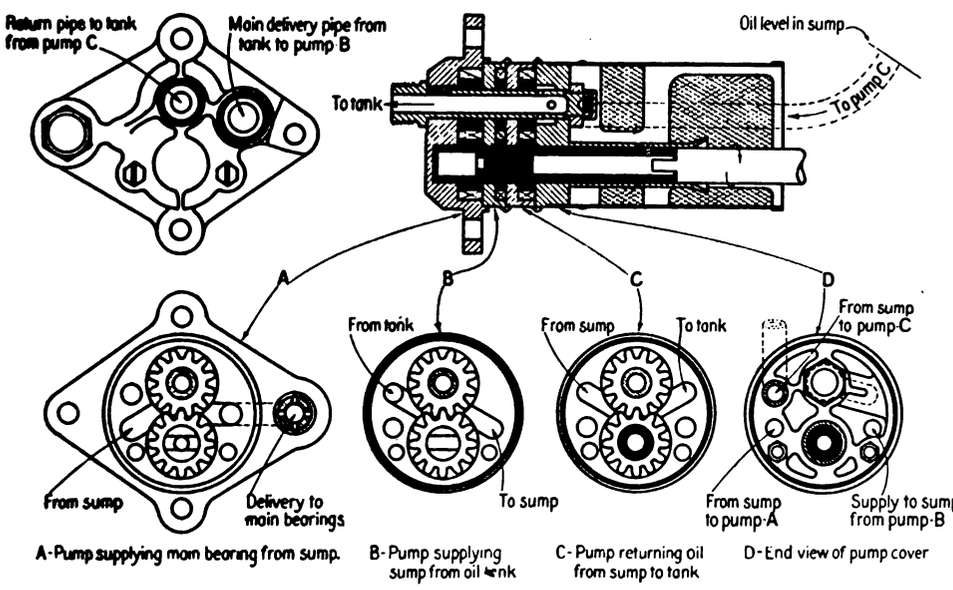
Referring to the diagrams of the oil pump, the operation of it is as follows: Oil is drawn by the main pressure pump *A* from the reservoir in the sump through the holes in the end cover of the pump, lubricating the main bearings through the main oil pipe and the small branch pipes and hollow crankshaft. Thence delivery proceeds to the piston-pin bearings through the small pipes inside the tubular connecting-rods, and the surplus oil thrown out from the hollow cranks on to the camshafts, etc., returns by gravity to the sump, flowing over the air-cooling pipes in the base. Fresh oil is fed into the sump by the small suction pump *B* from the oil tank, while the correct working oil level is maintained in the reservoir by the gear pump *C*, the oil being drawn off through the bent pipe *E* and returned to the oil tank. The fresh oil from the oil tank passes through a cylindrical gauze filter attached to the under side of the crank case.

Oil Pump

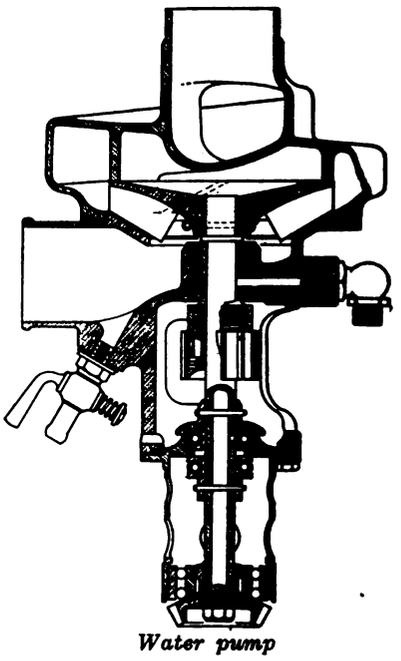
The complete oil pump with its filter is easily detachable from the sump, being held in position by studs through the flange. A small spring-loaded ball valve provides the oil pressure release in the main oil supply pipe. The gears of the oil pumps and also the pump body are of cast iron. The weight of the complete pump is 2.89 lb.

Oil consumption during a Royal Aircraft Factory test was 4.5 pints per hour, equalling 0.02 pins per b.hp.-hour. The working oil pressures are 50 lb. maximum, 28 lb. normal.

Two Z.H.6 magnetos are mounted on brackets at the rear end of the crank case, and are driven off the cam-



The triple oil pump



Water pump

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shaft gear wheels. The scheme of the drive is neatly carried through, and is clearly shown in the rear end view of the engine. Ignition control is effected by small-toothed quadrants that mesh with teeth cut in the under side of the magneto cam box. The interconnected levers of the timing control quadrants are coupled by a rod which passes through the end of the crank-case casting.

Two spark plugs are fitted to each cylinder, one on each side, and the high-tension wires are carried in a sheet aluminum casing attached to the cylinders. The ignition is timed as 30 deg. early fully advanced, *i.e.*, 18 mm. on the stroke.

Water Cooling

The centrifugal water pump is arranged on the top of the rear end of the crank case, the vertical spindle of the rotor being driven by bevel gears off the camshaft intermediate pinion, as shown in the large general arrangement drawing of the engine. The speed of the water pump spindle is 1.58 to 1 of the crankshaft, and the diameter of the rotor is 120 mm. The diameter of the water inlet to the pump is 50 mm., while the diameter of the outlet is 55 mm. Water enters at the top of the rear cylinder through the steel tube elbow, and, as previously mentioned, is deflected around to the exhaust passage of each cylinder. A double thrust ball race is fitted to the spindle, which is provided with a large stuffing gland; the spindle is lubricated by a grease lubricator operated from the pilot's seat.

From a separate test of the pump carried out at the Royal Aircraft Factory, in which the pump was removed from the engine and coupled to an electric motor, the following results were obtained, running at an average speed of 2100 r.p.m., equivalent to 1325 r.p.m. of the crankshaft:

Maximum delivery = 120 gal. per min. with free outlet.
Minimum delivery = 48 gal. per min. against a pressure of 7 lb. per sq. in.

A diagram of the complete water-cooling system is shown, and from this it will be seen that the greater part of the water is forced by the pump directly through the cylinder heads in series, while the bottom portion of the cylinder water jackets is supplied through a branch pipe arranged just above the outlet of the water pump. This branch pipe is also connected to the carbureter water jackets, as shown in the diagram.

Water Connections

The water connections between the heads of the cylinders are made by rubber rings contracted by steel band clips of ingenious design. The strap of the clip is a thin strip of annealed spring steel, and this passes twice round the rubber ring, after which it is pulled up and fastened by a bolt in the link. In making the joint, the end of the steel band is first bent over the bottom bolt of the link and then twice round the rubber ring, the free end of the steel band passing through the center portion of the link on the second winding, when the end of the steel band is then fastened to the top bolt by inserting it into a slot suitably cut. Evidently when this bolt is rotated, the steel band is pulled tightly round the rubber ring and remains thus. The water capacity of each cylinder jacket is 1873 c.c., and the total amount of water carried in the engine, apart from the radiators, is 30.9 lb. Two rectangular honeycomb radiators are fitted, one on each side of the machine.

The automatic fuel pump constitutes one of the most interesting features of the engine, its function, of course, being to supply gasoline under pressure to the carbureter without the disadvantages of gasoline tanks under pressure. The pump is used in conjunction with a supplementary pressure reservoir inside the main fuel tank, and the system includes an auxiliary fuel tank and semi-rotary hand pump. Details of the main pump are shown in the general arrangement drawing, and its function and operation, together with the supplementary pressure reservoir, are explained by the diagram.

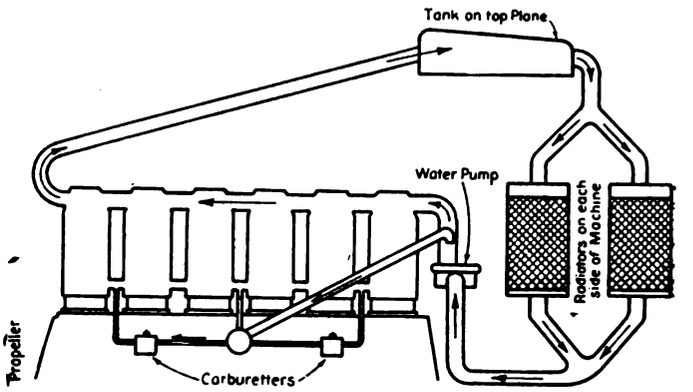
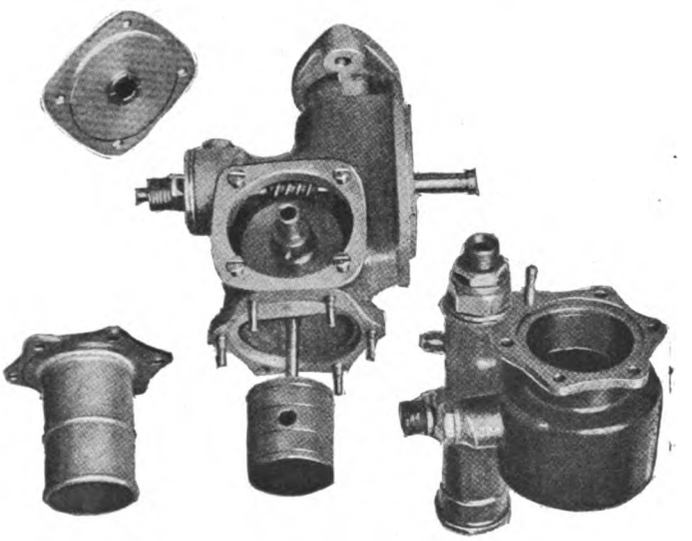


Diagram of cooling system

In its essentials the pump consists of a small piston of cast iron, 40 mm. in diameter, working in a cylinder of phosphor bronze, open at both ends. The piston is arranged below the crank, and the lower portion of the cylinder extends nearly to the bottom of a chamber, which contains castor oil. The piston is actuated by a connecting-rod, driven through worm gears by a spindle forming an extension of the inlet camshaft.

With regard to the operation of the pump, gasoline from the main tank enters the pump through the filter at the side, and on the upward stroke of the piston producing falling of the castor oil, gasoline is drawn into the annular chamber through the inlet or lower check valve. Upon the downward stroke of the piston, the gasoline charge, above the castor oil column, closes the inlet check valve and forces the charge out of the upper valve. The volume of gasoline discharged at every stroke corresponds, of course, to the displacement of oil by the stroke of the piston.

From the delivery of the pump gasoline is forced into the top of the pressure reservoir inside the main gasoline tank, and, rising in the reservoir, creates a cushion of compressed air above the gasoline, thus serving to damp out the pulsations arising from the action of the pump. From the bottom of the pressure reservoir the gasoline is forced upward through the shorter of the two pipes inside the reservoir, and is delivered at even



Details of fuel pump

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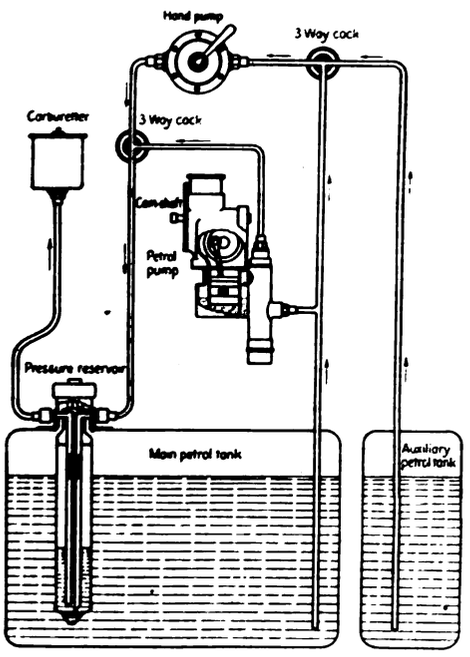
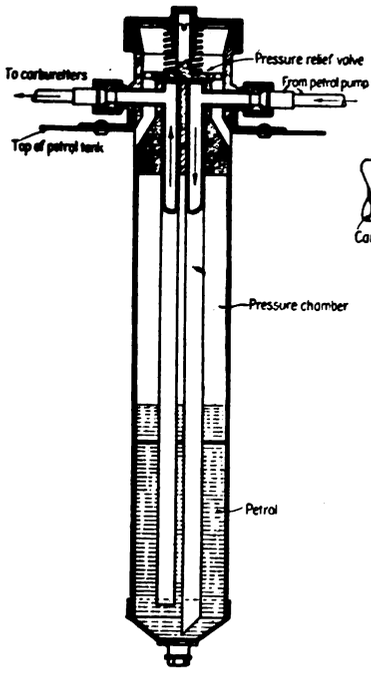
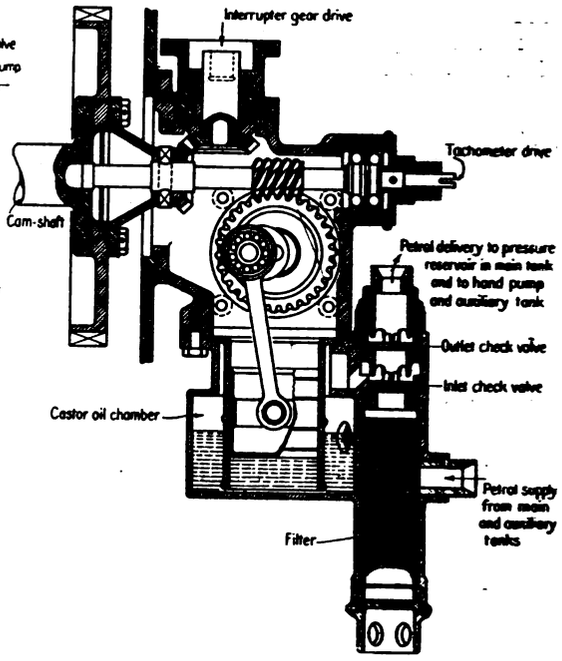


Diagram of fuel supply system



Fuel pressure reservoir



General arrangement of fuel pump

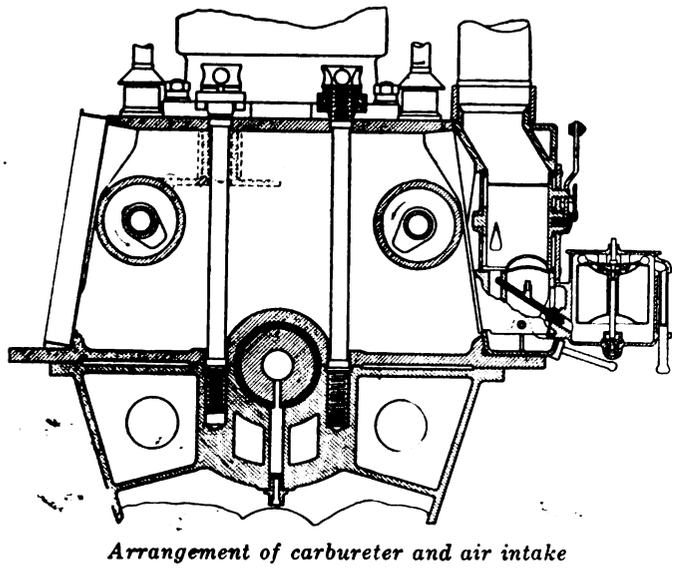
pressure to the carbureters. A pressure relief valve is fitted to allow excess gasoline to return to the main tank, which is effected through twelve holes drilled in the head casting of the pressure reservoir.

As illustrated in the diagram of the fuel system, a supplementary supply system is embodied, employing an auxiliary fuel tank and a semi-rotary hand pump in conjunction with the main system. Two three-way cocks are fitted, which allow any one of the following three means of supply to be utilized:

(*a*) Main gasoline pump from main tank.
(*b*) Hand pump from main tank.
(*c*) Hand pump from auxiliary tank.

The driving spindle of the gasoline pump also drives through bevels a vertical spindle operating the interrupter gear for the machine guns, while to the rear end of the pump spindle is fitted the flexible tachometer drive.

In the earlier types of gasoline pumps fitted to the Benz engines the castor oil chamber was provided with an oil-filling cap, which was screwed into the side of the chamber casting, and was fitted with a special form of drain cock to determine the quantity of oil poured into the pump. This filling arrangement has now been given up, and the annular oil chamber is fitted with a drain plug only.



Arrangement of carbureter and air intake

The following data in connection with the pump will doubtless be of interest, and attention is drawn to the tabulated test results of the Royal Aircraft Factory given below:

Speed ratio of the driving spindle to the small crankshaft driving the piston of the fuel pump.	10.75 to 1
Bore of the pump	40 mm.
Stroke of the pump	26 mm.
Lift of valves (inlet and exhaust)	2 mm.
Volume of gasoline delivered at each stroke of the pump	2 cu. in. (approx.)
Weight of complete fuel pump	6.75 lb.

The normal consumption of the engine is approximately 150 pints per hour at normal speed, and the pump has a greater delivery than this at any angle up to 60 deg. in any direction.

The maximum delivery of the pump in a vertical position is 288 pints per hour at 10 lb. per sq. in., running at 850 r.p.m. At normal speed, *i.e.*, 700 r.p.m., the delivery is 233 pints per hour; while at speeds in excess of 750 r.p.m. the inertia of the fluid columns causes displacement of the castor oil.

The pump was run for ten minutes with the piston in direct contact with the gasoline, with no deleterious effect, but a test of such short duration is, of course, practically valueless as being any indication of the possibility of permanently so running the pump.

A number of tests were carried out to determine the rate of flow, also the inlet and outlet pressures of the pump, while tilted at the angles likely to occur on a machine in flight. The effects of banking to the right and left, diving and climbing were thus shown, and the results are given in the diagram.

(*To be continued*)

IT is reported that German airplane constructors, instead of using mahogany and walnut for propellers, are using softer woods of different kinds laminated together. Experiments made to determine the strength of these propellers show that with the wood skilfully compacted together these propellers are as difficult to break as the best hardwood propellers. It must be remembered that the extreme strain necessarily makes the life of even the best propeller comparatively short, and there is something to be said for the view that efficient and durable propellers may be made from comparatively cheap timber.

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Automotive Design and Transportation as Developed by the War*

Purchasers No Longer Choose a Car by Size and Weight —Economy of First Cost and of Upkeep the Deciding Factor—Tendencies in Design Revealed by New Models

By J. Edward Schipper

WE are to-day face to face with a condition in automotive engineering that would have been 3 years or more removed if it had not been for the war. War demands a general speeding up, and the methods of peace times no longer suffice.

One of the great problems which confront the world to-day is that of transportation. Under the demand for the movement of unprecedented quantities of materials and manufactured articles, as well as that of greatly increased passenger traffic of a military and commercial nature, the nation's railroads have been strained to the breaking point.

When it is considered that owing to heavy government purchases, more money is being spent for manufactured goods in this country this year than was spent in a period of many years previously, and that as a result every productive industry in the country has been pushed to the limit, it is not hard to understand that the weak links in the chain of our transportation system should give way.

Both within and without the country we must keep things moving. We must move fuel, materials, manufactured articles, food, clothing and armies. Transportation is the big demand of the age and with the railroads of the country taxed to their limit, it is automotive transportation that must be resorted to.

New Measure of Distances

A century ago ideas of distance were gaged by the abilities of the horse. If we thought in terms of the horse to-day we might just as well surrender, yet there are over one hundred millions of acres of land cultivated annually in this country to support the horse. Nevertheless, the days of thinking in terms of the horse in transportation are gone. Quick transportation, certain transportation and above all efficient transportation is the greatest demand of the age. Let us see how the automotive industry fits in with this demand.

The change from a year ago to now has been a change of peace to war. We have been awakened from our gilded dream to find out that our Chinese wall of internal self-sufficiency has crumbled. It has crumbled largely because transportation has advanced to such an extent that countries which, in the days of "no entangling alliances," were remote, have become our next door neighbors. This great change has been accompanied by a revulsion of feeling in this country, which would have been considered impossible.

A great wave of economy has swept over the country. Our great national fault has been extravagance. We have been extravagant of every resource. The great forests which once covered the country have been cut away so that to-day lumber is cheaper in the oldest countries of the world than it is here. Our minerals, the game of the fields and forests, all the gifts that nature bestowed on this country have been used in a lavish way and naturally along with this the habits of our people have been affected until we have become known as the most wasteful nation in the world.

This characteristic has been reflected quite clearly in our automobiles. The American people have been buying cars by size. They have been buying cars by the pound. If two cars were offered side by side, at the same price, but one larger and more gaudy in appearance than the other, there would have been no possibility of one competing with the other, as the larger one would have nearly all the sale in spite of the fact that the other might be a better piece of engineering. But a change has come.

We have suddenly awakened to the fact that the automobile of to-day is not efficient and not economical and at the same time the people of the country have been awakened by the exigencies of war to the fact that our daily habits, whether they are concerned with transportation or what not, must be more efficient and economical.

The result is that to-day people, when they are purchasing goods, want the most for their money. When they buy transportation they want the most transportation for the money they spend in the purchase and afterward in maintenance and for supplies.

Too Much Dead Weight

When we say the automobiles of to-day are inefficient, and are not giving the owner the value in transportation that they ought for the money expended, we simply mean that what he gets back in transportation is not enough in proportion to what he puts in.

Take for instance the man who owns a car weighing 2½ tons who drives downtown to his office, a distance of 5 miles. In the evening he returns, another 5 miles. If a friend were to offer to take him to his office and back for a dollar a day, he would probably laugh at him. Yet in all probability this is what it is costing him. The upkeep of such a car, even without including the depreciation which we all know is high in a car of this weight, will easily amount to 10 cents a mile.

The car weighs too much for the passenger load. The man weighs probably 150 lb. The car weighs 5000 lb.; in other words, 33 lb. for every pound of passenger weight. This is too much. The car is heavier than the average, it is true, but this example is taken merely to illustrate the point. Even with five passengers in the car, the weight would be over 6 lb. per passenger and this is too much.

Ton-Miles and Comfort the Objects

Study this from the transportation efficiency standpoint. We have two sides to the ledger sheet, on one side what we put in and on the other what we take out. We put in money in terms of fuel, time, weight of vehicle, labor (if a driver is employed), road or track maintenance and vehicle maintenance. We take out just two things: passenger-miles and comfort. The comfort comes extra in an automobile as it does on a Pullman car. In a commercial vehicle it is ton-miles alone.

We have got to get the best results possible and at the same time to keep the cost down to the limit. Most of the cost factors are in the control of the engineer, and, indeed, most of them are simply weight factors. Taking them one by one:

*Paper read before Detroit Section Society of Automotive Engineers, Feb. 21.

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Fuel Consumption—Primarily affected by weight and to a moderate extent by design in average practice.

Time—Controlled by law and traffic conditions.

Weight of Vehicle—The real crucial factor involving displacement and weight of powerplant, length of wheelbase, physical qualities of materials, vehicle characteristics and purposes.

Road or Track Maintenance—Covered by state tax and a function of weight and horsepower in many states.

Vehicle Maintenance—Function of weight, materials, design, handling, road conditions and a number of other variables.

In every one of these items we have been high in the past and we must make a rapid change to reduce them if we wish to fit in with the desires of the public. If the progress of the times is to be studied, it must be done with the broad fundamentals outlined carefully in mind.

No War-Time Cars Yet

The new cars at the shows are hardly war-time cars. They have been out on the road under test for so long that they antedate the economy wave which has swept over the country. All that they serve to show is that the tendency was in the direction of what has now come to be a demand. This demand in a great many ways is not even known to the people themselves, yet it is there. The attitude of the people at the shows was to a large extent noticeable. They were searching for something they did not find and so they took the nearest thing to it, or, took nothing at all.

These people were looking for a car in which the weight per passenger was at the lowest limit. In other words a car that utilized every inch of wheelbase to the greatest possible efficiency; that was not of a displacement higher than necessary to carry the load; that had materials which returned the greatest amount of service because of their light weight and scientific disposition.

No longer were they looking for the biggest car that they could buy for a certain sum of money. The American public have had a psychological shock from which they have not recovered. It is to be hoped that they will not recover because the new condition is a healthy one begetting a higher plane of mental and physical existence. It devolves upon the automotive industry to design tools which suit this new state of mind. We must have efficient transportation.

At this time of the year when all the new cars have made their appearance and the designs for the following season have all been disclosed we are naturally interested in seeing the trends of development. This year, for the reasons pointed out, the trends can not possibly teach us as much as in the past because the designs in which they are included can not possibly have taken into consideration the change of the national psychology. Nevertheless, since we were beginning to move in the right direction it is important to study these developments to see what should be accelerated in order to meet the new conditions and new standards. We must hold up the past tendencies to the spotlight and see what conforms to our new demands for conservation and economy.

Only Five New Chassis at Show

At the shows there were but five really new chassis, incorporating new powerplants and redesigned to a sufficient extent to really classify them as being absolutely new. During the year two additional chassis which can really be classified as new were brought out. This gives a total of seven entirely new chassis which were not on the market a year ago. All of these have new powerplants and are the latest types under normal development. It is interesting to note that of the seven, five are four-cylinder and five have over-head valves.

Nothing radical is to be noted in any of these cars except that the leaning toward overhead valves is becoming stronger year by year. The conclusion cannot be avoided that an unqualified indorsement has been placed upon the overhead valve engine by the industry. The fundamental reason behind this development is naturally the effort to secure the greatest possible output from a given displacement. To secure high volumetric efficiency combined with a minimum loss through wall cooling a construction must be used permitting of the most direct entrance into the combustion chamber and of the most advantageous combustion chamber shape.

If we were to take all the American passenger cars on the market and strike a general average, the cylinder size would be 3½ by 5 in., and the average displacement, taking account of cylinder numbers, would be 269 cu. in. To look at this from the standpoint of engines of different numbers of cylinders, the following averages obtain:

No. of cyl.	Bore	Stroke	Piston Displacement
4	3.6	4.95	221
6	3.46	5.00	282
8	3.13	4.59	282
12	2.87	4.96	386

Contrary to what has been outlined as the probable future development of passenger car engines, the average engine is larger to-day than it was a year ago. The piston displacement is now 269 cu. in., as compared with 222 formerly. The gear ratio has been altered from 4.15 to 4.22, yet the increase in average tire size from 31 to 34 in. has prevented a large increase in the displacement per mile on high gear. A year ago this averaged 384 cu. ft. It is now 388 cu. ft. Thus, although actual engine displacement has increased, car ability as measured by displacement per unit of distance has not increased.

Overhead Valve Gaining

A census taken before the shows indicated an increase in overhead valve construction of 2.2 per cent with a corresponding reduction in L-head engines. The additions to the the list as brought out by new cars at New York and Chicago bring the increase in overhead valve engines to about 3 per cent. The percentage is rather lower than it ought to be, because the assembled cars practically all use L-head engines, due to the fact that the largest builders of stock powerplants confine their efforts to the L-head type. As each selection of an engine represents what might be called an engineering ballot in favor of that type, it is fair enough to take the chassis and obtain the average as given.

Probably one of the results of more carefully shaped combustion chambers, combined with a continued tendency toward larger valves, more scientific cam contours, better designed intake ports and galleries, and superior carburetion due to the development of the hotspot manifold and carbureter mixing chambers giving better velocities is that mean effective pressures have been increased.

More Radical Changes Next Year

If automobile factories get the opportunity to carry out designs which are being suggested by the changed attitude of automobile buyers, the changes made during this season will be more radical than anything in the last decade. There has been no incentive for the engineering department to make every inch of wheelbase return an inch of body space, riding comfort, or other concrete quality. The reason for this is that we have had more than enough wheelbase. At the present cost of materials and with the present objection of the public to carrying around any more useless car weight than is absolutely necessary, manufacturers are not going to be as wasteful of car length.

What can be done in this respect is hardly appreciated. For example, one concern which brought out an entirely new car this year shortened the wheelbase 7 in. and after rearranging the layout had as much room in the tonneau as in the previous model and 2 in. more in the front compartment. This result was not arrived at in an attempt to cut wheelbase length to the limit, but was more or less incidental to a design intended to be more economical than and equally good in performance as the previous model. With more passenger space and a smaller engine, a gain of 50 per cent in economy of fuel, and a large cut in weight, and a better performing car was secured. The improvement in performance covered acceleration, low speed torque, and speed range on high gear.

Engineering Talent Engaged on Other Problems

In an analysis of this kind, it is only fair to remember that it has been impossible to realize many of the anticipations of a year ago, owing to the fact that the minds of engineers who

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would ordinarily be on development work have been employed on the vast task of designing and making ready for the production of government necessities. Another matter which has retarded development has been the scarcity of materials which normally would have come into their own this year. Without doubt aluminum would have been employed to a greater extent than ever before, but the fact that it remains scarce and expensive has prevented its use on any but high-priced products.

To come to some of the details in which alterations have been made during the year, the detachable cylinder head is one of the most significant. All the new engines brought out during the year have this feature, and, in addition, makers who have not employed the feature before have adopted it. Two Detroit makers, one manufacturing a high grade twelve, and the other a high grade eight, have changed over to the detachable head, showing that its practicability is recognized on the V engine as well as on the vertical. The early difficulties have been solved and they have been found to be due to two main causes, either insufficient metal around the studs, or insufficient water space permitting circulation around the head. Care has to be taken that the tension on the cylinder head retaining studs does not distort the valve seat.

Cold Weather Starting Devices

For 3 years the fuel question has been exerting a highly important influence on engine design. This year there has been a crop of the so-called hotspot manifolds. There is no doubt that the use of these has resulted in a material reduction in the warming-up period. This is of considerable importance, as with the highly efficient choking devices employed on up-to-date carbureters, a stream of raw gasoline is drawn into the cylinder during the cranking period and naturally some of this is sure to leak past the piston rings, with the result that considerable crankcase dilution occurs, destroying the lubricating qualities of the oil.

Cold weather starting is engaging the attention of automobile engineers, and during the year many suggested means have been offered for solving the difficulty. Probably the most promising of these is the method by which a small electric coil is employed to heat a small quantity of gasoline, which is thus evaporated, throwing into the cylinder a drier product which facilitates combustion and lessens crankcase dilution. In one of these primers, the electric coil is in the float bowl of the carbureter, and in another a cylindrical well is employed of slightly larger diameter than the pencil shaped coil.

Single ignition has been continued and has been improved in detail. The battery, breaker mechanism and coil have all been improved. One concern has developed a battery in which rubber separators are used with threaded wicks which carry the active material in the desired manner. Both breaker boxes and coils are faster than ever, this being necessary to take care of the increased crankshaft speeds at which engines are running. Platinum and tungsten for breaker points are scarce, making it difficult for manufacturers to keep up the quality.

Engine Balancing

Engine balancing has been studied more carefully than ever and counter-weighted four-cylinder engines are more numerous than before. Inherent balancing in which the rotary balance of the shaft is taken care of in design is also meeting with favor. In connection with the crankshaft the question of lubrication naturally arises, and it is interesting to note that pressure feed for the main bearings is increasing. While the percentage does not show up very high, owing to the fact that there have been some new models added which neutralize the figure, the proportion of engines with drilled crankshafts is increasing. In practically all cars selling at a price which renders it possible to afford the cost of drilling the shaft, this method is being used.

Leaving the power plant and in examining the rest of the chassis, it will be noted that the average wheelbase has increased by 7 in. It is safe to assume that this will not be the case another year. The fundamental reasons noted at the beginning of this paper preclude the possibility of again adding weight unless there is a very good reason for doing so.

As a matter of fact, the 1917 chassis has not followed out the curve of weight reduction which past trends would indicate. The abandonment of alloy steel wherever it is possible to get a reasonably satisfactory substitute of carbon steel may have something to do with this. Another reason for increased weight is in the deeper frame sections which are now employed, although this depth is necessitated by the longer wheelbase. The increased depth has been accompanied by a tendency toward longer springs of the semi-elliptic type. The latter form of suspension in combination with the Hotchkiss and other drives is growing in popularity. There are now only three cars which use full elliptic springs. Three manufacturers also continue to use the platform spring, there having been a notable conversion in this respect by one of the concerns making twin sixes. Hotchkiss drive is used on 53 per cent of present-day American chassis.

Clutch Operations Made Easier.

Clutch adjustments continue to decrease. The success of the light types now on the market has been proved. The problem of securing the lightest and most efficient clutch to transmit a given torque has been studied very carefully during the past few years, and at the present time clutches are easy to disengage. The fact that with the powerful clutch springs the clutch pedal can be disengagd on some cars with the hand indicates how the travel of the engaging members has been shortened. The use of fewer disks has contributed to the shortness of travel and is one of the factors which is making clutches lighter.

In chassis fittings a marked trend toward the more extended use of forgings for brackets, axle parts, etc., has been somewhat checked by the abnormally high prices asked for forgings at the present time. The result of this has been a temporary tendency toward an increased use of malleables. Manufacturers have been forced, in some instances, to change from forgings to malleables and in a few instances from malleable to steel castings, simply because of the difficulty in obtaining delivery of certain parts.

Malleable Castings Replace Forgings

Further than this, in view of the present prices of forgings, malleables are being used for some parts where the size is a matter of convenience rather than of structural strength. In a great many trucks which ordinarily would employ forgings, practically all of the frame brackets, spring hangers, motor brackets, etc., are of malleable iron. All parts which are in tension, and particularly those which are under shock, such as shackle links, are made from forgings if possible, or else from steel castings.

For the vital parts of all trucks and passenger cars forgings will continue to be used. This refers particularly to such parts as axles, steering connections, propeller shaft parts, etc. It is this condition which has put a check for the time being to the big trend toward forgings and stampings, but as soon as the war is over and conditions are relieved it is certain that the forgings and stampings will once again come into their own.

A very prominent engineer in charge of motor truck construction in this country states that the following rules guide him in selecting cast steel, malleable and drop forgings for small brackets, axle parts, etc.:

1. Cast steel is used for more important structural parts that cannot be forged. It must be made fairly heavy to allow for segregation in the castings, blow holes, etc. It should really only be used for complicated pieces.
2. Drop forgings should be used where very great strength is required, with lightness.
3. Malleable iron should be used for unimportant structural parts, such as spacers, packing pieces and the like; parts where cast iron itself would probably be strong enough as regards the actual work to be done, but not strong enough to bear transportation and rough handling.
4. In general, it is a very wise rule to use forgings as much as possible, as after the first cost of dies, they are usually found to be cheaper and much more homogeneous.

Bodies generally have been altered only in exterior lines; the beveled edge is typical. There has been a slight ten-

(*Continued on page* 463)

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Express Service Over the Road By Motor Truck

Goodyear Has Seven Pneumatic-Tired Trucks Operating on Regular Schedule Between Boston and Akron—Round Trip, 1480 Miles in 6½ Days

By Joseph Husson

ONE of the greatest steps yet taken by any one company in the development of overland truck transportation has been made by the Goodyear Tire & Rubber Co., Akron, Ohio. That company began the operation of its first truck overland between Akron and Boston on April 9, 1917.

It now has seven trucks running overland between the same points on a regular schedule. What is even more important, these trucks have been operated through the deep snows of the present winter. Of course, there have been delays and interruptions of the service for short periods as required when breaking through new roads or when mechanical trouble on the trucks was encountered. But no truck that started from either end of the route has been forced to return and abandon the trip.

Tire Test Original Idea

The operation of trucks overland by the Goodyear company was started for a dual purpose. The principal reason was to test out the giant pneumatic tires being produced by the Goodyear company. The carrying of goods as a useful load was a secondary, but necessary, requirement in order that the tires being tested would have to undergo the same conditions as they would meet in actual service.

The makers of the first truck put into service, a 5-ton Packard, were very skeptical as to the feasibility of the project, but the Goodyear company insisted and finally started the vehicle on the first leg of its journey from Akron early in April of last year. The trip took 17 days. To-day the same truck and others of the fleet are making the identical run in 4 days, and in several instances a complete round trip of 1480 miles has been made in 6½ days. One of the late additions to the fleet, a 3½-ton Mack, recently made the trip between New York and Akron, a distance of 533 miles, in 60 hours, total time, and in 49 hours actual running time. The roads were deep with snow all along the route and the thermometer registered 13 below zero for a considerable portion of the run. Due to the fact that the truck was fitted with giant pneumatic tires all around, it was able to make a speed which would have been impossible with tires of the solid variety. Notwithstanding that the Pennsylvania mountains had to be crossed on the trip, the vehicle averaged 10.9 m.p.h. actual running time.



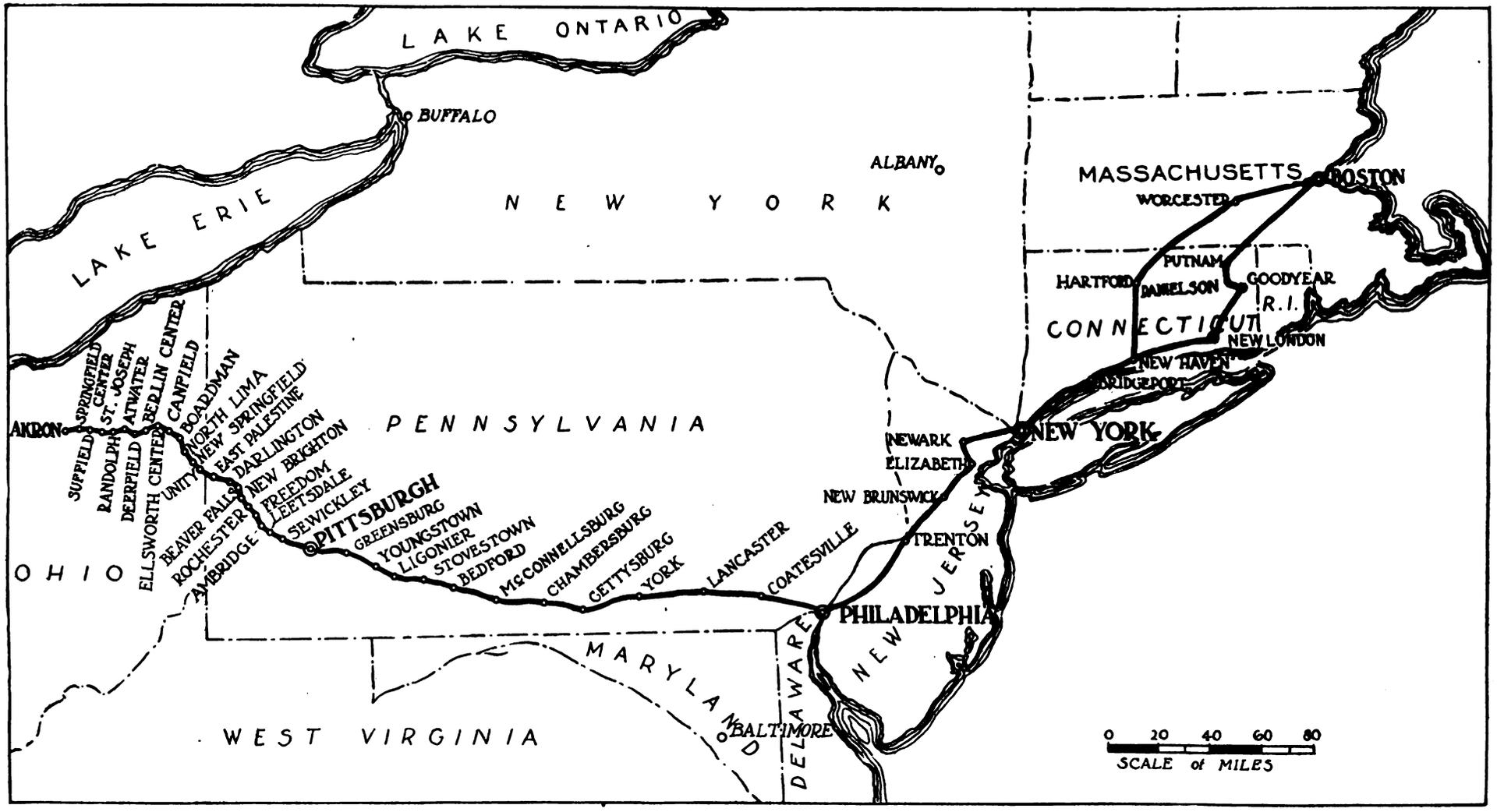
Two views of the 3½-ton Mack fighting its way through deep snows in the Allegheny Mountains. The upper illustration shows the great depths of the drifts and how they were cut through by the efficient Pennsylvania highway plows and men. The lower view gives some idea of the depth of snow on the level

Since the first truck was installed, the Goodyear company has added six others, the last going into service during the present week. Two 5-ton Whites were put into the work after the initial Packard had been bought. A 3-tonner of the same make was next added, followed by a 3-ton Packard. A 1½-ton White was then purchased, and recently a 3½-ton Mack. The latest truck to go into service is a second 3-ton Packard truck equipped with the engine usually fitted on the 5-ton size.

The experience gained by the Goodyear company during the 10 months it has been operating the trucks will go a long way toward making the opera-

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740-Mile Overland Route of Goodyear Trucks from Akron to Boston



THE southerly route taken by the Goodyear trucks as shown above, and which passes through Pittsburgh, Philadelphia, Trenton and New York City, is much longer than a route from Akron along Lake Erie and thence across New York State to Albany and east through the Berkshire Hills through Worcester to Boston. Still, it had to be followed, even though it costs more to ship goods a greater distance than a shorter distance, because of weak bridges and poor roads.

From North Lima eastward the route is the same as that followed by the Government war trucks now being driven from Detroit to Baltimore, except that the Government trucks leave the route at Gettysburg for Westminster, Md., and thence through to Baltimore. From Rochester, Pa., the route shown is the same as the Lincoln Highway.

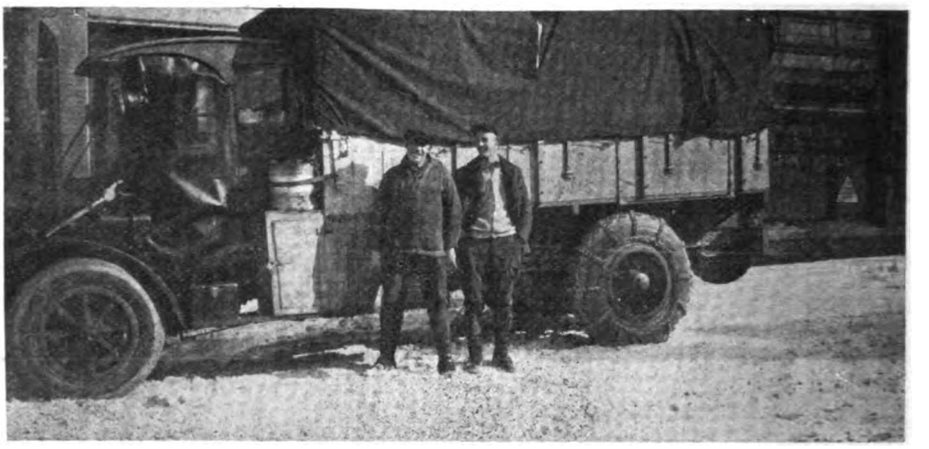
From Philadelphia the route leads up through New England as shown, passing through Hartford and Worcester to Boston on the eastward trip with tires to the Boston branch and returning by way of Putnam, Danielson to Goodyear, Conn., where a load of tire fabric is picked up and carried back to the Goodyear factory in Akron. The complete run from end to end is 740 miles long.

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tion of any additional trucks it may purchase more successful than ever before.

Saving Time All Important

Of course, the giant pneumatic tires have played a large part in the successful operation of the trucks, in that they have made possible greater speeds than could have been secured with solids. Greater speeds mean a saving in time, which after all is the fundamental principle because of which the transportation of to-day has advanced beyond that of past centuries. Time is becoming more and more important in the transportation of the world's goods. While it is infinitely cheaper, for instance, to ship goods by sailing vessels than by steamships, very few of our large industrial corporations find it worth while to trust the delivery of their goods to the will and caprice of the winds. Instead they prefer to ship by steamer, even though the cost is high, because of the reliability of delivery.



The 3-ton White on its way across country. Note the ordinary cab fitted, the extra tool box and tank on the runningboard. Giant non-skid chains are used on the rear tires, as shown

While of course the present delay in rail shipments is due to unusual congestion, set up by abnormal war conditions, it is the same time element which will be one of the greatest factors in the further development of overland haulage by motor trucks.

The cost per ton delivered will also be of great importance, and the pneumatic tire undoubtedly will prove to be one of the main factors in reducing the cost because of the greater speeds which they make possible and because of the lesser amount of repairs required on account of the greater cushioning which they provide for the truck mechanism.

The 10 months of operation of the Goodyear trucks brought to light many needed improvements not only in the tires undergoing experiment, but also in the trucks themselves. At first there was much tire trouble and the beading was found to be too weak to withstand the loads carried. Many of the tires were removed before their full life had been run and then cut apart to see what effects the wear had produced. Tire sizes and inflation pressures, side wall thicknesses and other points of construction were worked out as a result of the first trips made early last spring. As a result the tires now in use are giving satisfaction, although the experimentation is still being carried on with tires of even larger size, including 48 by 12 on the 5-ton trucks.

Speed and Power Essential

In the trucks a need was found for both speed and power. Due to the many steep ascents and long pulls which had to be encountered in the Pennsylvania mountains, it was found that the engines had to be more ruggedly constructed than those which were giving eminently satisfactory service under average conditions or on city streets. One particular part of the engine which gave considerable trouble at the start was the connecting-rods, which were in one or two cases twisted off and smashed the crankcases when they let go. The engine of the initial truck experienced this trouble and a new engine fitted with heavier connecting-rods has since been in continual service without giving any trouble.

On some of the down grades of considerable length it was found that the engine attained too high a speed when used as a brake and this condition made itself felt especially on the connecting-rods.

5-Ton Engine in 3-Tonner

The reason why the latest 3-ton addition to the Goodyear fleet is equipped with an engine of a size usually fitted on a 5-ton truck of the same make is to secure greater power and, at the same time, greater speed. The experience of the Goodyear company has been that the average engine fitted in the average 5-ton truck is not sufficiently large to pull a 5-ton load at the speed which pneumatic tires make it possible to run.

The question of the most economical size of load to haul has not been answered as yet, although the Goodyear company is running 1½, 3, 3½ and 5-ton trucks. It is entirely probable that continued experiments with the trucks will make it possible to reduce the sizes of some of the truck parts on account of the use of pneumatic tires, and at the same time carry the full load for which the vehicle was designed. The use of a 5-ton engine in a 3-ton truck fitted with pneumatic tires gives promise of securing some very valuable facts which will bear an important part on the future development of high-speed trucks for overland work.

SCHEDULE OF GOODYEAR TRUCKS FROM AKRON TO BOSTON

READ DOWN ACCORDING TO DAY OF TRIP START							City	TIME Arrive	TIME Leave	Miles	Remarks
Sun.	Mon.	Tues.	Wed.	Thur.	Fri.	Sat.	Akron	.....	6.00 a. m.		
"	"	"	"	"	"	"	Beaver Falls	3.00 p. m.	3.30 p. m.	90	Fill with gas.
"	"	"	"	"	"	"	Pittsburgh, Pa.	6.30 p. m.	7.00 p. m.	120	
"	"	"	"	"	"	"	Greensburg, Pa.	11.30 p. m.	12.00 p. m.	151	Fill gas. Telegram.
Mon.	Tues.	Wed.	Thur.	Fri.	Sat.	Sun.	Bedford, Pa.	10.30 a. m.	10.45 a. m.	216	Fill gas. Telegram.
"	"	"	"	"	"	"	Chambersburg, Pa.	7.00 p. m.	7.30 p. m.	270	Fill gas. Telegram.
"	"	"	"	"	"	"	Gettysburg, Pa.	10.45 p. m.	10.45 p. m.	300	
Tues.	Wed.	Thur.	Fri.	Sat.	Sun.	Mon.	Lancaster, Pa.	5.00 a. m.	5.30 a. m.	356	Fill gas.
"	"	"	"	"	"	"	Philadelphia, Pa.	11.30 a. m.	12.00 a. m.	404	Eat.
"	"	"	"	"	"	"	Trenton, N. J.	3.30 p. m.	4.00 p. m.	443	Fill gas.
"	"	"	"	"	"	"	New York, N. Y.	10.00 p. m.	.....	504	
Wed.	Thur.	Fri.	Sat.	Sun.	Mon.	Tues.	Bridgeport, Conn.	3.30 a. m.	4.00 a. m.	560	Telegram. Fill.
"	"	"	"	"	"	"	Hartford, Conn.	9.00 a. m.	.....	617	
"	"	"	"	"	"	"	Springfield, Mass.	1.00 p. m.	1.30 p. m.	643	Fill gas.
"	"	"	"	"	"	"	Worcester, Mass.	6.00 p. m.	6.30 p. m.	700	Eat. Wire.
"	"	"	"	"	"	"	Boston, Mass.	10.00 p. m.	.....	740	Wire.

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A drift as high as the top of the truck. Note that the snow-removal work has been well done so that serious delays are avoided

The Goodyear trucks are now running on a 24-hour per day schedule except for the time required for the men to eat and to fill the fuel and oil tanks of the trucks. This has been made possible by providing two drivers, one of whom sleeps while the other drives. The sleeping compartment runs crosswise of the truck body directly in back of the driver's seat, and is entered through a sliding door in a partition extending to the roof. The sleeping compartment is well ventilated and is provided with a regulation single bedspring and mattress. The floor of the compartment is about 2½ ft. from the floor of the truck body and extends out into the truck body proper. Its rear side is boarded up so that there is no communication between the compartment and the truck body except by getting down onto the driver's seat and walking around to the truck tailgate at the rear. The space beneath the floor of the sleeping compartment is made use of to carry a portion of the load.

Pneumatics Make Sleeping Comfortable

While at first it might seem that sleeping on a 5-ton motor truck would be one of the most uncomfortable things a person could do, especially when the truck was traveling over rough roads, the drivers do not find it impossible because of the use of the large-sized pneumatic tires which make the truck ride almost as easily as some of the heavier makes of passenger cars.

The schedule of the runs in each direction is given on pages 458 and 459, and is laid out for a 4-day run in each direction. The trucks carry finished tires from the Akron factory to the Boston branch and other branches en route as required, and then run from Boston to Goodyear, Conn., where a load of tire fabric is picked up for the return trip to Akron. The drivers do not stay over at the eastern end of the route, but begin the return runs immediately. On arrival at Akron, each driver is given 2 days off before the next trip east is begun.

The route taken by the trucks, as indicated on page 458, is very interesting in that it is by no means the shortest route between Akron and Boston. A much shorter trip could be made by following the lake shore to Buffalo and thence down the Mohawk and Hudson River valleys to Albany, and thence across Massachusetts to Boston. Before the present route through southern Ohio, Pennsylvania and New Jersey was determined upon, the Goodyear company made exhaustive studies of both routes and found that it was not feasible to run 5-ton trucks on the Mohawk and Hudson valley route because of weak bridges.

Poor Bridges Lengthen Route

On this account considerably greater mileage now has to be covered than is necessary, and this, of course, adds to the cost of transporting the material. These conditions bring out very forcibly the great need for suitable motor truck roads, as pointed out time and again in articles appearing in these pages.

In the further development of overland truck haulage at times when the railroads are not so congested as at the present moment, the necessity for running over the shortest distance between any two points will be of paramount importance because of the cost factor, especially when the time element is not the most important consideration. The present route, as shown on page 458, differs from the route originally selected when the service was first established in that it takes a more southerly course between Akron and Youngstown, Ohio.

The latter change was made necessary by trouble encountered on an especially poor stretch of unimproved roadway outside of Akron for a distance of 10 or 15 miles. During rainy periods this road became almost impassable and caused such a large number of delays that it was found advisable to change the route slightly. A stretch of the poor road formerly covered is shown in the illustration appearing at the top of page 460.

SCHEDULE OF GOODYEAR TRUCKS FROM BOSTON TO AKRON

READ DOWN ACCORDING TO DAY OF TRIP START							City	TIME Arrive	TIME Leave	Miles	Remarks
Thur.	Fri.	Sat.	Sun.	Mon.	Tues.	Wed.	Boston, Mass.	Unload	3.00 a. m.	740	
"	"	"	"	"	"	"	Goodyear, Conn.	9.30 a. m.	2.30 p. m.	826	Telegram.
"	"	"	"	"	"	"	Danielson, Conn.	3.00 p. m.	3.30 a. m.	831	Fill.
Fri.	Sat.	Sun.	Mon.	Tues.	Wed.	Thur.	Bridgeport, Conn.	3.00 a. m.	3.30 a. m.	940	Fill. Telegram.
"	"	"	"	"	"	"	New York, N. Y.	9.00 a. m.	.....	996	Fill.
"	"	"	"	"	"	"	New Brunswick	1.00 p. m.	1.30 p. m.	1037	Fill. Telegram.
Sat.	Sun.	Mon.	Tues.	Wed.	Thur.	Fri.	Coatesville, Pa.	12.00 mid.	12.30 a. m.	1133	Fill. Telegram.
"	"	"	"	"	"	"	Fort Louden, Pa.	11.00 a. m.	12.00 a. m.	1250	Fill. Telegram.
"	"	"	"	"	"	"	Bedford, Pa.	5.00 p. m.	5.30 p. m.	1291	Fill.
Sun.	Mon.	Tues.	Wed.	Thur.	Fri.	Sat.	Greensburg, Pa.	3.00 a. m.	4.00 a. m.	1359	Fill. Telegram.
"	"	"	"	"	"	"	Beaver Falls	10.00 a. m.	10.30 a. m.	1419	Fill. Telegram.
"	"	"	"	"	"	"	Akron, Ohio	10.00 p. m.	.....	1510	Stop.

TYPE OF TELEGRAM

Mr. M. D. Scott, Name of city and date.
Goodyear Tire & Rubber Co., Akron, Ohio.
Arrived Pittsburgh seven thirty p. m. OK
(Signed).....
If for any reason you do not keep up to schedule, report same in daily wire to Mr. Scott.
Scott's telephone, No. 969-W-3. To be used in case of accident or late telegram.

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A poor stretch of road 25 miles east of Akron gave much trouble until the route was changed

At first it was believed that it would be impossible to operate the trucks all year around on account of the deep snows encountered on both sides of the Allegheny Mountains as well as in the Ohio flatlands. This difficulty was really overcome to a great extent because of the fact that the route over which the Goodyear trucks are running is in part the same as that selected for the overland drive-aways of government war trucks from Cleveland and points further west, except for a short stretch between Youngstown, Warren and Ravenna, Ohio, as followed by the war trucks and the more southerly route as previously mentioned and taken by the Goodyear trucks. From Beaver Falls east to New York the route is laid over the Lincoln Highway, which passes through Ohio, Pennsylvania and New Jersey. The steepest grades encountered are mostly in the State of Pennsylvania, where the route crosses the Allegheny Mountains. It was at these points that it was expected the greatest difficulty would be encountered. The anticipated trouble was avoided because of the splendid manner in which the Pennsylvania highway authorities kept the route open as a war measure to assist in the delivery of the government war trucks.

Pennsylvania Snow Removed

Pennsylvania took a leading part in the snow-removal work and arranged for new methods, new appliances and new schemes to keep the roads clear. This work was carried out under the drection of W. D. Uhler, chief engineer of the Pennsylvania State Highway System. His department is kept fully informed at all times by the Pittsburgh weather bureau as to weather conditions and approaching storms.

As soon as word was received of the approach of a storm the maintenance division immediately sent notices to the various engineers through whose districts the State highways passed. They in turn arranged to have their men and equipment ready so that no time was lost in fighting the storm. They worked on the principle that it was better to fight the storm while the snow was still falling than to wait until it had become packed hard.

The equipment used consisted of horses and scrapers, motor truck snow plows and a goodly number of able-bodied shovelers. Some of the equipment employed and the manner in which the roads were cleared of snow are shown in several of the accompanying illustrations.

Mechanical equipment was used in every case where possible, and in some instances both day and night shifts were provided in order to have the road cut through heavy drifts before the truck trains arrived.

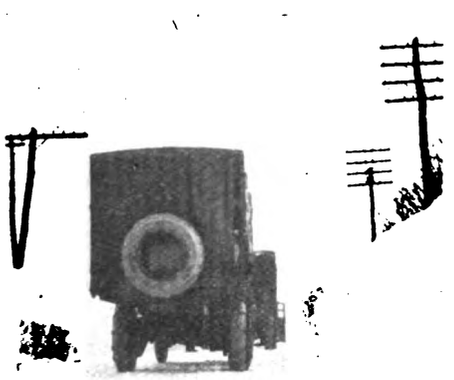
Trucks Equipped with Shovels.

At points in Ohio and New Jersey, where the roads were not so well cleaned, the truck crews oftentmes had to perform some of the snow removal work, and all of the Goodyear vehicles were equipped with shovels and other necessary implements for doing it.

With the advantages of overland motor truck transportation brought home in such a convincing manner this winter, and the work which has already been done toward the removal of snow off the main roads in the rural districts, those owners of trucks who operate them over the roads next winter will undoubtedly find conditions conducive toward more economical operation.

Of course overland haulage during the winter months, especially during the extremely cold periods, is a strenuous service and demands that the greatest possible comforts be given the drivers. The Goodyear company has met these conditions by fitting a closed-in cab on each of its trucks and by providing a heater so that the cab may be kept at a temperature sufficiently high to prevent driving and sleeping from becoming a hardship. It also found it necessary to provide a winch on each of the trucks together with 500 ft. of rope, block and tackles, etc., in order that a mired truck might be extricated with the least difficulty.

The Goodyear company carries full loads both ways on each of its trucks, and this condition will have to be satisfied in the future development of overland hauls for such distances in order that the cost may not become altogether prohibitive. As the work extends to larger and larger fields, it will undoubtedly divide itself up into two main classifications. These include, first, the use of privately owned trucks such as those of the Goodyear company, carrying Goodyear goods, and, second, the employment of commercial vehicles operated by specialists solely in overland haulage.



Over the crest of one of the many mountain grades. Note how the spare tire is carried on the tailgate



The loaded truck reaching the end of the improved road between New Springfield, Ohio, and Beaver Falls, Pa.

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Must Prepare Now for After-War Trade

Scarcely Any Portion of World but Will Look to United States—Manufacturers and Industries Must Co-operate for Export Business —Importance of American Merchant Marine Now Coming Into Being

By J. K. Clark

AN ATTEMPT to outline to-day, even in the most general fashion, any phase of international trade after the war is bound to meet with disapproval from more than one quarter. There are those who cry treason whenever a thought is given to any subject except the pursuit proper of the war, while others object to such an attempt as above indicated on the grounds that so many conditions of life and industry after the war are impossible to forecast to-day that all speculation on the subject seems useless.

Those in the first group include many of those who, while sincerely patriotic, refuse to see any need of preparedness up to the very moment when war could no longer be averted, and whose viewpoint has been proved to be shortsighted. The second class of objectors can be answered by pointing to the many new features in industrial and commercial life which the war has brought forth in every country and which are bound to continue after hostilities will have ceased—such as the generally standardized production and distribution of public necessities, the increased centralization of government in each country and the tendency to make every land able to exist on its own native resources as far as possible; finally, to the fact Germany has shown to the world the value of preparing for war in times of peace, and is even now preparing in many respects for the day when international commerce shall once more be resumed. Nor is Germany alone in this class; Great Britain, France and Japan are making keen efforts to be ready for that future time. It would be criminal if America in this regard, too, should lag behind and be required to start future world trade with a handicap.

Expects Closer Combinations

Indications are that standardization of production will by far surpass the state which obtained in our industries four years ago, that quantity manufacture of many articles will be desired because of the new and grander scale on which our factories have learned to work since 1914. With a better regulated financial and transportation system which the war has given us, production and distribution in this country will be much easier, provided there is a sufficiency of capital. Combinations of industrial interests will be looked upon with more favorable eyes by public and government; and industrial policies, planned ahead for considerable periods, will become possible as never before. Very likely, ours will be a much improved merchant marine compared with the days before the war, and it will be the part of the government to so regulate the relations between shipping and seamen's interests as to develop our overseas trade to best advantage.

These conditions will exist no matter how long the war lasts. America will be financially and industrially the strongest country in any case, partly because the United States had to stand three years less of war's burdens than any other nation, partly because its resources are superior.

Turning to the world market, it will be necessary to divide it in a number of regions, which shall be discussed one after the other. They are, beginning on this continent:

Canada; Mexico and Central America; South America; Great Britain; France, Spain and Italy; Germany, Austria-Hungary, Bulgaria and Turkey; the Balkans south of these states; Scandinavia; Holland and Belgium; Russia and Rumania; British Africa; French Africa; India; China; Japan; Australasia.

Canada in Pan-American Group

Canada will be drawn more closely into an official or unofficial Pan-American group of states and will find reciprocal freedom of trade to greater advantage than before the war. With ocean freight rates rising more than railroad rates, and following the universal necessity of economy, it will be easier to deal with the Dominion.

It is fair to assume that the Mexican problem, like so many others, will be solved through the war. In this case the United States is geographically and financially in the best position; already our interests in Mexico are of imposing magnitude and peace will increase rather than decrease them. Considering its natural wealth, Mexico's indebtedness is very small, and as soon as a fairly stable government is developed there, trade will be relatively easy yet profitable. As to Central America, there is every indication of our relations with these states growing more intimate every year.

With an ample merchant marine there should be no difficulty in building up a huge South American trade. This applies especially to those countries which are interested in commerce via the Pacific, where it will take the energies of both Americas to hold their own against keen Japanese competition. Industrial advance in South America will probably reduce the present insularity of the countries and bring Brazil and possibly Peru and Paraguay into closer affiliation with the leading European countries than with North America. One factor which will make South American trade easier, speaking generally, is that the war cannot fail to strengthen that continent's commercial ties with Europe and Asia, develop their industries and make them financially stronger so that in dealing with them long-time credits will not be as necessary as heretofore. Likewise, a great deal of provincialism still existing there will vanish; it will be easier than formerly to do business in the English language.

The trade with Great Britain and Ireland will probably be somewhat lessened after the war. The United Kingdom, if it wishes to re-establish its former dominating position as a creditor nation, must draw as far as possible on its colonies for raw materials and half-finished products. Likewise, if England is to retain the

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commercial leadership on the sea, she must lay the greatest possible stress on the lines of communication between the Isles and the British colonies, but also with South America, Russia and the Far East. Naturally, sound business sense will force the English to tranport most of their imports on their own merchantmen, of which fewer can then be directed to plying between England and the United States than before the war. Trade with Great Britain will be much more in meat, copper, hides and similar merchandise than in finished products of any sort, and in these goods trade will possibly be smaller than five or ten years ago.

Increased Field in Europe

An increased field of foreign commerce awaits us in Western Europe—France and Spain, as well as Italy. The two countries among these which are now belligerents will naturally prefer, unless price makes it impossible, to deal with America than with Central Europe, or even via Central Europe with the East. Both France and Italy have been less able or forced to develop the enormous automobile industries which have sprung up during the war, here, in England and in Germany; and with their supply of horses diminished and few automobiles emerging from the war capable of further service, they will represent excellent markets, if they are given a fair credit. Spain is in a similar position, because she is removed from the industrial centers of Europe, and having built up a notable merchant marine of her own, will be able to buy here in great quantities and transport her purchases more cheaply than she could by rails over a few hundred miles. Therefore, Spain should offer a splendid market.

Germany and her present allies will probably continue to be more or less closely affiliated in a commercial way, except if the war is continued to the point of their absolute ruin. Unless indications are very misleading, Germany is even now preparing to make up for the losses in her merchant marine, and is said to have built many vessels already. If so, she will commence heavy buying, not only of raw materials, but also of all such finished products which the world market affords at relatively low price—for instance American automobiles and machinery—so as to release the greatest possible proportion of her own production for the markets in Eastern Europe and Western Asia, South America and the Far East. All the sentiment in the world will not be able to prevent this; for Germany is in a favorable position to pursue such a policy, due to her having husbanded her gold during the war.

Might Find German Market

As maximum sale and production is the principal means whereby we may best hope to assume and maintain a leading position in any special world market, the United States automobile industry is likely to engage in such a trade, even if it be to Germany's advantage temporarily; for the latter country will, based upon developments there during the war, so organize her finance as to release a maximum of credit for foreign trade, basing internal commerce principally upon government regulation and "clearing-housing" of materials and good-will. Austria-Hungary will, very likely, be very much under Germany's control; while Bulgaria is likely to try and retain as much independence as possible by keeping in touch with the international, and not only the German market. With Turkey, there is also a possibility of coming to commercial arrangements in spite of German influence.

It is a safe assumption that the southern Balkan states, Serbia, Montenegro, Albania and Greece, will be in a state of full independence after the war, and, offering free access to trade from land and sea, the law of supply and demand will hold valid there in a broad way. Each of these countries will, as Asia is invaded from East and West, be transformed from a purely agricultural condition to a state of budding industrialism, offering a fruitful market to the foreign producers of divers modern machinery. In a section as mountainous as the Balkans and now deprived to a large extent of its former means of animal transportation, there will be a strong demand for motor vehicles, especially since the railroads which these countries require for their development cannot be constructed as rapidly as needed. Of course, business there will call for long-term credits; but with a certain amount of business regulation by representative governments there should be no reason why such credits could not be extended.

There still remain to be considered the Northeastern countries of Europe. The Scandinavian countries, Denmark, Sweden and Norway, have been forced by the war to form a kind of entente cordiale, which most likely will survive the war in some form or other for the sake of economic benefits. Trading arrangements and conditions in these countries will be very much alike. All three will, provided they continue to remain neutral to the end, be as progressive and as prosperous as any in Europe, and in need of, as well as able to buy, plenty of modern equipment of every sort.

Holland Buys Diplomatically

Holland, while economically as strong as the Scandinavian countries, will have to maintain well-balanced business relations with both sides of the present belligerents, due to her geographical position. She will always require many products she herself is unable to turn out; but being forced to keep on the best possible terms with everybody, her buying will not be guided by purely business considerations alone. The chances are, however, that general satisfaction will best be maintained by her buying certain raw materials and finished products from one country and others from another—say, cotton, wheat and machinery in England and America; and coal and its divers products, sugar and rails in Germany. These examples are, of course, taken rather at random and only for purposes of illustration.

Belgium, even if she should desire to maintain a similar basis of free or equal trading, is bound by such strong ties to America and her allies that her business will be principally with these countries. With a seaboard of her own, and at least Great Britain backing such a policy, she will probably keep as well separated from Germany as any country in Europe. Belgium is a prosperous country under normal conditions, which the peace arrangements undoubtedly will restore, and the work of reconstruction will create a manifold market there, in which American trade is bound to share to a very large extent.

Russia at this moment is rather an unknown quantity; but order is bound to return, and with order must come a period of unprecedented advance. Already Russia is preparing to develop an efficient railroad net. The land is being so redistributed as to make possible profitable farming by its small owners who will be ready to invest in all modern devices rendering their lives broader and more enjoyable. Indeed, before the war, the Russian masses were highly conservative; but even before the revolution, war itself, and the contact with Germany and her up-to-date methods, had served to educate the Russians to the meaning of the twentieth century, technically speaking. There will be a wonderful market there for those who understand conditions and have foresight

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enough to develop the correct ways and means of dealing with them.

As for Rumania, she will be economically an appendage, either of Russia or of Germany. A great deal of her needs will come from the latter country, but as Rumania possesses a coast in the Black Sea (which body of water will be brought to greater importance by Russia's becoming a commercial nation), she will have an opportunity of ample overseas trade.

Africa Expanding Market

The African colonies of Great Britain and France will very likely attain a somewhat greater liberty than heretofore, and a great many requirements of their further evolution will be supplied by the United States. The colonies will *have* to be developed as rapidly as possible, and France and England will welcome any help from without that renders them powerful markets within the shortest possible time. To reach this point, the colonies will have to be possessed of modern industries, carried on by modern machinery, which America can cheaply and rapidly supply.

With the minimum of shipping the world will have ready when the war ends, Australia will have to deal with her nearest neighbors as far as possible—and here is the chance for America and Canada. There should be opportunity for similar agreements between the United States on one hand and each of these colonies on the other; and to a certain extent England will acquiesce in, if not support, such a policy; at least for a limited length of time.

Finally, there are Japan and China. The war has strengthened very much the ties which bind the latter to the former and, while the once open door may still be ajar, it will take the co-operation of the Western powers to keep it so. Japan is to-day in a position to depend on herself, or almost wholly so, and she is rapidly developing Chinese resources which are of service in this respect, and of course tends to monopolize Chinese resources as far as possible. Needless to say, China's development must soon reach a point where, in consciousness of her own advantage, she will demand and receive in a fair measure the blessing of the open door, which has been curtailed more and more since the day Japan entered the war. When China reaches this stage the nearest hand she will be able to grasp will be that of America; and it is to prepare for that time to which our efforts must be directed.

Undoubtedly, after gaging the divers conditions, opportunities and peoples of the countries of the world, it must be granted by even our ultra patriots and commercial pacifists that we must give some thought to the methods of the near future. Attention has been called by several writers, especially by former Ambassador Gerard, to Germany's after-war plans. They include industrial combinations for collective buying and selling abroad, and it goes without saying that unless we want to be the losers Greek must meet Greek. Individual firms must deal with other countries through government-controlled agencies for buying and selling, and the hand of the government will insure the general public against ill use of their combinations by such firms.

Centralize Exports

For instance, all automobile manufacturers desiring to export to France should act through a central agency and exhibition in Paris, with possible branches in other large cities, familiarizing the French public with our wares. If Frenchmen desire to buy here direct they will do so through a similarly organized "purchasing embassy," whereby neither party is at an advantage or disadvantage by its or the other's monopoly.

It is for developments along these lines that we must now begin to prepare, lest they are to surprise us when they come about. The manufacturing, distributing and governmental influences should now begin to work hand in hand toward the planning of efficient organizations whereby an ever greater world trade can be built up.

Automotive Design and Transportation as Developed by the War

(*Continued from page* 455)

dency toward improvement of the front compartment, a thing which has been fought for in some quarters very strongly in the past three years. Where there has been additional space gained, this has usually gone into the front compartment rather than the rear. The remarks which were made a year ago regarding the front compartments, however, still hold good to a large extent. The driver's seat is generally comfortable after he has seated himself, but while entering and leaving the seat the driver is apt to be uncomfortable.

The color situation is a little better now than it was a year ago, although it is not so easy to secure the desired pigments even now. There are a number of brighter colors now in evidence, showing the tendency toward individuality, particularly among concerns which make in the neighborhood of ten to fifteen cars a day.

One of the tendencies which may be predicted in body design is that the cars of the future, at least of the touring variety, will be of the two, four or six-passenger type. This is highly desirable from the standpoint of beauty of outline, as it gives a car which does not have to have the rather unsightly wheel housings. A two, four or six-passenger body can be swung between the rear wheels, giving a narrow gas line.

Manufacturers will do very well to put out a few special bodies wisely scattered through the country on their stock chassis. There is always a market for these cars that act as potential advertising for the company and can always be sold at a figure leaving a handsome profit. The dealer welcomes a car of this kind for his show room, and it has been the experience of companies that have made these cars that there is always a great amount of competition between the dealers as to who is to be the one to get the special body.

There is still room for improvement in door fitting, judging from an inspection of the cars on the floors of the show. This same condition held true last year. Doors will be tight on one side of the body and loose on the other. The shape of the backs of the seats can also be further improved, as the bulge of the back should fit the body. With respect to closed cars, and particularly the convertible type, we seem to be in an era of uncertainty. Manufacturers do not know whether the majority of buyers want a permanent pillar or a removable pillar in the sides of the touring sedan models. This popular car has had a large sale this season and will continue to have equal success next year, according to present indications. There has been a considerable amount of argument in favor of the permanent pillar, in that it can be made lighter and at the same time more substantial. This seems to be a matter for education on the part of the purchaser as well as development by the manufacturer.

Summing up the entire situation, it may be said that we have entered upon a new era. The improvements in design up to the present will serve as a valuable guide in the new period which the war has brought on. The car which will carry its load with the least surplus weight, with good acceleration ability, without undue length, with an engine of ample but not excessive displacement, and which will give the utmost in performance and comfort for the money expended will be the one which will best meet the new conditions.

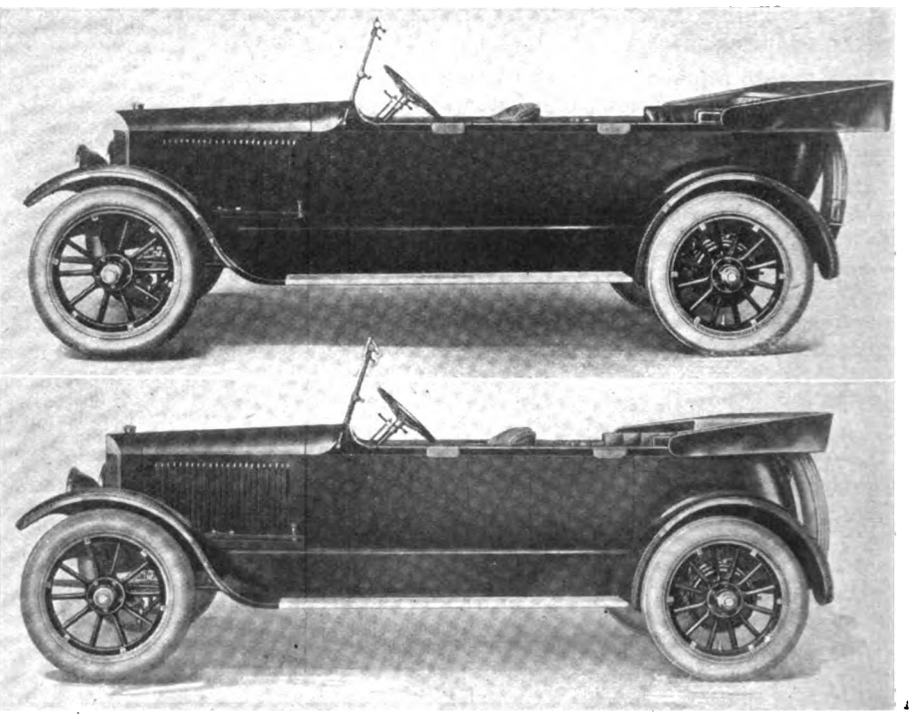
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The Stanley Steamer in New Form

Fitted with a Body of Modern Design of Either Four or Seven Passenger Type—Piping System Greatly Simplified

A NUMBER of detail changes have been made in the Stanley steam car for this year which have made it a considerably improved product. Probably the most radical changes are in the body and in the piping system. The body has been brought thoroughly up to date and is now an example of the straight line type, designed by George J. Mercer, who is well known as a contributor to AUTOMOTIVE INDUSTRIES. The cowl has been raised, as has the hood, making the radiator higher. The V shape at the front of the radiator has been made sharper so that it now has what is known as the Mercedes line. The remaining part of the car is of the straight sided, flat, beveled edge type with square corners on the doors, full crowned fenders and a cowl board for gages, speedometer, etc. The windshield is sloping.

Instead of making the car in three-, five- and seven-passenger styles as previously, only two bodies are offered now, the seven passenger and a four passenger. There is no roadster model and no five-passenger model. The four-passenger model has both front and rear doors and where the back has been moved up to make it close-coupled, a sweep has been given the back, giving a modified turtle back.



Seven passenger and four passenger Stanley cars

From the owner's standpoint probably the biggest change is in the electric device for heating and igniting the pilot vaporizer. This operation was formerly accomplished by means of a Prest-O-Lite tank. This has been done away with, however, and current is now furnished by a Willard storage battery to a resistance coil controlled by a button. The arrangement is such that the current cuts itself out after its mission has been accomplished. With this modification of the burner it is now possible to use kerosene in the pilot. If desired, however, gasoline can also be used or a mixture of the two fuels. Pilot burner and vaporizer are now a unit and can be easily removed at any time without disturbing the burner.

Piping System Redesigned

From an engineering standpoint probably the cleaning up of the chassis is the most noticeable improvement in this year's Stanley car. By redesigning the piping system it has been possible to reduce the total length of piping by about 60 per cent. The piping itself is now also standardized as to size and fitting and the units themselves have been made much more accessible.

In the fuel line the vaporizer coil has been omitted and the so-called master valve as well. The fuel line is controlled by the main burner valve on the instrument board, which not only does the work of the fuel valve, but also incorporates the work of the master valve. The pressure tanks on the fuel system have been moved forward and are now in front of the pump box. This cuts out a complete return piping system to these tanks and shortens the connection very considerably.

In the water system the piping has been standardized as to size and is now 7/16 in. throughout. The front and rear pumps are now interchangeable and the system has been improved so that any sound or water hammer is impossible regardless of the car speed. The pumps are connected so that they now work together instead of independently as before, and this has simplified the water line considerably. The three-tube water indicator formerly employed has been replaced by one of new design of the float type, which always indicates the correct level of the water whether the car is under steam or not.

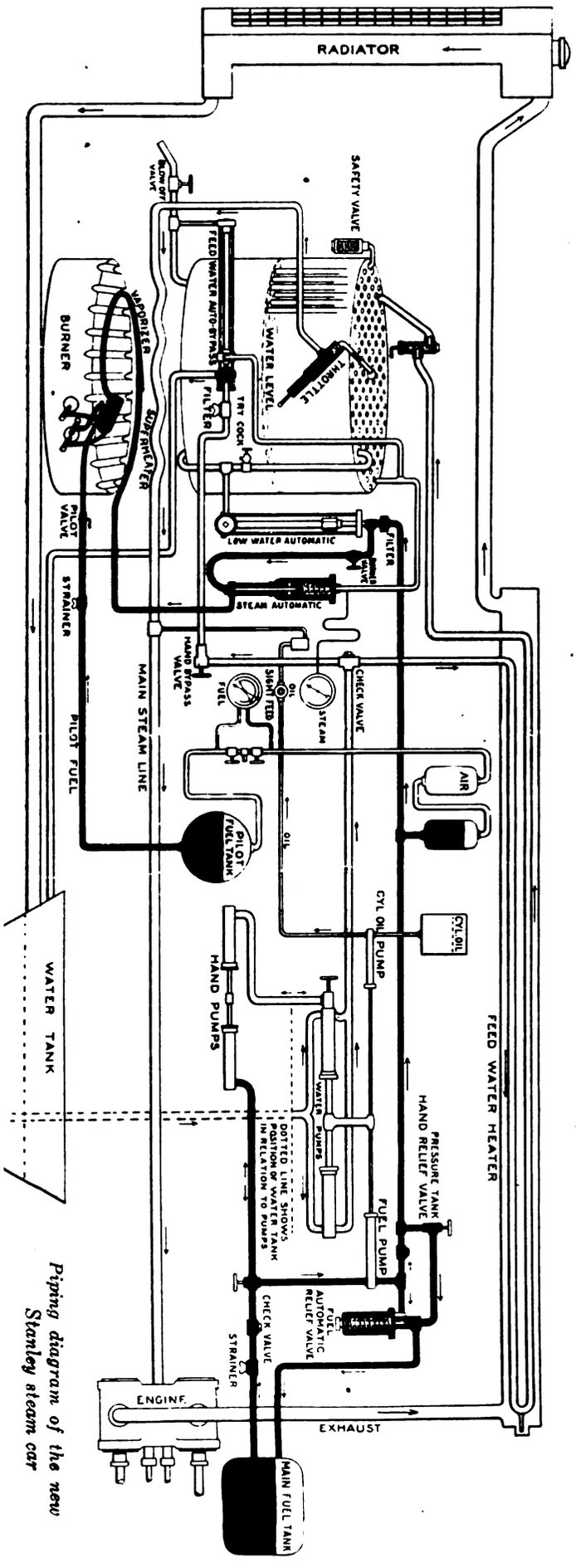
The piping diagram herewith shows the new system completely. It should be pointed out that this is in diagrammatic form and that on the car the units are somewhat differently located than in the illustration. For instance, the water tank is right beside the power pump, instead of below, as indicated in the diagram. The rear by-pass valve has been eliminated, and both the rear and front water pumps are controlled automatically, so the driver no longer needs to use a rear by-pass valve as heretofore.

Very few changes have been made in the steam system. One important change, however, is in the super-heater, which is now arranged in a series of parallel loops instead of a coil, as heretofore, and the steam on leaving the super-heater goes direct to the engine instead of passing up through the boiler. With this arrangement a greatly improved job is obtained, from an accessibility standpoint. The whole super-heating system can be taken out by removing three bolts, and without disturbing the burner. The super-heating tubes, furthermore, are made of an improved heat resisting metal, that is practically unaffected by the continued high temperature under which they operate.

Fuel System Rearranged

The fuel system has been greatly simplified by moving the pressure tank up to the pump. This places the units of this system in the most direct arrangement and the air pump line to the pressure tank is only 18 in. long instead of being the entire length of the chassis. The fuel automatic is under the floor in the rear, so that the return line from the automatic can be very short. The fuel pump is practically unchanged,

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Piping diagram of the new Stanley steam car

and the fuel flows straight to the burner, passing the fuel automatic, pressure tanks, low water automatic, and steam automatic on the way. It enters the vaporizer on the rear end of the boiler and from it passes to the burner. The pilot fuel system is now just one straight tube from the pilot tank to the pilot burner without interruption and with but one valve. There is a loop in this pilot line directly over the pilot burner, which acts as a small vaporizer.

Specifications of the car are given in the accompanying table:

Car	Price
Seven-passenger touring car	$2,600.00
Four-passenger	2,550.00
Chassis only	2,225.00

MECHANICAL SPECIFICATION TABLE

Boiler	Stanley fire-tube type welded construction, 23 in. diameter.
Burner	Drilled type, burning kerosene or gasoline without alteration.
Pilot	Kerosene or gasoline with small tank of four gallons capacity.
Engine	Two cylinder, 4 by 5 slide-valve type double acting and geared direct in the differential ring gear.
Water tank	24 gallons capacity.
Water mileage	150 to 250.
Pump	Driven from rear axle at one-quarter engine speed.
Light	Electric throughout with Willard battery and Apple electric generator.
Steering gear	Warner.
Wheels	34 by 4 artillery type cord.
Tires	35 by 4½ straight side.
Body	Aluminum.
Color	Royal green.
Fuel tank	20 gallons capacity.
Brakes on rear wheels.	
Front axle	Timken.
Rear axle	Stanley, with Timken and S.K.F. bearings.
Wheelbase	130 in.

Analysis of Labor Motives

EIGHT human instincts must be reckoned with in handling the labor problems of a factory, according to the views expressed by industrial relations experts at a recent conference in the Brooklyn, N. Y., Academy of Music. The experience of personnel managers in the past few years shows that it is old-fashioned and unintelligent to assume that labor is interested only in the dollar and cents side of its work, although that is a fundamental consideration.

The chief influencing factors in the life and work of the employee were outlined as follows:

1. Parental Instinct.
2. Sexual Instinct.
3. Workmanship Instinct.
4. Possessive Instinct.
5. Aggressive Instinct.
6. Submissive Instinct.
7. Herd Instinct.
8. Instinct of Curiosity.

The possessive, parental, and sex instincts may be considered as those most closely related to the wage problem. Every worker wants more money for himself, so that he may establish a home, and so that he may bring up a family. Where the wage fails to satisfy, at least in a measure, these instincts there is sure to be discontent and lack of co-operation. A man's interest in his family will also make him seek a community where housing and social conditions are good, in preference to a community which is deficient in that respect, even though the wages at the latter place are somewhat higher.

The herd instinct, better known among laborers as "solidarity," is an increasingly important factor in the labor problem. It is one of the most potent forces in unionism.

The aggressive instinct and the instinct of curiosity are two forces that a capable personnel manager will be able to turn to great advantage, both from the standpoint of the organization and the workers themselves. A laborer who has curiosity is interested in his work, and one who is aggressive is capable of a high degree of production if he is placed in some position where his powers can be exercised. The so-called "agitator" can usually be an asset to the organization if the employment department is well-managed.

On the other hand, the submissive instinct is probably the most useful of all, viewed from the angle of large scale production. The rank and file of workers take what their jobs bring to them, through inertia. Keeping a working force enthusiastic and interested in the organization is a big task, but the routine of the industry is greatly facilitated because the average worker takes orders unhesitatingly.

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MANUFACTURERS' MERCHANDISING

The Farm Tractor Instruction Book

It Must Be Illustrated with Photographic Reproductions, Should Be Pocket Size and Should Have Work-Proof Covers—Should Tell How to Make Tractor Repairs

Part II

LAST week we told how H. L. Thomson advised tractor makers to deliver their instruction books to the farmer. This week we give Mr. Thomson's practical suggestions on the writing of an instruction book.

Covers—A poor cover is the worst possible advertisement to a tractor instruction book. When the farmer needs it his hands are dirty. They have grease on them. They may be wet with water or mud. If the cover is poor paper it just melts out of existence and is gone. Make the cover oil proof and water proof.

Size—There is nothing so good as a pocket size book. It should never be of that size that it has to be folded to be carried in the standard size of pocket.

Simple Language—Too many books are written as one engineer would talk to another engineer. They talk about mean effective pressure, volumetric efficiency and bearing tolerances or piston limits, that cannot be understood by the user. Such language turns the user away from the book rather than magnetizing him.

The Simple Story—Do not use blueprints. The farmer never made one in his life and cannot read them. Use X-ray wash drawings instead. Get a sketch artist and make perspective drawings of parts and systems. Do not spend thousands of dollars on good engineers and then not hundreds on good illustrations for an instruction book.

Oiling Charts—Use large charts showing every bearing and tell in plain figures how often each should be oiled. Have arrows pointing to the bearings and print the period of time (in colored ink) when these parts should receive attention.

The True Story—DO NOT CAMOUFLAGE. Do not be so foolish as to write your book as if nothing would ever go wrong with your tractor. That is just the way to get in bad with your buyers. Parts of your tractor and every other tractor will go wrong. If you attempt to deny it you are like an ostrich hiding its head in the sand, vainly imagining that because it cannot see that it in turn cannot be seen.

Major Repairs—Tell in the book how to make major repairs on your tractor. Do not forget that with the tractor the farmer must be the expert. When a tractor goes wrong you cannot drive it to the nearest garage, as with a motor car or motor truck. No. You must tell the farmer how to do the job. It might be how to take up a lower connecting rod bearing. Give him every step in the process. Number them 1, 2, 3, etc. Tell him how to scrape a bearing. It is not enough to say: "Take out the crankshaft and with the ordinary scraper smoothe the bearing until it is round and fits the shaft." That is no good at all. Illustrate how the scraper should be held. Tell how to mark the bushing to show where scraping must be done. Tell every step in the job. There may be ten other important jobs on your tractor that must be repaired. Take ten or twenty pages, if necessary, to tell how these are done. Every dollar you put into such may save you thousands of dollars in service later.

Book Arrangement—So often the tractor instruction book is poorly arranged. Many have no logical arrangement. Decide on some logical order of taking up the entire tractor. You may first take up the motor, then the transmission system, and lastly the chassis, or you may use other sequence, but get some order and adhere to it.

Hitches—Every instruction book should carry instruction with good illustrations on hitches. Illustrate this fully, and whatever instruction you have regarding the hitch print it right below the illustrations, so that it will all be easy to follow.

Laying Out Fields—The book should contain instructions on how to lay out field for tractor plowing and cultivation.

Timing Charts—There should be timing charts with the complete wiring system. If possible, lay out these charts as simply as possible. It is not a bad idea to place the chassis in dotted lines back of the instruction diagram, so that it is easier to follow the circuits. Place the complete system in one chart, if possible. Carburetion charts explaining how to make carbureter adjustments should be included.

WE take the liberty of adding one suggestion to the excellent ones given by Mr. Thomson. Perhaps the first is that the book should be psychological in its arrangement. That is easy. Here is one of the first laws of psychology:

GO FROM THE WHOLE TO THE PARTS.

That means give a general conception of the entire oiling system of the engine, for example, before you attempt to tell all about some little detail of that system.

Do not try to explain the pressure control valve in the oiling system before you have explained that it is a full pressure system in which an oil pump delivers oil under pressure to the main crankshaft bearings, and that from these the oil enters the hollow crankshaft and is delivered by centrifugal force into the wrist pins and thence is sent by pressure up the connecting rods to the wrist pins, with a safety valve to bypass some oil when the pressure rises too high. With a general conception given, then pass to details.

This means going from the whole to the parts.

Going from generals to particulars means the same.

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Problems of the Hotchkiss Drive

Side-Sway Has Been Practically Eliminated by the Use of Flat Semi-Elliptic Springs—Brake Linkages Are Causing Some Trouble Owing to Change in the Center of Oscillation

By J. Edward Schipper

IN spite of the fact that the Hotchkiss drive continues to grow in popularity, and is proving, in the main, a very satisfactory arrangement, both from the standpoint of weight saving and that of satisfactory service, there are certain problems connected with it that remain to be solved. During the first two years the drive was in general use the matter of side-sway was probably the most important difficulty which had to be dealt with, but this has been solved to a large degree on present installations.

The side-sway difficulty has been overcome chiefly by the use of semi-elliptic rear springs which are almost flat when in the normal riding position. Springs of this type are relatively rigid sideways and interpose a considerable resistance to periodic side-sway. It is, of course, necessary to back up the springs by a substantial structure at the rear of the frame. This is done by thoroughly bracing that portion of the frame which extends back of the rear cross member.

It must be remembered that the stresses imparted by the car in its tendency toward side-sway are all transmitted to the rear end of the frame, and, as the rear cross member is some distance from the rear, it is quite certain that a weaving action will take place unless there are bracketing members to take up these stresses. A crossbar placed as closely as possible to the rear end of the frame is one of the best means of securing rigidity at this point. Crossbars are more serviceable in this connection than gusset plates, which are susceptible to rivet troubles.

Difficulties With Brake Connections

Difficulties with brake connections are always encountered with the Hotchkiss drive. This is only natural, considering that the center of oscillation shifts constantly, owing to the flattening and elongation of the spring and to variations of braking torque in connection with the reaction of the spring. When the brakes are tightened on the rear wheel drums there is a tendency for the wheel to carry the axle housing around with it. Thus, if brake levers on the rear axle extend upward, there is a tendency to shorten the brake rod length, as the housing will move slightly, owing to the flexure of the rear springs. On the other hand, if the car is moving backward and the brake is applied, there is a tendency for the brake rods to lengthen. Should the brake levers on the rear axle extend downward, the above conditions are reversed for both forward and backward travel.

If the centers of oscillation could be fixed so that changes due to the flexure of the springs could be compensated for in the braking mechanism, no difficulty would result from these conditions. But since it is impossible to fix accurately the center of oscillation, it is necessary to determine the mean center and then to work from this point. An example of what has been done in this respect is furnished by Leroy V. Cram, chief engineer of the Empire Automobile Company, who states:

"After carefully determining the approximate mean center of oscillation, our results were checked by laboratory methods and were corrected slightly. Then, because of the tendency of the brake rod to change length we made up our mind that for maximum safety one set of brake levers should extend up from the axle and the other set down. We, therefore, extended our service brake levers down, that being the correct position for 90 per cent of the braking, and the emergency brake levers up, to take care of the exceptional case."

Variation in Braking Power

This does not mean that with this installation the service brake is ineffective when the car is backing up, or that the emergency brake lever does not function when the car is going forward. It simply means that the service brake is more effective in going forward and the emergency in going backward. In either direction it will skid the wheels upon gravel roads, but it takes less pressure with either brake in one direction than it does in the other.

One of the difficulties that engineers have experienced in connection with the Hotchkiss drive, and which up to now has not been entirely eliminated, is wear of the slip spline on the propeller shaft. The amount of slippage at this point normally amounts to about ½ in., but change of propeller shaft length under heavy loads when there is a very severe pressure on the spline causes wear to be noticed at this point at the end of several thousand miles of driving. Probably the remedy is in the use of a type of joint which does away with the necessity for a splined shaft at this point.

—

New Aircraft Engine Oiling System

AN arrangement of oil pumps for aircraft engines has been patented in England by A. A. Remington of the Wolseley Motor Car Co. which makes it unnecessary to slope the oil base toward the center so that this will always be the lowest point of the base no matter how much the airplane is tilted. Remington provides two return pumps for the oil, one located at each end of the sump and having its inlet in a depression therein. So long as the engine remains substantially level, both pumps will return the oil accumulating in the base of the engine to the oil reservoir, but if the engine is tilted appreciably, so that the inlet of one of the pumps is above the oil level, all of the oil will be returned by the other pump, and for this reason both return pumps are made of sufficient quality to handle the entire oil circulation. The oil feed pump may be located in a pocket of the middle of the sump.

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THE United States produces 65 per cent of the world's petroleum output. The United States, Russia and Mexico together in normal times produced nearly 90 per cent. The Russian and Mexican oils, however, to a large extent, are not of the class known as "refinable crude petroleum," hence for the production of petrol and naphtha by ordinary refinery methods oil from the United States must be depended upon.

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AUTOMOTIVE INDUSTRIES
The Automobile

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Tractor Development

IT is a matter of congratulation that the tractor industry has made such signal progress within the past year. So far as engineering trend in tractor design is concerned, it is now certain what channels of development will be followed. The more general use of forged, heat-treated gears; the introduction of pressed steel frames; broader use of ball and roller bearings; weight reduction in wheels and gearsets and better engines will make a higher standard of tractor efficiency possible.

The rumors concerning a standardized Liberty Government tractor aroused the tractor makers. Not that they might in any way be opposed to tractor standardization being carried further than it has been carried this year, but the opposition has largely been because any such announcement would tend to delay buying by private purchasers, many farmers deciding to wait until they had seen the new job. The emphatic denial that such a tractor is even being considered by the Government has clarified the tractor sky a good deal.

Good progress has been made with tractor standards in S. A. E. work in the past year, though as compared with what has been done in aviation standards the progress has been very slow. The cases are different. Aviation has but one customer, and that the Government, whereas every one of the 6,000,000 farmers of the country is a possible tractor customer. It is not logical to draw comparisons between the two.

The Fuel Oil Shortage

HARDLY had we passed the critical point in the coal shortage when the country was prepared for another shortage which, if it should materialize, might equally hamper our industries. The first intimation of the impending shortage in fuel oil in the eastern parts of the country was given in an announcement issued last week by M. L. Requa, in charge of the oil division of the Fuel Administration.

As in the case of coal, there is no pronounced shortage at the source, the oil fields of Oklahoma, Texas and Mexico. But the means of transportation have been curtailed, while, on the other hand, the consumption in certain lines has greatly increased. Fuel oil, it may be explained, is a distillation product of crude oil, heavier and less volatile than lamp oil. In recent years much of the fuel oil has been converted into motor oil or gasoline by the cracking process, which, of course, has greatly decreased the available supply of fuel oil. Fuel oil is used very extensively under the boilers of naval vessels, and as a result of the present activities of our fleet, both at home and in European waters, the demand from this field has greatly increased. Further, fuel oil is used for enriching so-called water gas, largely used in industrial processes, as a fuel in stationary steam-power plants and as a fuel for certain classes of internal combustion engines. In the heat treatment of steel, which is now being carried on on an unprecedented scale, owing to the manufacture of munitions in thousands of plants throughout the country, fuel oil is largely employed.

It seems that what led directly to the shortage was the commandeering of a number of tank steamers which plied between Gulf ports and Atlantic Coast refinery districts. There seems little chance of making up for this by increasing railroad haulage of crude oil, as to offset the loss in tanker tonnage would require tens of thousands of tank cars, not to mention the number of locomotives required and the congestion already existing on practically all railroad lines that would come in question. Perhaps, however, when our shipbuilding program gets into full swing and vessels are being turned out according to schedule, the tankers now commandeered will be released and additional ones placed in service between Atlantic and Gulf ports so that there may be no need for shut-downs of industrial or public service plants on account of lack of liquid fuel.

That the situation is serious is shown by an official statement that only five classes of the twelve established under the priority regulations are being supplied at present, and a report from Schenectady last week intimated that the General Electric Co., which is largely engaged on war work, might have to shut down for lack of fuel oil.

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Assembly Jobs Must Be Well Balanced

THE practice of assembling from stock parts purchased of outside manufacturers is now so common in the motor truck industry that the quality of motor truck service in general depends to a great extent upon the care with which these components are selected. If a truck is built complete in one plant, every part, naturally, is designed to harmonize with every other part as regards its ability to transmit power or to support loads, and the complete truck generally forms a well-proportioned unit. Starting with the engine as a basis, the clutch is made of just sufficient capacity to transmit the maximum engine power, with perhaps a slight reserve; the change gear is designed to take care of the same amount of power, while in the design of the rear axle account is taken not only of the maximum engine output but of the lowest reduction in the gearbox as well, and the proportions of such parts as the axle shafts will depend also upon the final reduction ratio.

Generally, when an assembled truck is first evolved the various components also are fairly well balanced. Not only is it to the assembler's advantage to use parts of as nearly as possible the same capacity, because it results in a better-performing truck, but the parts manufacturers are interested to have their parts stand up and they will see to it that these parts are not grossly misapplied. Sometimes, however, it is difficult to secure exactly the right parts, especially in times like the present, when the truck industry is booming.

Engine Protected

Probably of all the manufacturers supplying parts for motor trucks, the engine maker is concerned least with a judicious choice of components. If the engine selected is larger than necessary it will simply run light most of the time, which would lengthen its life, though it might lower its fuel economy. On the other hand, if the engine is somewhat small—well, it cannot be made to give more than so much power, and since truck engines have their bearings and other vital parts proportioned for heavy duty, they cannot be injured by being run more or less continually under full load. On the other hand, the clutch, transmission and rear axle all must take the load which the engine is capable of delivering, and if their carrying capacity is below that of the engine, trouble is sure to ensue.

Perhaps no part of a truck is so apt to suffer as the rear axle, if the design is not well balanced. There is no truck axle that has a very high factor of safety, because an axle stronger than need be tends to make the truck heavy and sluggish and to increase tire wear. The best axle is one which has just a small excess of strength over the maximum stress that is likely to even come upon it.

Now there are certain changes which can be made in the design of a truck which will raise this maximum possible stress. They are:

An increase in the engine size; an increase in the low gear reduction ratio; an increase in the rear axle reduction ratio.

It is evident that each of these changes involves an increase in the maximum torque which can be impressed on the axle shafts. No reliance can be placed on the limited coefficient of adhesion causing the wheels to slip, as the use of grips and non-skid chains practically eliminates this safeguard.

Higher Low-Gear Ratios

We understand that some trouble has been caused recently by the introduction of transmissions with extra large low speed reductions. Truck manufacturers have long been calling for such transmissions, but until recently the call had not been heeded by the transmission manufacturers. It is evident that an engine of given torque characteristics can impress 20 per cent more torque on a rear axle if the low gear reduction is five than if it is four, and this may easily be the difference between an axle that will stand up and one that will give trouble.

Heretofore it has been the custom of axle manufacturers to specify the maximum A.L.A.M. horsepower and the maximum weight for which an axle was designed. Low-gear reduction and rear axle ratio have been considered as practically constant for trucks of given capacities, but recent developments have made these assumptions unsafe. It is therefore not unlikely that axle manufacturers will introduce a load figure or capacity figure which will be the quotient obtained by multiplying together the cubic inches engine displacement, the low gear ratio and the rear axle ratio. If this were done and axle makers strictly adhered to the rule of not supplying axles of a given capacity for trucks calling for a higher capacity, axle trouble would be greatly reduced.

Meanwhile it would be well for assemblers to bear in mind that in a well-balanced truck every part is of just sufficient capacity to do its work and no more, and if this balance is disturbed by adopting a larger engine, for instance, the other parts will suffer. There has been a well-defined tendency among assemblers to use engines more powerful than necessary, as it permits of making impressive demonstrations and helps to effect sales. However, to sell the trucks is not the whole problem; unless trucks once sold "stay sold," impressive demonstrations will soon be of little avail, and the first step toward making them "stay sold" is to eliminate weak links and trouble breeders at the outset.

AMONG the many other industries stimulated by the war is that of growing castor beans. Castor oil is generally admitted to be the best lubricant for aircraft engines, but is little used at present because of its scarcity. During the coming spring large areas in several Southern States will be planted to castor beans, at the instigation of the Chief Signal Officer. The price of castor oil has gone up constantly since the outbreak of war, and as long as the war lasts the price will be at least maintained. Even in peace times about a million bushels of the beans are needed in this country annually.

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Latest News of the

Pennsylvania Buys 40 Tractors

Agriculture Department Will Loan Them to Farmers at Minimum Charge

HARRISBURG, PA., Feb. 27—Secretary of Agriculture Charles E. Patton has completed arrangements to place forty or more farm tractors at the disposal of the Pennsylvania farmers.

No department funds are available for the purchase of tractors, but Secretary Patton had little trouble in securing the pledge of co-operation from the Committee on Public Safety and Defense, which is headed by Governor Brumbaugh and is composed of three other State officials. This commission has had at its disposal for war purposes $2,000,000 and a liberal amount is to be allowed for tractor purchases.

Negotiations are now on with tractor manufacturers for the purchase of forty tractors. Eight or ten different makes of tractors will be purchased and these will be apportioned to different sections of the State. The next task will be to secure eighty or more competent tractor operators, for each machine will be equipped with lights and crew and kept going 20 hr. a day.

Will Train Operators

When the tractors are purchased and the operators secured, one machine of each make selected will be sent to the State Agricultural College and the operators will be sent there for a week or 10 days for instructions from factory representatives and engineers. Eighty first class operators and mechanics are expected to come forth from that school.

Efforts will be made to have organizations of farmers in one county arrange to use the tractors and a regular schedule of work will be made up in each territory. One farmer will contract for 40 acres, another for 50 and enough will be signed to contracts to make it worth while to establish the tractors in that section of country. When all the assignments are made up, a regular tour will be outlined, enough machines will be assigned to the work, and it will be tackled by experienced men. The farmer furnishes the labor.

The farmer will sign a contract specifying how many acres he desires to have plowed and agreeing to pay the charges which will be fixed for plowing and fitting work. The basis for these charges will be fixed by the acre. They will include the cost of fuel, operator and oil, the idea of the State being to furnish the tractor at the very lowest cost to the farmer, with the least amount of trouble and care on his part.

The tractor will carry its own plows, but any other machinery, such as harrows or disks, will have to be supplied by the farmer. It is likely that the charge for plowing will be between $2 and $3 an acre and the charge for fitting the land about 80 cents or $1 an acre.

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Suspend Aviation Examinations

WASHINGTON, Feb. 28—The War Department has issued an order temporarily suspending examinations at all aviation examining boards, owing to the fact that every aviation school in the country is crowded to the limit.

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Washington Denies Airplane Contest

WASHINGTON, Feb. 28—The Aircraft Production Board denies newspaper reports of a contest between Liberty airplanes and the Avon airplane at Washington. It states, however, that there will be flying tests at Dayton in the near future between Liberty airplanes and Rolls-Royce airplanes. There will be some Liberty airplanes flying over Washington in the near future, also, but not engaged in any contest.

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Disagreement Over Fuel Committee

WASHINGTON, Feb. 28—It is apparent that there is considerable disagreement between the Automobile Industries Committee headed by A. W. Copeland and including Hugh Chalmers and John R. Lee and the Fuel Committee headed by W. C. Durant. There are substantial reports current around Washington that these two committees are not working in harmony and that the Fuel Committee appointed five weeks ago to deal with the question of the curtailment of coal to the automobile industry, has not invited the Automobile Industries Committee into its two informal deliberations that have been held. In fact, the Automobile Industries Committee has been entirely ignored so far as this problem is concerned. A formal committee meeting of the Fuel Committee has not been held since the appointment of the committee five weeks ago, although Dr. H. A. Garfield, Fuel Dictator, wanted as early as possible information with regard to the fuel situation in relation to the automobile industry.

It is unfortunate that a committee like the automobile industries committee, appointed to represent the industry in Washington, and in reality representing the industry there, should practically be set aside in this matter. These are days when harmony rather than discord is needed. These are days when co-operation wins more than competition.

One Organization for Ohio Factories

War Industries Commission Plans Pooling of Interests to Stop Inefficient War Buying

CLEVELAND, Feb. 27—A plan to coordinate several thousand factories, including practically every industry in two-thirds of Ohio and part of Pennsylvania, has been proposed by the Ohio War Industries Commission. In brief, the plan would convert all Ohio industries into one huge business with which the government could deal through its representantives in Cleveland. Arrangements would be made so that all inspection, purchasing and payments could be transacted directly through a Cleveland government representative, thus saving the numerous expenses incurred through dealing directly with Washington.

Under the plan proposed, all buying of parts for assemblers and manufacturers doing war work in this district would be done directly in the district. This would save transportation and loss of time. For example, if one company in the Cleveland district were buying small parts in Michigan and sending them to Pennsylvania for machining and then having them returned for assembly, this unnecessary transportation would be eliminated by having all the work done within the Ohio district.

The Ohio War Industries Commission has appointed an executive committee consisting of J. H. Foster, president of the Hydraulic Steel Co., who will have supervision over forgings and castings; E. E. Allyne, president of the Aluminum Castings Co., for aluminum castings; A. W. Henn, secretary-treasurer of the National-Acme Co., for machinery and machine products; J. H. Herron, president of the Cleveland Engineering Society, for engineering. Others include C. A. Otis, president of the Cleveland Chamber of Commerce; E. M. Fairchild, T. S. Grasselli, A. K. Printz and E. E. Teare. Representatives of automotive and rubber industries will be named in the near future.

It is the plan of the commission to divide Ohio into ten districts, each to be controlled by an executive committee with sub-committees further dividing each industry into strict classifications. For example, there are sub-committees in the castings division for gray iron, aluminum, brass, malleable iron, and steel. The Executive Committee will deal directly with a Government body

(*Continued on page* 475)

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Automotive Industries

Dayton Gets S. A. E. Summer Session

June 17 and 18 Chosen—Aviation Program to Include Flying Demonstrations

DAYTON, Feb. 26—The annual midsummer meeting of the Society of Automotive Engineers will be held in Dayton, Monday and Tuesday, June 17 and 18, with Wednesday, June 19, set aside specially for those wanting to visit several of the factories engaged in aviation work. One entire forenoon will be given up to aviation demonstrations in connection with flying and other allied activities.

The decision to hold a summer meeting at Dayton came as a recommendation from the meetings committee and was approved by the Council of the Society at its monthly meeting held here yesterday. The great activity of the society in aviation matters and the fact that there are three aviation fields in Dayton were deciding factors in selecting this city for the summer meeting. Headquarters will be at Hotel Miami.

Dayton engineers held a meeting today to decide on forming a Dayton section of the Society. This section will practically take charge of all local arrangements with regard to the summer meeting. Although the city has not adequate hotel accommodations for the 700 or 900 who will attend the session, the Dayton committee will arrange a billeting system which will take care of 1000 or more members and friends.

At yesterday's meeting of the society, B. B. Bachman was appointed chairman of the Standards Committee for 1918, and a large percentage of the committee personnel decided upon. The complete appointments will not be made for some weeks yet. Bachman succeeds J. G. Utz, who filled the position last year and who is now in charge of production of the standardized war trucks. David Beecroft was appointed chairman of the meetings committee and announced as his committee F. E. Moscovics, C. F. Scott, F. E. Place and E. R. Greer.

The finance committee under Chairman H. M. Swetland consists of Christian Girl, Hugh Chalmers, Henry R. Sutphen and George H. Houston. President Kettering also appointed C. C. Hinkley chairman of the membership committee.

President Kettering gave a dinner to the Council and several Dayton friends at the new Dayton Engineers Club which was opened a few weeks ago. The club, the gift of President Kettering and Colonel Deeds, both of Delco fame, to the engineers of Dayton, is one of the most modern clubs and contains a lecture hall that will seat 400.

After the dinner the subject of discussion was the knock in the kerosene engine, the illustrated talk being given by members of the research laboratory, of which President Kettering is head.

The point was established that the knock is not due to pre-ignition but to the composition of the fuel and that detonations and almost major explosions occur after the first ignition and when the piston is well down on the stroke. These knocks are due more to the composition of the molecule than to the degree of volatility. Diagrams were shown illustrating how the knock varied with different fuels.

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Vincent and Marmon Promoted

DAYTON, Feb. 26—Major Jesse G. Vincent, chief engineer of the airplane department here, has been promoted and is now a Lieutenant-Colonel and Capt. Howard Marmon is now Major Marmon and is assistant to the chief engineer and in charge of McCook Field, the experimental and research center for airplane development of the country.

The building activity around the field is being rapidly pushed and the field put in condition for the opening of spring. Col. Vincent and Major Marmon are in complete charge not only of airplane design but experimental work as well. Major B. D. Gray, in charge of production, is now located here.

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Morse Vice-President of Curtiss

WASHINGTON, Feb. 27—E. C. Morse, former vice-president of the Chalmers Motor Co., has been elected vice-president of the Curtiss Aeroplane & Motor Corp. He has been at Washington for some time as representative of the John Willys interests, including the Willys-Overland and Curtiss companies.

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Chandler Stock on 12 Per Cent Basis

CLEVELAND, Feb. 28—The directors of the Chandler Motor Car Co. declared a regular quarterly dividend of 3 per cent, placing the stock on a 12 per cent basis. Heretofore dividends have been paid at the rate of 2 per cent with 1 per cent extra each quarter. J. W. Prentiss, of Hornblower & Weeks, retired as a director, and was succeeded by J. A. Fayne of the same firm.

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Younger in Army Engineering Section

WASHINGTON, Feb. 28—John Younger, truck engineer of the Pierce-Arrow Motor Car Co., Buffalo, is now serving in the engineering division of the motor transport section of the Quartermaster Corps under Christian Girl.

Chevrolet to Be G. M. Division

Status Will Be Same as Buick and Cadillac—No Change in Production Methods

NEW YORK, Feb. 23—The Chevrolet Motor Co. is soon to pass out of existence as an independent automobile producing company. Under the terms of a recommendation submitted at the annual meeting of the General Motors Corp., and soon to be ratified, it will become a division of the General Motors Co. and its status will be the same as that of other General Motors divisions such as Buick, Cadillac, Oakland, Oldsmobile, and the other large parts-making concerns. Like these companies it will go on producing automobiles as in the past and its methods of distribution will not be altered.

The Chevrolet Motor Co. at present owns a controlling interest in the General Motors Co., but when the new plan becomes effective there will be only General Motors stock outstanding. This will amount to $50,000,000 of 6 per cent preferred stock, representing an increase of $30,000,000, and $150,000,000 common stock, this being an increase of $67,400,000, both increases having been recommended.

Combined Output of 400,000 Cars

When the changes are completed, the General Motors Corp.'s various divisions will have a combined output of close to 400,000 cars a year with cars in every price class except the very lowest, ranging from the smallest Chevrolet at $685 to the Cadillac at $2,800. Chevrolet alone accounts for 125,000 cars of the 400,000.

The Chevrolet company at present owns 54 per cent of the outstanding General Motors stock amounting to 450,000 shares. It is proposed that the General Motors Corp. turn over 282,684 shares of its stock to the Chevrolet company for all its assets except the General Motors stock it now owns. In other words, when the deal is finally put through, the assets of the Chevrolet company will consist of 732,684 shares of General Motors stock. Against this there will be outstanding some 140,048 shares of Chevrolet having a present par value of $64,004,800, which is to say that the Chevrolet Motor Co. will then own one and one-seventh shares of General Motors stock for every one of its own. Under the new plan, Chevrolet will become the owner of 732,684 General Motors shares out of a total outstanding of 1,108,264.

W. C. Durant who fathered and developed the Chevrolet Motor Co., will continue head of the General Motors Co. and

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chairman of the board of directors, in which there have been some changes. E. I. du Pont de Nemours & Co. have acquired substantial stock holdings in both Chevrolet and General Motors, both of which companies are controlled by the du Pont company and Durant, who is the largest single stockholder. L. G. Kaufman has resigned as a member of the finance committee but remains a director, and the du Pont company now is represented on the Board of Directors by J. A. Haskell, J. J. Rafkob, P. F. du Pont, Irenee du Pont and Henry F. du Pont, the last two being elected directors last Thursday.

The General Motors Corp. was formed Sept. 16, 1908, and at present owns the entire capital stock of the following divisions or manufacturing companies: Buick Motor Co., Cadillac Motor Car Co., General Motors Export Co., General Motors Truck Co., Jackson-Church-Wilcox Co., Oakland Motor Car Co., Olds Motor Works, Northway Motor & Mfg. Co. and Weston-Mott Co. It also owns a majority of stock interest in the Champion Ignition Co., Flint, and operates under lease the McLaughlin Motor Car Co., Oshawa, Ont., and the General Motors, Ltd., London, England.

The Chevrolet Motor Co. was formed Sept. 23, 1915, and owns all of the outstanding capital stock of the Chevrolet Motor Co. of New York, Chevrolet Motor Co. of Michigan, Mason Motor Co. of Flint, Chevrolet Motor Co. of Toledo, Chevrolet Motor Co. of Bay City; it has profit sharing relations with Chevrolet Motor Co. of Canada, Chevrolet Motor Co. of St. Louis, Chevrolet Motor Co. of California, Chevrolet Motor Co. of Texas. In addition to its 450,000 shares of General Motors stock, the company also owns 106,000 shares of common stock of the United Motors Corp. and 13,650 shares of Scripps-Booth common.

Due to the fact that this large block of United Motors stock is owned by Chevrolet, and because the same interests control both General Motors and United Motors, there is talk of having General Motors take over United Motors in the same way it has taken over Chevrolet, to make of it another General Motors division.

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Dort to Make 20,000 Cars

FLINT, MICH., Feb. 24—The Dort Motor Car Co. and its Canadian associates, Gray-Dort Motors, Ltd. of Chatham, Ont., produced about 8000 cars in 1916. Last year the production increased practically 100 per cent, and this year it is expected that the two plants will turn out 20,000 cars.

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Will Not Reveal Garabed Tests

WASHINGTON, Feb. 23—The secrets of Garabed, the new and mysterious free energy discovered by W. K. Giragossian, will not be revealed through the official tests approved by Congress. Its inventor claims that he does not wish the secret to fall into German hands and refuses to reveal the names of the five scientists who will make the tests and will not tell the exact place or the date.

Plan International Standards

American Delegates Already in England to Help Formulate System for All Allies

WASHINGTON, Feb. 23—Standardization of manufacturing materials related to production of motor cars, motor trucks, airplanes, tractors and machinery takes a new step with the announcement of arrival in England of delegates from all the allied countries for conference on International Standards.

The American delegation headed by F. G. Diffin, representing the Aircraft Production Board, arrived safely late last week and includes members from all the prominent American engineering societies: The Society of Automotive Engineers, American Society of Mechanical Engineers, American Society for Testing Materials, etc. There are also members from the Aircraft Board, the Advisory Committee on Aeronautics, the Signal Corps, the Navy, and the original International Aircraft Standard Board from which this conference is an outgrowth.

The following is the list of the American members: F. G. Diffin, Chairman; Dr. W. F. Durand, Lieut.-Commander Benjamin Briscoe, Lieut. W. F. Prentice, E. H. Ehrman, Charles M. Manley, James Hartness, Albert L. Colby, Capt. A. B. Tilt, F. G. Ericson, C. F. Clarkson and F. R. Baxter.

Will Influence Future Production

Standardization of parts and materials in America to augment industry was first emphasized through the work of Howard E. Coffin, now chairman of the Aircraft Board, and the late Henry Southern. After the war started, a paper was read by Diffin before the Society of Automotive Engineers on Aircraft Standardization, which led Coffin to place Diffin in active charge of standardization work toward international results.

The present conference is the result of Diffin's work during the past 9 months. This present congress will without doubt have considerable influence on future international manufacturing, enabling better service with less man-hour effort by relieving plants from carrying in stock materials not standardized and by concentrating on materials of known performance.

No attempt will be made by the conference to standardize airplane construction, but rather those materials and units which are at present causing difficulties in purchase and delivery and for which suitable standards can be set.

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Harroun Assets $11,186,768

WAYNE, MICH., Feb. 26—The Harroun Motors Corp. reports gross assets of $11,186,768.26 for the year ending Dec. 31. These are divided into capital assets, consisting of land and buildings, machinery and equipment, tools, dies, etc., of $1,348,295.13; patents, models and goodwill, $7,006,887.01, and treasury stock, $2,155,930. Current assets including inventory are $277,286.09; cash on hand, $157,068.10, and with accounts, notes and investments total $660,263.45. Prepayments, covering advance insurance, travelers' expenses and advances on ordnance contracts are $15,392.67.

Liabilities include capital stock, $10,000,000; deferred liabilities, $784,462.40, with current liabilities of $395,375.86.

Production of the Harroun Motors Corp. is now up to 30 per day. This production is being maintained in spite of the fact that a large contract calling for several million 155-millimeter shells has been taken by the company. It is probable also that assembly work on the Class AA truck will be undertaken at the Harroun plant, but this will not interfere with the production, which is expected to increase rather than decrease. To date the company has not had to complain of freight car facilities owing to its advantageous location on the outside of the congested belt area. It is reported that an outer belt freight line will also be established at Detroit and if this is done the line will touch Wayne.

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S. A. E. Tractor Discussion

CHICAGO, Feb. 22—Tractors, in order to be economical on a farm, should be selected in accordance with the number of cultivated acres. The relation of the S.A.E. to the automotive industry and the fundamental differences between the tractor and the motor car were the subjects discussed at last evening's meeting of the Mid-West section of the S.A.E.

David Beecroft, first vice-president of the S.A.E. and directing editor, Class Journal Co., spoke of the enlarged activities of the society and how it had been extended to take in the motor truck, aircraft, tractor, motorcycle, motor boat, and stationary engine industries in addition to the motor car industry. He also spoke of the importance of the tractor with regard to increased food production and of the close relation existing between the society and the government in furthering the latter's war plans.

Dent Parrett of the Parrett Tractor Co. spoke on the fundamental differences existing between the motor car and the tractor from the viewpoint of design and manufacture. He compared the differences between the various principal units, the reasons for these differences and their adaptation to the tractor. A paper on the Economic Size of Tractor was read by Ernest Goldberger, Efficiency Engineer, Packard Motor Car Co.

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Want Name For Sub-Chasers

WASHINGTON, Feb. 23—The Navy Department has asked the public to suggest a name for the new boats being built by Henry Ford. Two letters are wanted. Assistant Secretary Roosevelt proposed S. D. for submarine destroyers but he thinks a better name can be found. The Ford ships are going to be midway between submarine chasers and destroyers. They will use depth bombs as their principal weapon.

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No Anti-Freeze Fluids in France

Alcohol and Glycerine Needed for Explosives—Drivers Must Drain Radiators

PARIS, Feb. 10—No anti-freezing solutions are made use of in the automobile services of the French army. The best non-freezers are alcohol and glycerine, but both of these are required for making explosives, and could only be used in automobile radiators by robbing other and more important services.

It has been found possible to overcome the danger of freezing and consequent cracked jackets and radiators by causing all cooling water to be drained off every evening and during the daytime whenever it is known that trucks will have to stand for a number of hours. A general rule to this effect goes into force each winter and is applicable until repealed at some date in the spring. Drivers are individually held responsible for the observance of this rule; it is no excuse to plead that the evening was mild or that no definite orders had been given for draining off water on that particular evening. So well is this understood that French truck drivers will drain off all water if there has not been a sign of frost for weeks and if the chances of frost during the night are but one in thousands. It is a rule that the radiator plug shall be put inside No. 1 valve cap and the cylinder jacket plug in No. 8 valve cap. New drivers always know where to find the plugs.

A cracked cylinder jacket, owing to neglect to drain water, is punished by prison; a recurrence of this crime may send the culprit into an infantry regiment in the trenches. The rigid observance of this rule entails a certain amount of labor which would be avoided in any private truck service. It has the advantage, however, of reducing cracked cylinders and radiators to near the vanishing point. Before this rule went into force the loss from cracked cylinders was an important item every winter.

French trucks are not fitted with radiator and hood covers, although many drivers at the front make these covers in their own interests. English trucks are served with these covers. No European trucks are fitted with radiator thermometers, these being found only on a few makes of imported American trucks.

There is no doubt many engines are run too cold, and are inefficient, through lack of a heat indicator. Few drivers consider it necessary to cover the radiator unless it is actually freezing. Experiments with one make of Italian truck built for Alpine conditions, and extensively employed in the French army, showed that with the thermometer at 40 Fah., exactly one-half of the radiator had to be covered to get a good summer average at the outlet from the cylinders. Undoubtedly these trucks were running inefficiently with the whole of their radiator surface exposed.

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Italy Exports 6678 Cars and Trucks

TURIN, ITALY, Feb. 15—Italy still occupies the position of the leading exporting nation of Europe, according to figures issued by the Ministry of Finance. For the first 8 months of 1917 motor exports totaled $17,736,361, an increase of 96.4 per cent over the corresponding period of 1916, and 113.4 per cent over the first 8 months of 1915.

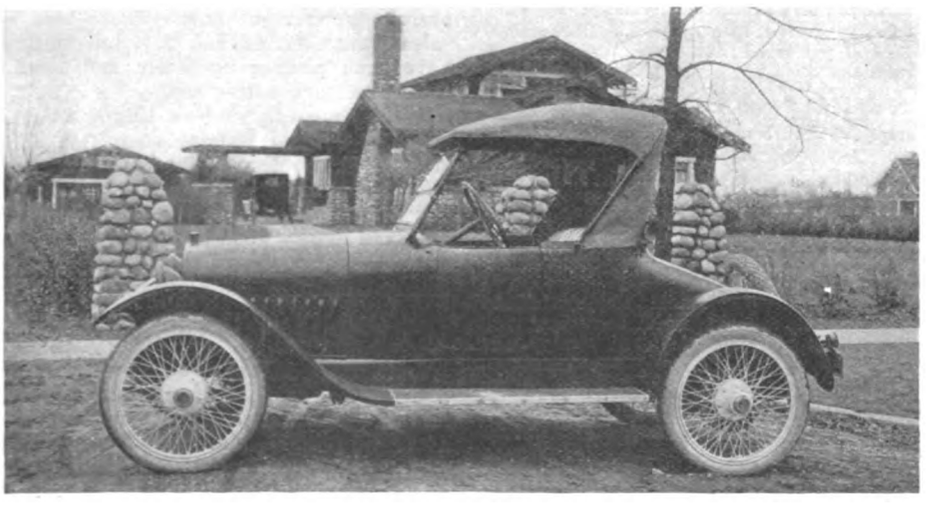
The greatest proportion of exports were trucks to the Allies, these numbering 6169, at a value of $15,927,835, as compared with 506 touring cars, at a value of $1,619,200. Practically all were fully equipped for allied service.

Imports amounted to only $200,000 for 10 trucks and 183 passenger cars.

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Harroun Adds Roadster Model

DETROIT, Feb. 23—The Harroun Motors Corp. has added a roadster to its line. It is a two-passenger type, but with a seat wide enough to accommodate three persons if necessary. Its general characteristics are quite similar to the Harroun touring car, and it is mounted on the same chassis. The roadster is illustrated herewith and, as will be noted, has a modified rear deck with tire carrier in the rear. The price of the Harroun roadster is $995, and wire wheels are $100 extra.



1917 Copper Supply Decreases

Smaller Production and Increased Exports Causes of Reduction

DETROIT, Feb. 25—The copper yield of the United States during 1917 had a value of $510,000,000. Arizona produced the most copper, the output being 687,800,000 lb.; Montana, second, with 278,000,000 lb.; Michigan, third, with 275,000,000 lb.; Utah fourth, with 245,000,000 lb. and Nevada fifth, with 110,000,000 lb.

The total production of copper in this country in 1917 was slightly less than 1916, according to preliminary figures and estimates collected by B. S. Butler of the United States Geological Survey. The average price of copper during 1917 was 27 cents per lb., and for 1916 it was 27.2 cents per lb. The average quoted price in 1916 was about 2.5 cents more than that received, while the average for 1917 was probably near the quoted price.

The total production of blister and lake copper from domestic ores was 1,890,000,000 lb. in 1917, as against 1,928,000,000 lb. in 1916. The output of refined copper, including electrolytic, lake, casting and pig from primary sources, domestic and foreign, for 1917 is estimated at 2,362,000,000 lb., as compared with 2,259,000,000 for 1916. The output of refined copper, including electrolytic, lake, casting, and pig from primary sources, domestic and foreign, for 1917 is estimated at 2,362,000,000 lb. as compared with 2,259,000,000 for 1916.

Imports of Unmanufactured Copper

According to the bureau of foreign and domestic commerce, the imports of unmanufactured copper of all forms for the first 10 months of 1917 amounted to 460,780,000 lb., as against 397,594,000 lb. for the first 10 months of 1916. The imports for the year 1916 were 462,335,000 lb.

The exports of pig, ingots, bars, plates, sheets, rods, wire, and lake copper products for the first 10 months of 1917, as determined by the bureau of foreign and domestic commerce, amounted to 953,876,000 lb.; the exports for the first 10 months of 1916 were 655,473,000 lb. Similar exports for the year 1916 were 784,006,000 lb.

At the beginning of 1917 about 128,000,000 lb. of refined copper was in stock in the United States. By adding this quantity to the refinery output of the year, it will be seen that the total available supply of refined copper, exclusive of secondary copper, was about 2,490,000,000 lb. By subtracting from this quantity the exports for the first 10 months and the estimated exports for the last 2 months, and assuming no change in stocks, it will be seen that the supply available for domestic consumption in 1917 was materially less than the 1,430,000,000 lb. available in 1916.

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Fisk Profits Double in 1917

Amount to $3,578,484.57 Before Deduction of Taxes—Equal $42 a Share on Common

CHICOPEE FALLS, MASS., Feb. 26—The fifth annual report of the Fisk Rubber Co. shows net profits for 1917 of $3,578,484.57. This almost doubles the $1,836,829.86 earned in 1916. The earnings last year amounted to $16 a share on the $21,525,000 outstanding stock, after all dividends were paid.

The profit and loss and surplus account follows:

Surplus, Balance December 31, 1916		$1,875,442.37
Add:		
Net profits for year ending December 31, 1917, after deducting manufacturing costs, depreciation and interest on borrowed money, but before providing for 1917 Federal income and excess profits taxes		3,578,484.57
Nominal value of 25,500 shares of Federal Rubber Co. common stock, par value $100.00 each, received for sundry services, etc., for which no specific charge was made		1.00
		$5,453,927.94
Deduct:		
Dividends paid:		
First preferred stock	$631,750.00	
Second preferred stock	341,100.00	
	$972,850.00	
Surplus appropriated for retirement of first preferred stock	405,328.81	
Premium paid on 3750 shares first preferred stock retired January 18, 1917	34,819.71	
Provision for insurance liability on stock and equipment at branches assumed by the company	30,000.00	
Payment of taxes applicable to prior periods	5,536.45	
		1,448,534.97
Surplus, balance December 31, 1917		$4,005,392.97

Following is the balance sheet of the company on Dec. 31, 1917:

ASSETS

Capital Assets:		
Land, buildings, machinery etc., at Chicopee Falls and equipment in branches all at depreciated values		$7,040,415.67
Manufacturing rights and leasehold property		106,030.99
Good will		8,000,000.00
Total		$15,146,446.66
Investments		284,622.63
Current Assets:		
Merchandise, raw, process and finished		$17,737,637.58
Tires under mileage contracts		68,561.01
Receivables, less bad debt reserve		6,262,541.01
Collateral notes — employees stock subscription account		462,717.41
Cash		1,658,894.20
Total current assets		$26,190,351.21
Deferred charges		365,348.35
		$41,986,768.85

LIABILITIES

Capital Stock:		
First preferred non-convertible		$4,025,000.00
First preferred convertible		5,000,000.00
Second preferred		4,500,000.00
Common		8,000,000.00
Total capital outstanding		$21,525,000.00
Current Liabilities:		
Loans payable		$11,375,000.00
Accounts payable		3,311,683.01
Accrued wages		24,010.20
Dividends due, not paid		6,706.00
Total		$14,715,399.21
Reserves:		
Balance 1914 reappraisal		$104,577.23
Insurance liability assumed		40,608.26
Guarantee		215,462.37
Total		$360,647.86
Surplus appropriated for retirement of first preferred stock		$1,380,328.81
Surplus		4,005,392.97
		$41,986,768.85



BERNARD M. BARUCH

Who has been appointed head of the War Industries Board, succeeding Daniel Willard, resigned

Fuel Committee Meets

WASHINGTON, Feb. 27—A preliminary, informal meeting of the Fuel Committee, of which W. C. Durant is chairman and which later is to confer with Fuel Administrator Garfield, was held here Tuesday and Wednesday. Among those present were: W. C. Durant, Hugh Chalmers, M. F. Maxwell, Roy Chapin, W. N. Peek, Walter Chrysler, Richard Collins, L. M. Bradley, W. C. Rands, George Graham, John Willys, J. D. Dort and Alfred Reeves.

Baruch Made Head of War Board

Succeeds Willard and Probably Will Have Considerably Broader Powers

WASHINGTON, Feb. 26—Bernard Baruch was to-day named chairman of the War Industries Board, succeeding Daniel Willard, who has resigned. The appointment of Baruch, who on Aug. 25, 1917, was given a place on the War Council Board and made chairman of the Purchasing Board of the Council of National Defense, is taken to mean that President Wilson is practically assured of the passage of the Overman bill. This bill gives the President enlarged powers and would permit him to consolidate buying from scattered departments and bureaus and place it under the control of some central agency. Baruch, in testifying before the Senate Committee, strongly urged a central organization for purchasing. It is expected he will fill, to a great extent, the function of Minister of Munitions but without holding a cabinet seat. The Overman bill would give the President executive power to centralize purchasing power under Baruch's direction.

The whole board probably will be reorganized and enlarged to include representatives of the Shipping, Railroad, Food and Fuel administrations. The new board it is stated will have large authority regarding questions of priority, manufacture and transportation. It is likely that the board will be made independent of the Council of National Defense of which it is now a part.

Boston Show Opens Saturday

BOSTON, Feb. 27—Boston's show, the last big exhibit of the season, opens Saturday. There will be both cars and trucks, and quite a few of the latter, because many of the dealers now have truck agencies and all are looking for a good truck business in New England this year.

The show comes at the beginning of the selling season and is always a good buying show. The prospects seem especially good right now. There was a sales slump during January, but things have been picking up lately and conditions are much better now.

A rally meeting of New England dealers is to be held Monday noon at a luncheon. E. Le Roy Pelletier, nationally known as an advertising man, will tell a story of optimism and why dealers should seek and expect good business. Pelletier has talked at several western meetings during shows.

Briscoe Prices Up $100

JACKSON, MICH., Feb. 27—Prices of the Briscoe 4-passenger touring car, roadster and open delivery truck will be advanced $100 on March 1. The present price is $725 for all three, but after Friday they will be listed at $825.

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Shipbuilding Plant for Ford

$2,000,000 Plant of Five Buildings Covering 5 Acres to Be Ready in 75 Days

DETROIT, Feb. 25—Henry Ford will erect a new shipbuilding plant at River Rouge to complete the manufacture of submarine destroyers. Construction work on the buildings has already been started, and it is expected that the plant will be completed in 75 days. There will be five buildings, covering an area of 5 acres, and costing, including equipment, approximately $2,000,000. The plant will comprise a fabricated shop, 150 x 450 ft., where parts for hulls will be made; three assembling plants, 100 x 1700 ft., and a fit-up shop, 100 x 1500 ft. The buildings alone will represent an outlay of $1,000,000. The power plants and other machinery will be manufactured at the Highland Park plant of the Ford Motor Co.

Chain System Employed

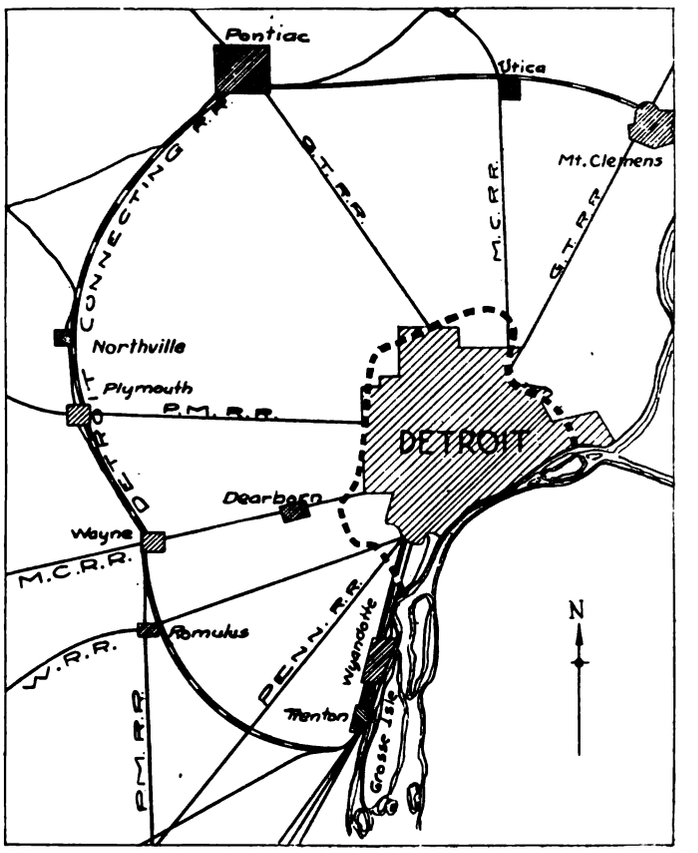
The material for the chasers will enter the fabricated plant from which the hulls will come out on tracks to each bay of the assembling stations. The hulls then move along, parts being constantly added until they are ready for the transfer table, from which the hulls drop into the water on a hydraulic lift. After the boats are floated the installation of motor parts, boilers and armament begins, the last addition being a wireless. The boat is then ready for the submarine zone.

When the plant is complete and in operation, it will give employment to from 10,000 to 15,000 men. A canal, or slip, from the Rouge River to the plant is now being dredged.

—

Ford & Son Make 75 Tractors Daily

DETROIT, Feb. 27—Henry Ford & Son are now building 75 tractors a day, and will double production within 30 days. The order for 1000 tractors to be sent to the Canadian government will be completed by April. The company has an option on making an additional thousand for Canada.



It is planned to build an inner belt line for railroads entering Detroit so that loading and unloading may be facilitated. The dotted line shows the route of the proposed new belt

One Organization for Ohio

(*Continued from page* 470)

to be appointed in Cleveland and which is to be headed by Samuel Scovil, who has been named by the Ordnance Department to represent it in the Cleveland district.

The commission hopes by this pooling arrangement to make war buying less wasteful and more efficient.

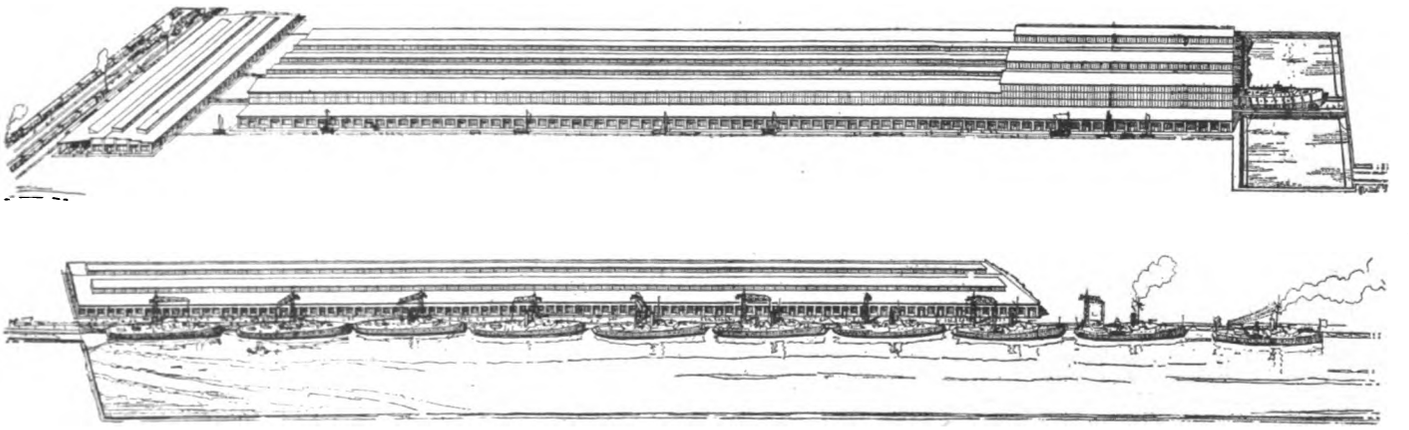
Blue prints and specifications of all manufacturing plants will be filed in the offices of the Ohio War Industries Commission for consultation by government officials. Every industry in Cleveland and Akron is a member of the commission, including such companies as Winton Motor Car Co., Chandler Motor Car Co., White Co., Standard Parts Co., Willard Storage Battery Co., Grant Motor Car Co., Peerless Motor & Truck Corp., Miller Rubber Co., Goodyear, Goodrich, Firestone and others.

Plan Outer Belt Road for Detroit

DETROIT, Feb. 27—The Detroit Connecting Railroad has been organized here with $500,000 capital to operate an outer belt line around this city. The proposed road will terminate at Mt. Clemens, on the north, and Trenton on the south, and will pass through Utica, Pontia, Northville, Plymouth, Wayne and Romulus. A belt line of this sort, it is thought, will relieve freight congestion and permit earlier deliveries.

Manufacturers often have to wait 4 to 6 days before freight cars which arrive at a point near the city can reach the unloading station. The outer belt line, by taking care of the needs of the small towns nearby, and increasing the track facilities, will leave the inner belt free for local needs.

It is expected that the road will be ready for operation within the next 12 months.



Ford's new submarine chaser plant will cost approximately $2,000,000 and when finished will cover 5 acres. This is an architect's drawing

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175,000 Mechanics in Training

Will Be Ready for Service by October—Estimate Based on Reports of 143 Schools

WASHINGTON, Feb. 22—One hundred and seventy-five thousand newly trained mechanics and technical men will be ready to answer roll call by Oct. 1 for occupations required by the United States Army.

This estimate is the result of questionnaires mailed and personal visits to 143 colleges, trade schools and allied institutions throughout the country, which work was performed by the Federal Board for Vocational Education. Forty-two institutions have signified their willingness to begn work at once and 17 stated they will be able to give instruction by May 1.

The plan is to take drafted men of the First Class who have signified their willingness and give them intensive training. The program of the Federal Board which was created prior to the war to enlarge educational facilities for students of mechanics, industry and agriculture calls for the complete diversion of the available institutions of the country to war vocational training, the board acting for the newly created war education committee of the War Department which was recently formed, as told in a past issue.

The schools are expected to train men with various assets of knowledge and experience to do the work demanded in various army occupations in courses of two months' duration. It is not expected at the outset that novices can be made into experts in this length of time.

The Federal Board now has a number of representatives traveling through the country investigating both public and private schools, including those taking in all automotive trades and industries. These representatives analyze a school and if found satisfactory they place it on an approved list to come before the notice of the War Education Committee.

A course of instruction is expected to accomplish one of the following four results with the individual:

1. Make a semi-skilled mechanic such as a drill-press hand or a second-class lathe operator from a novice.
2. A good technician, as for instance a chauffeur from a novice.
3. An expert in some special line of work from a skilled or semi-skilled journeyman, as for instance a wood specialist on airplanes from a cabinet maker, or an ignition repairman from a garage mechanic.
4. A fairly skilled mechanic from a semi-skilled worker, as for instance a fairly good blacksmith from a blacksmith's helper. The schools are being asked to train men in the following and other lines: Airplane mechanicians, auto repairmen, chauffeurs, draftsmen, gas engine repairmen, ignition repairmen, motorcycle repairmen, sheet metal workers, wood workers, and welders.

A tentative schedule has been arranged for 70,000 mechanics as follows:

Begin training with	10,000 men	March	15
Increase to	20,000 men	April	1
Discharge	20,000 men	May	30
Take on	25,000 men	June	1
Discharge	25,000 men	July	30
Take on	25,000 men	August	1
Discharge	25,000 men	Sept.	30

It is planned to divide these men into eighty squadrons of 125 men to a squadron and each squadron of future soldiers will be taught 21 trades in all.

—

Denby Building Assembling Plant

DETROIT, Feb. 26—The Denby Motor Truck Co. is erecting an assembling plant. The building is a story high, and of brick and steel reinforced concrete construction.

—

Plan Alterations in Factory

DETROIT, Feb. 26—Contracts have been awarded for extensive alterations in the factory of the Detroit Copper & Brass Rolling Mills factory.

—

Studebaker Addition for Shell Work

DETROIT, Feb. 26—The Studebaker Corp. is planning a brick and steel addition to its factory. This, it is understood, will be used chiefly for shell work, which is to occupy 50 per cent of the attention of the company. The contract for the addition has already been awarded.

—

Government Purchases Saxon Branch

DETROIT, Feb. 25—The Michigan Avenue branch of the Saxon Motor Car Corp. has been taken over by the government for munition storage. The transaction was made through the Industrial Terminal Corp., a bonding company, and records filed Monday in the office of the Registrar of Deeds show that the consideration was $800,000. This plant is the new building which was erected by the Saxon company to house its entire business. It has been used in part for storage purposes by the Saxon company, but has not been completed to a sufficient extent for manufacturing purposes.

The deed of transfer was signed by Benjamin Godfredson, president of the Saxon company, and C. A. Pfeffer, secretary. Besides the building, a large piece of land lying between two adjacent roads was involved in the transfer.

—

U. S. Rubber May Resume Dividends

BOSTON, Feb. 26—There have been intimations that the United States Rubber Co. might resume payments of dividends this year on the $36,000,000 common stock. None have been paid since June, 1915, although the company has earned well over 6 per cent each year. In the 2½-year period the company has held back 15 per cent in common dividends, a sum equal to $5,400,000, all of which has been used to strengthen working capital, retire bonds or make plant improvements.

Resume Driveaways in Michigan

Condition of Roads Greatly Improved—May Use Lake Boats for Shipments

CHICAGO, Feb. 25—Driveaways from Michigan factories to Chicago and points west have begun with the partial clearing of the roads by road crews and the recent short thaw. The local Dodge distributer received word from the factory that the road was open between Chicago and Detroit, and a crew of ten men is leaving the factory to-day, and five more leave to-morrow.

Twelve cars from the Reo factory at Lansing are reported to have reached Michigan City en route to Chicago. One hundred cars for the Buick branch at Chicago will leave Flint to-morrow night so that the driveaways are on in earnest, although no cars have come through as yet. There is a possibility that conditions in some parts will be so bad that the crews may be held up a few days.

The train of Reos is particularly well equipped to buck the snow, being preceded by a car equipped with a rotary snow plow. The local Reo distributer expects to receive eight or ten cars a day throughout the season.

In order to determine the road conditions for the Buick fleet, the entire road is to be covered before to-morrow night by cars from Flint, Benton Harbor, Michigan City and Chicago, each traversing a certain section of the road. These cars will have a crew of five men equipped with shovels, etc., to clear away the drifts at the worst spots, and have the roads ready for the fleet of 100 cars which starts from the factory to-morrow. The Chicago Buick distributers have arranged for a schedule of from 100 to 150 cars a day over the roads, and it may be that before the season is over the high-water mark of 185 Buicks a day, which was reached last summer, will be duplicated.

The possibilities of using the lake boats for shipments to Chicago from Michigan factories is being investigated seriously, and, if possible, cars will be driven from a number of factories to ports on the east side of the lake and shipped by boat to Chicago. Scarcity of bottoms, however, may prevent this being done to any great extent.

Studebaker is arranging to ship by boat from Grand Haven, and Maxwells may be shipped by boat if bottoms can be obtained. Harry Newman, the local Maxwell distributer, is endeavoring to charter his own ships, which, if obtained, will carry raw material on the eastern trip and Maxwells on return, thus saving railroad capacity both ways. At the present time Maxwells have been arriving in the Chicago district by railroad, in sufficient quantities, and it is expected that this month will prove one of the biggest in the year.

The circus cars and other flat cars of the Oakland Co., some of which are

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owned and some leased, have made it unnecessary for local Oakland distributers to worry about driveaways.

Utilizing Chicago as a shipping platform for Michigan car manufacturing centers is an innovation which was put into force by the Reo Co. The factory maintains a crew of eight men at the Chicago branch to load the cars received by driveaway on freight cars for shipment west. Reo also has been using 25 leased horse and express cars for railroad shipment.

—

Hayes Wheel Adds $315,685 to Surplus

JACKSON, MICH., Feb. 25—Profits of the Hayes Wheel Co. for the year ending Dec. 31, 1917, amounted to $787,351. Sales aggregated $8,674,370 and manufacturing costs were $7,907,018. After making discounts on purchases, deducting $37,327 for interest, setting aside $270,000 for federal income and excess profits taxes, and $165,000 for dividends, a balance of $315,685 was carried to surplus, increasing the accumulated surplus to $754,083. This, after various adjustments, including writing off of $76,652 on patent rights and good will, and appropriating $38,411 to cover the unamortized part of discount on the company's 5 per cent gold notes, is reduced to $641,340.

The balance sheet on Dec. 31 follows:

Total assets	$3,936,242.17
Listed inventories, at or below cost	1,400,129.99
Accounts receivable, less reserves	773,637.88
Cash surrender value of life insurance policies	12,616.30
Installment paid on liberty bond subscription	60,400.00
Cash on hand	393,953.30
Investment in properties and plant	1,258,401.12
Investment in other companies.. (Hayes Motor Truck Wheel, $25,000; Jackson Co-operative Realty Co., $1,000.)	26,000.00
Current liabilities:	
Notes payable	$557,481.18
Accounts payable	475,477.47
Accrued taxes	42,624.58
Accrued royalties and commissions	35,323.95
Reserve for federal income and excess profits taxes	270,000.00
Capital liabilities	1,500,000.00
Outstanding authorized capital stock	2,000,000.00

It is reported that plans are under way to apply for listing the company's stock on the Detroit Stock Exchange.

—

Ban Extra Pay for Aviators

WASHINGTON, Feb. 22—Following the recent request of Secretary of War Newton D. Baker, Secretary of the Navy Josephus Daniels has recommended to Congress that extra pay and allowances for members of the Navy Flying Corps be abolished. Secretary Daniels advances the argument that the granting of such extra pay is no longer necessary since flying has progressed to such an extent that it is no longer an extra hazard in time of war, and he states the granting of such extra pay is unfair and unjust to other officers and enlisted men operating in service more hazardous.

Export-Import Rule Not Harmful

Manufacturers Do Not Believe Industry Will Be Affected by Proclamation

DETROIT, Feb. 25—Manufacturers in Detroit and throughout this territory do not believe that the President's ruling regarding the licensing of exports and imports will seriously affect the automobile industry. Certain phases of the ruling, however, might have an adverse effect if they are to be construed too literally by the government. Looking at the matter from a general standpoint, manufacturers believe that the internal freight situation and the difficulty of shipping to tidewater points have put a far greater damper on export business than the regulations incorporated in the President's proclamation.

With a reduced production due to war work, manufacturers in the automobile industry are nearly all behind in production. It is therefore quite natural that domestic demand will be taken care of before foreign demand, so that this factor alone would necessarily reduce exports.

The Ford Motor Co. is a good example of this. In all probabilities this concern will cut off immediately all export shipments. This, however, would have been done regardless of President Wilson's order, in view of the fact that production has already been cut 50 per cent, and also that the company has stopped shipments to congested freight districts, such as New York and Philadelphia. As a move in the direction of the conservation of shipping space, manufacturers cannot help but approve of the action, and concerns which export, even in large consignments, do not believe that their business will be seriously affected. Dodge Brothers do not fear any adverse results for several months to come, if at all.

Naturally great numbers of passenger cars will be shipped for military purposes, and large producers are making earnest efforts to get a share of this business. Dodge Brothers are shipping a number of their cars for use as officers' cars, and are heartily in sympathy with President Wilson's proclamation.

Some of the concerns say that European business has been quiet for some time, with the exception of Spain, and since the embargo on gasoline and oil to the latter country, which made the price of gasoline approximately $1 a gallon in that kingdom, business has been decreasing there also. For that reason shipments to Europe will not be seriously affected. It is not likely that the government will curtail export business in South America any more than is absolutely necessary, in view of our efforts toward commercial supremacy in that part of the world after the war.

Manufacturers look for a modification of that part of the order in which the weights of certain metals comprising the articles to be shipped must be mentioned. This would be a manifest hardship in certain cases, as it would take a metallurgist a long time in a great many instances to list the weights of different kinds of metals used in certain parts.

—

Northwest Tractor Men Organize

MINNEAPOLIS, Feb. 23—The Northwest Tractor Trade Association was formed with 36 charter members at a meeting in the Hotel Radisson, attended by 80 persons. Dues were put at $50 a year payable semi-annually and the organization started after adoption of by-laws with a list of officers as follows: President, D. J. Murphy; vice-presidents, N. B. Nelson and J. M. Orton; secretary, W. B. Gleeson and treasurer, P. J Perry; directors, H. W. Brown, H. D. Dodge, P. J. Keating, W. R. Stephens, E. K. Jenkins.

The purpose of the organization is to bring the manufacturers and distributers of tractors and power machinery into co-operation for furthering of the industry. Eligible for membership are all manufacturers of gas, oil and steam tractors and plows and accessories, distributers and factory branch managers. The only paid official will be an assistant secretary.

—

Freight Embargoes Limit National Profits

INDIANAPOLIS, Feb. 25—The operations of the National Motor Car & Vehicle Corp. under reduced production from July, 1917, until December, 1917, showed a much better margin of profit than formerly, until freight embargoes in December limited the company's shipments to a point below opportunity for any profit during the month. The balance sheet, on Dec. 31, 1917, follows:

Assets

Property and equipment, less depreciation	$827,689
Cars, stores, works in process and supplies	1,353,750
Accounts receivable and drafts on customers less drafts secured by cars shipped	198,895
Cash in banks and on hand	21,879
Insurance, advertising and organization expenses	67,208
	$2,469,422

Liabilities

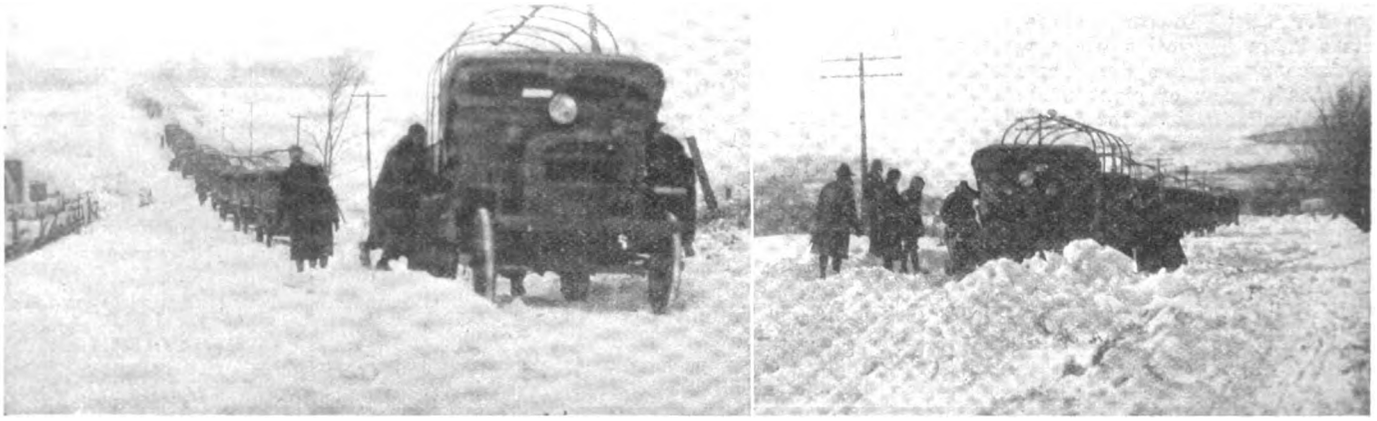
Accrued taxes on car sales	$12,579
Accrued payrolls	7,513
Federal, state and county taxes	31,000
Reserve for guarantee on car repair	15,000
Notes payable—banks	605,000
Notes payable—creditors	117,991
Accounts payable	224,042
Deposits by dealers	44,281
Capital and surplus	1,412,212
	$2,469,422

—

Prudden Directors Re-elected

LANSING, MICH., Feb. 25—At the annual stockholders' meeting of the Prudden Wheel Co. the following old board of directors was re-elected: H. F. Harper, W. H. Newbrough, O. A. Jenison, C. C. Richardson and R. J. Haule. Two new directors added are Birney J. Adams and C. C. Carolton. Officers have not yet been elected.

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"The problem of keeping the roads clear so that motor trucks may be utilized to the fullest possible extent in relieving the railroads is one that calls for more than isolated, emergency effort. It must be dealt with comprehensively and preparation made in advance to keep roads open at all times."—Roy D. Chapin, Highways Transport Committee

Columbia Motors to Make 500 Government Trailers

DETROIT, Feb. 23—The Columbia Motors Co. has obtained a government contract to make 500 two-wheel 1-ton trailers. It is expected to have half of the order ready for delivery early in March and the complete order on the way by April.

The factory is preparing plans to readjust its forces so as to permit the building of the trailers without undue interference with the manufacture of passenger cars.

The government has asked the company to arrange its factory forces and equipment so as to enable it to take care of subsequent orders. The officials state that their plans are so arranged that they can fill all orders for the government as fast as the latter requires them, and at the same time continue their previously arranged program of building passenger cars.

Simultaneously with the receipt of this order the Dort Motor Car Co. was asked to build 1500 trailers, the Ohio Trailer 1000 and the Miami Trailer and Rogers Trailer each 500. This makes an aggregate order of 3500 trailers.

—

Commerce Truck Gets Government Contract

WASHINGTON, Feb. 24—The Commerce Motor Truck Co., Detroit, has received a contract for 1500 1-ton Commerce trucks for the Ordnance Department.

—

Fords Now $595 in Canada

TORONTO, ONT., Feb. 27—The price of Ford cars in Canada has been increased $100, making the new price $595.

—

Studebaker in Production on New Models

DETROIT, Feb. 27—The Studebaker Corp. expects to be working full speed by the end of March, before which time it will have manufactured 1000 cars. The three cars which the company has been trying out on the Chicago Speedway for several weeks past have completed their tests, and have traveled 30,000 miles. The tests were made to secure information for the engineering department. Two of the cars used were 6-cylinder touring models, and the third a 4-cylinder.

—

Goodrich and Kelly-Springfield to Reduce Capital

NEW YORK, Feb. 27—Two tire manufacturing companies will reduce their capital stock in March. The B. F. Goodrich Co. stockholders, at a special meeting to be held here on March 13, will vote to authorize the reduction of the preferred stock from 264,000 shares, par value $100, to 255,000 shares. This will bring the total capitalization from $86,400,000 down to $85,500,000. The stockholders of the Kelly-Springfield Tire Co. at their meeting in Jersey City, March 12, will ratify the resolution adopted by the Board of Directors to reduce the capital stock $248,900 by the withdrawal of 24,800 shares of 6 per cent cumulative first preferred stock.

—

Preferential Coal Distribution Outlined

WASHINGTON, Feb. 26—Fuel Administrator Garfield has outlined a series of classes for preferential coal distribution. Class I includes domestic consumers, Class II necessary war industries, Class III necessary peace industries, and Class IV makers of so-called luxuries. The preferential distribution will be enforced by orders to coal operators and railroad embargoes.

—

Leverton Federal Factory Manager

DETROIT, Feb. 27—A. C. Leverton has been appointed factory manager of the Federal Motor Truck Co. He was formerly general superintendent of the Chalmers Motor Co.

—

Standard Parts to Move

CLEVELAND, Feb. 27—The Standard Parts Co. is to have a new home. It has leased the fourth, fifth and sixth floors of a six-story building to be erected here and to be called the Standard Parts Bldg.

Announces Manufacturers Doing Government Work

WASHINGTON, Feb. 23—Following the action of the Secretary of War, Newton D. Baker, in allowing publicity for military contracts, H. L. Horning, Chairman Automotive Products Section, Council of National Defense, has made public the following lists of companies which are working on Government truck motorcycle and passenger car requirements. This list represents only contracts which have come through Horning's office for approval. No publicity is given to tractor contracts which includes tanks, or to amounts and sizes of contracts.

Motor Trucks

Denby Motor Truck Co.	Detroit
Dodge Bros.	Detroit
Packard Motor Co.	Detroit
Hudson Motor Car Co.	Detroit
Four Wheel Drive Motor Co.	Clintonville, Wis.
Garford Motor Truck Co.	Lima, O.
International Motor Truck Co.	New York
Kelly-Springfield Motor Truck Co.	New York
Locomobile Co.	Bridgeport
Pierce-Arrow Motor Co.	Buffalo
Standard Motor Truck Co.	Detroit
United States Motor Truck Co.	Cincinnati
Velie Motor Co.	Moline, Ill.
Bethlehem Motors Corp.	Allentown
Brockway Motor Truck Co.	Cortland, N. Y.
Diamond-T Motor Car Co.	Chicago
Gramm-Bernstein Motor Truck Co.	Lima, O.
Indiana Truck Corp.	Marion, Ind.
Selden Motor Truck Co.	Rochester
Service Motor Truck Co.	Wabash, Ind.
National Motor Co.	Indianapolis
Premier Motor Corp.	Indianapolis
Federal Motor Truck Co.	Detroit
Paige Motor Corp.	Detroit
Commerce Motor Car Co.	Detroit
General Motors Co.	Pontiac
Nash Motors Co.	Kenosha
Republic Motor Truck Co.	Alma, Mich.
United Motors Co.	Grand Rapids
White Co.	Cleveland
Springfield Motor Truck Co.	Springfield, O.
Sterling Motor Truck Co.	Milwaukee, Wis.
Mitchell Motor Co.	Racine, Wis.
Kissel Motor Co.	Hartford, Wis.

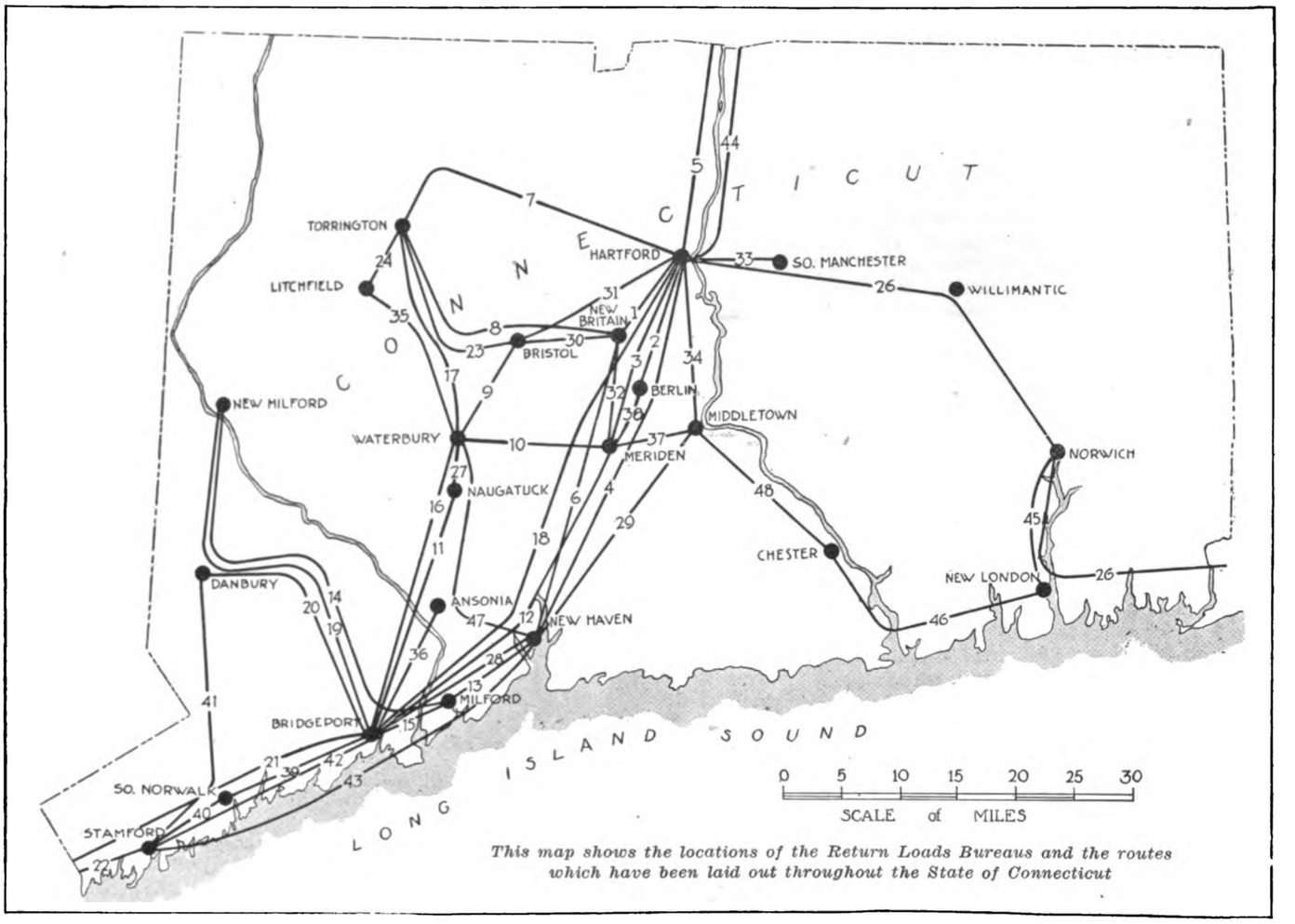
Passenger Cars

Cadillac Motor Co.	Detroit
Dodge Bros.	Detroit

Motorcycles

Hendee Mfg. Co.	Springfield, Mass.
Harley-Davidson Motorcycle Co.	Milwaukee

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This map shows the locations of the Return Loads Bureaus and the routes which have been laid out throughout the State of Connecticut

Connecticut Eliminates Dead Truck Mileage

Information as to Routes Necessary for Deliveries Obtained from Shippers by Return Loads Bureaus

NEW YORK, Feb. 25—The State of Connecticut, as told in AUTOMOTIVE INDUSTRIES last week, has 14 Return Loads Bureaus in as many cities and about 700 trucks of 1-ton capacity are operating in conjunction with the bureaus. The whole Return Loads Bureau idea is an advertising one whereby the shipper who has goods to move may get in touch with a motor truck operator able to move them. As such the bureaus have advertised extensively and have posted in conspicuous places in the various cities posters telling of the existence of the bureau and how it can serve both manufacturer and transportation company.

One of the greatest troubles experienced by the Council of National Defense in getting the idea started was the indifference on the part of shippers generally and the idea that their responsibility ended as soon as the goods were packed and dumped on the railroad platform. The old-style traffic managers of the industrial plants were loath to change their shipping methods from railroads to motor trucks. At first they claimed there were no trucks available.

When it was proved to them that there were 700 trucks of 1-ton capacity and over in the state available for the work, they claimed that the roads would be impassable. But here again Connecticut solved the situation by its efficient snow-removal plan.

While the principal work of the Return Loads Bureau was in connection with motor truck traffic over the roads, it also was the means whereby the trolley freight concerns more than doubled their tonnage and also increased the service rendered by the boat lines running between Connecticut points and New York.

One boat line between these two points was to be shut down during the winter until the committee offered to guarantee the boat company a profit on the run. Even then it was skeptical, but finally consented to run the line with the result that it received so much freight that an embargo had to be set down on the line in less than a week's time.

The first step in the formation of a Return Loads Bureau to cover a state or any particular territory in that state is to find out the number of trucks in the state or territory under consideration.

This done, it is necessary for the main or central bureau to then send out return postal cards requesting information as to the trucks in each particular case; whether or not the trucks are available for overland haulage; the sizes of the trucks; what they can best carry, and the routes they usually run over and how often.

The information obtained from these postals may be entered on index cards. The trucks available for work on any particular route are filed behind a blank card having a marker designating the number of that particular route.

This master file should be duplicated and furnished to each of the local Return Loads Bureaus formed in each of the important cities, together with a map showing the location of each bureau and all of the numbered routes.

By this means the head of the bureau in each city knows exactly what trucks are available for any of the other forty-eight routes. For instance, the bureau in New Haven knows what trucks are available for haulage work between Danbury and Bridgeport or between Hartford, South Manchester or Norwich.

As soon as this information has been obtained each of the bureaus should circulate the information that such data are available by means of letters to all of the large shippers and manufacturing plants in its own locality. Each bureau should also request that each shipper or

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manufacturer give the bureau information concerning its overland haulage needs so that this data may be included on cards similar to those on which the trucks data is kept and inserted in the front part of the filing cabinet in each bureau.

Thus, when a shipper calls up any bureau and asks for the names of available truck owners to haul goods between any two cities, the method is simply to determine the number of the route and then give the shipper the names of the truck owners operating vehicles over that route. Reversely, the names of shippers or manufacturers in any particular city may be had by scanning the cards in the front of the file.

Telephone Numbers Listed

To make it easier for either shipper or truck operator to get in touch with the bureau, the Connecticut organization has arranged to have the regular telephone number of the chamber of commerce listed a second time in the book under the heading "Return Loads." This makes it very convenient for a strange truckman to reach any particular bureau and find out the names of concerns which might have a return load to be hauled to its home city.

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Another Truck Train Arrives

WASHINGTON, Feb. 24—The first truck train of several which left Detroit within the last 10 days arrived at Baltimore to-day with its full quota of 30 trucks. The trip was made in 8 days, the average distance being 72 miles per day for the 575-mile journey. The highest day's mileage was 97.4 miles over smooth straight roads and 85.4 miles through the mountains. The second truck company reached Bedford, Pa., last night.

Ford Car Price Increase of $90—Chassis $75 More

Klingensmith Ascribes Raise to Greater Cost of Material

DETROIT, Feb. 25—The Ford Motor Co. has increased the price of its cars $90 and its chassis $75. The price of the truck chassis remains unchanged. The increase is not altogether surprising to dealers who for some time have been urging early purchases in view of a possible increase. Only last week, however, Frank Klingensmith, treasurer of the Ford company, stated positively that no increase was in contemplation.

Klingensmith ascribed the increase to the rising cost of materials. It is likely that the reduced output of the Ford company also has had an important bearing, the present production being but 1500 cars a day as against 3000 a short time ago. With the output thus reduced 50 per cent, it is but natural that materials cannot be purchased in such large quantities as with a normal output.

FORD PRICES

Model	Old Price	New Price	Increase
Touring	$360	$450	$90
Roadster	345	435	90
Chassis	325	400	75
Truck chassis	600	600	..

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O'Donnell Heads Oil Production

WASHINGTON, Feb. 22—T. A. O'Donnell, Los Angeles, Cal., has been appointed in charge of oil production for the oil division of the United States Fuel Administration.

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Guilford Truck in Greensboro

GREENSBORO, N. C., Feb. 26—The Guilford Motor Truck Co., recently organized with $250,000 capital, and established at Martinsburg, W. Va., will move here as soon as a factory can be leased. The company will manufacture a 1-ton truck to sell for $1,075, with a 130-in. wheelbase, worm drive, electric lights and starter. Materials sufficient for the manufacture of 2000 trucks, with the exception of engines and rear axles, have already been purchased and will be transferred from Martinsburg.

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Maccar Truck Prices Increased

SCRANTON, PA., Feb. 26—List prices of Maccar trucks have been advanced as follows:

Model	Capacity	New Price	Old Price
L	1½-ton	$2,550	$2,450
H	2½-ton	3,100	2,950
M	3½-ton	3,850	3,600
U	5½-ton	4,750	4,500

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Mid-West Mfg. Starts Production

HASTINGS, MINN., Feb. 26—The Mid-West Mfg. Co., organized here recently with a capital of $50,000, has started operations. The company will manufacture airplane parts and commercial bodies.

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Sweden Plans Airplane Mail Service

WASHINGTON, Feb. 25—Sweden is considering proposals for the establishment of airplane postal service between Stockholm and Abo and Stockholm and Petrograd. The service between Stockholm and Petrograd would reduce the time of postal transit from 5 days to 25 hours, and from Stockholm to Abo from 4 days to 6 hours.

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Savannah Dealers Organize

SAVANNAH, Feb. 26—Savannah dealers have organized the Savannah Automobile Dealers' Assn., with C. E. Vinson, head of the C. E. Vinson Motor Co., as president. L. H. Dimmitt was elected secretary and treasurer.

Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co	53	57½	+2½
*J. I. Case T. M. Co. pfd	83	85	—1
Chalmers Motor Co. com	5½	7½	— ½
Chalmers Motor Co. pfd	25	40	..
*Chandler Motor Co	89	91	+7
Chevrolet Motor Co	128	129½	+8½
*Fisher Body Corp. com	28	30	—5
*Fisher Body Corp. pfd	80	87	+2
Fisk Rubber Co. com	50	53	—2
Fisk Rubber Co. 1st pfd	98	103	..
Fisk Rubber Co. 2nd pfd	70	75	+5
Firestone Tire & Rubber Co. com	96	98	..
Firestone Tire & Rubber Co. pfd	97½	100½	+1½
*General Motors Co. com	125	126½	—7½
*General Motors Co. pfd	83	85	..
*B. F. Goodrich Co. com	41½	42½	—4½
*B. F. Goodrich Co. pfd	93	100	..
Goodyear Tire & Rubber Co. com	135	140	—5
Goodyear Tire & Rubber Co. pfd	98	100	—1
Grant Motor Car Corp	2	3	..
Hupp Motor Car Corp. com	2	2½	— ¾
Hupp Motor Car Corp. pfd	75	80	..
International Motor Co. com	13	17	..
International Motor Co. 1st pfd	35	45	..
International Motor Co. 2nd pfd	14	17	—3
*Kelly-Springfield Tire Co. com	45	48	+1
*Kelly-Springfield Tire Co. 1st pfd	75	80	—1
*Lee Rubber & Tire Corp	15	16	+1
*Maxwell Motor Co., Inc., com	27½	28½	— ½
*Maxwell Motor Co., Inc., 1st pfd	60	63	—1
*Maxwell Motor Co., Inc., 2nd pfd	24	25	+1
Miller Rubber Co. com	135	140	—10
Miller Rubber Co. pfd	95	98	..
Packard Motor Car Co. com	96	104	+1
Packard Motor Car Co. pfd	90	93	—1
Paige-Detroit Motor Car Co	18	19	..
Peerless Truck & Motor Corp	17½	18½	..
Portage Rubber Co. com	113	115	+1
Reo Motor Car Co	18	19	+ ½
*Saxon Motor Car Corp	10	11	..
Standard Motor Construction Co	12	13	+2½
Standard Parts Co	65	68	—1½
*Stewart-Warner Speed. Corp	56	58	—1
*Studebaker Corp. com	51	52	..
*Studebaker Corp. pfd	92	96	—1
Swinehart Tire & Rubber Co	..	35	—2
United Motors Corp	28⅛	28⅝	+3⅛
*U. S. Rubber Co. com	56½	57½	—1
*U. S. Rubber Co. pfd	100	102	+1
*White Motor Co	44	45	+1
*Willys-Overland Co. com	18½	19¼	..
*Willys-Overland Co. pfd	80	81	+1

*At close Feb. 23, 1918. Listed N. Y. Stock Exchange.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANG

ACTIVE STOCKS

	Bid	Asked	Net Ch'ge
Auto Body Co	7½	8½	..
Bower Roller Bearing Co	17	19	— ½
Chevrolet Motor Co	132	134	+13
Commerce Motor Car Co	6¾	..	+ ¾
Continental Motor Co. com	6	6⅛	+ ⅛
Continental Motor Co. pfd	..	..	..
Edmunds & Jones com	..	..	..
Edmunds & Jones pfd	..	..	..
Ford Motor Co. of Canada	212	..	+34
Hall Lamp Co	..	14½	..
Michigan Stamping Co. com	13¼	14¼	+ ½
Motor Products	..	..	..
Packard Motor Car Co. com	99	101	+4
Packard Motor Car Co. pfd	92¼	..	+1¼
Paige-Detroit Motor Car Co	19⅛	19¾	+1½
Prudden Wheel Co	..	16	—2½
Reo Motor Car Co	18¾	19	+1⅜

INACTIVE STOCKS

Atlas Drop Forge	..	30	..
Kelsey Wheel Co	83	90	+1
Regal Motor Car Co	..	26½	..

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Men of the Industry

Changes in Personnel and Position

Templar Motors Corp. Adds to Organization

CLEVELAND, Feb. 26—The Templar Motors Corp. has made several additions to its organization. Charles E. Taylor, who has been connected with Peerless, Chandler and Hal companies, is now in charge of factory production. Thomas McKay, who served 12 years as master mechanic of the Whitney Mfg. Co., has been appointed to a similar position with the Templar organization, and James Farr, who has had 7 years of training in ordnance work in England, is the new superintendent of munitions production.

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Clinton B. Amorous, who has been connected with the sales department of the Locomobile Co. of America for several years, and formerly held the position of assistant purchasing agent, has been commissioned a major in the Signal Corps. At present he is stationed at Washington.

W. F. Schmitt, for many years connected with the Packard-Missouri Motor Co., St. Louis, has been elected vice-president of the organization.

W. B. Cockran has been appointed western sales manager of the United States Motor Truck Co., Cincinnati. He will have headquarters in San Francisco.

T. P. Chase, for several years chief engineer of the King Motor Car Co., Detroit, has resigned.

J. B. Siegfried has been appointed general manager of the King Motor Car Co., Detroit. He has been an executive of the company for several years, first as production manager and later as assistant general manager.

William Burgess Nesbitt, who for 5 years has been advertising manager of the King Motor Car Co., Detroit, has been elected vice-president of the company, to succeed T. E. A. Barthel. His headquarters will be at 50 Union Square, New York.

A. C. Webb has been appointed district sales representative of the Fulton Motor Truck Co. with headquarters in Atlanta. He will have charge of sales in 7 states.

Louis Schwitzer has been elected president of the Automotive Parts Co., Indianapolis, manufacturer of cooling fans and other accessories. He was formerly vice-president and chief engineer of the Oakes Co., Indianapolis.

Lloyd A. Bachman, formerly purchasing agent for the J. C. Wilson Truck Co., is now connected with the Commonwealth Brass Corp., formerly the Lavigne Mfg. Co., Detroit. He will have charge of publicity and research work.

F. M. Holden, formerly in the airplane engineering department of the Signal Corps at Washington, is now research engineer of the Cadillac Motor Car Co., Detroit.

Harold G. Wilson, for 7 years sales engineer of the automobile division of the Hyatt Roller Bearing Co., Detroit, who left that position to join Holley Brothers, has returned to the Hyatt company to represent the tractor division in Detroit territory.

Owen Moynihan has been appointed general sales manager of the Amazon Rubber Co., Akron. He was formerly manager of the New York branch.

C. E. MacConnell has joined the sales engineers staff of the Hyatt Roller Bearing Co. MacConnell was formerly advertising manager of the Detroit branch of the Goodrich Rubber Co.

K. C. Miller, after 6 years' service in the ordnance department of the Root & Vandervort Co., Rock Island, Ill., has resigned to become chief engineer of the Wright-Martin Aircraft Co., New Brunswick, N. Y.

A. J. Jackson, for several years sales manager for the Kissel-Kar in Davenport, Iowa, has resigned to become sales manager for the Day-Elders Motor Corp., New York, and will have charge of Iowa and western Illinois territory. He was formerly with the Pierce-Arrow company.

A. R. Miller, former vice-president of the Wolverine Automobile Club, and sales representative of the Troy Wagon Works Co., Detroit, has been appointed district sales manager for the same company. He will have headquarters at Philadelphia.

J. A. Holihan has been appointed general sales manager of the Standard Motor Truck Co. He was formerly assistant general manager of the Briscoe Mfg. Co., and later president and general manager of the Holihan Mfg. Co. For the last 2 years he has been district sales manager for the Federal Motor Truck Co.

William D. Paine, for the last 10 months eastern sales manager for the Saxon Motor Car Corp., stationed at York, Pa., has been commissioned a captain in the Ordnance Reserve Corps.

W. H. Thompson, for many years with the Westinghouse Electric & Mfg. Co., has resigned. He will become works manager of the Fairmont Mining Machinery Co., Fairmont, W. Va.

R. F. Jackson, formerly assistant sales manager of the Zenith Carbureter Co., has been appointed sales engineer, succeeding P. E. Miquelon, who has been placed in charge of the Chicago branch.

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Aeronautic School for Pittsburgh

WASHINGTON, Feb. 25—An aeronautic school to be styled Langley Laboratory of Aeronautics will be erected shortly at the Carnegie Institute of Technology at Pittsburgh. It is expected that the airplane building will be ready in 30 days.

New Companies Formed

Latest additions to ranks of Automotive Industries

Wohlrab Company Starts Production of Truck Gears

RACINE, WIS., Feb. 25—The Wohlrab Gear Co., recently incorporated here, is just starting production of a split-nut steering gear for motor trucks. This is designed to operate with oil instead of grease, due to special construction of the housing and exterior arrangement. The company has $75,000 capital and is organized under the laws of Wisconsin. T. B. Wohlrab is president, E. M. Caskey vice-president, E. J. Smieding secretary, and J. G. Kluyskens export sales manager.

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STANLEY, WIS., Feb. 25—The Badger Chemical Co., organized with $500,000 capital, will establish a chemical and refining plant here. The company will make wood alcohol, with charcoal, potash and other chemicals as by-products. The incorporators are Charles Friend, Bernard Rosenow and A. E. Kopps, Milwaukee.

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KAUKAUNA, WIS., Feb. 26—Mayer Bros., Inc., Antigo, Wis., have combined with business men of this city and organized the Kaukauna Machine Works to manufacture the Mayer power hammer, trade-marked Little Giant. The machine shop and foundry of A. W. McCean & Co. has been purchased, and production will be started in a few months. The Mayer power hammer ranges in size from 25 to 100 lb. capacity and larger sizes will be added.

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McKEESPORT, PA., Feb. 25—R. V. Trader & Co. has been organized here to manufacture a fuel-saving carbureter for trucks. A building has been purchased and remodeled as a factory, and limited production is already going on. New machinery will be installed shortly and production increased. Philip Palmgreen, formerly with the Westinghouse Electric & Mfg. Co., is in charge of the factory.

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Swan & Finch 65 Years Old

NEW YORK, Feb. 25—The Swan & Finch Co., maker of lubricants, celebrated its sixty-fifth anniversary recently. The business started in 1853 in a small building on Water Street, New York.

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George K. Birge Dies

BUFFALO, Feb. 25—George K. Birge, founder of the Pierce-Arrow Motor Car Co., Buffalo, died last week. In 1896 he reorganized the George N. Pierce Co., then manufacturing bicycles, and established it firmly as an automobile manufacturing company.

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Industrial Review of the Week

A Summary of Major Developments in Other Fields

Coal Shipments Moving Regularly from Mines

For the first time in many weeks shipments from the mines are moving with moderate regularity. Reports from all sections, with the exception of the New England States, indicate that the coal crisis is over. However, this does not mean that the danger of a recurring scarcity is entirely removed, but that with a continuation of good weather distressing periods such as the country has just experienced are improbable.

The chief trouble still is lack of motive power, and many loaded cars yet remain on sidings on this account. A report by Government investigators shows that thousands of cars in poor condition clog the terminals and impede delivery. Railroad companies state they are unable to get sufficient men to keep up repairs. An appeal to mining companies for the transfer of men with mechanical ability has met with some success.

The general public expressed much satisfaction at the demise of "heatless Monday." Some industrial plants are working on close margins of fuel supply. Anthracite is still scarce, though the mines are shipping large quantities to tidewater. The resumption of waterborne traffic will also aid in the movement of coal and take some pressure off the railroads.

Radical changes in distribution routes are in prospect. So great is the demand from the East that a plan of coal distribution, approved by the Fuel Administration, proposes that Eastern seaboard states shall have first choice on the output of anthracite. This means that after April 1 states in the West and Northwest will not be permitted to receive hard coal. This will be true also of Canada and the South. The mines of the Middle West will thus have their natural markets pretty much to themselves.

The committee in charge of the zoning plan seems to be making but little progress. It has been found to be a more difficult proposition than at first contemplated. Theoretically the arrangement seems ideal, but so many difficulties have beset the practical application that it looks as if the plan will not be ready for operation for some time.

The announcement that the 15 to 30c. commission which jobbers are now permitted to add to the mine price will be done away with after April 1 has been received with consternation by many middlemen. It cannot be denied, however, that the order will tend to eliminate a great deal of profiteering on the part of some operators who established subsidiary companies for the express purpose of selling coal, thereby absorbing this commission. Under the new ruling retail dealers will obtain coal at the same price, whether they purchase it from the mine or through a middleman.

A New Service

¶ Herewith AUTOMOTIVE INDUSTRIES *supplies for the benefit of its readers a general summary of important developments in other fields of business. This is rendered possible by the editorial co-operation of leading industrial publications which are recognized authorities.*

By compressing the general industrial situation into this form we hope to give our readers a clear and comprehensive idea of up-to-the-minute developments which they could otherwise secure only with considerable expenditure of time and effort.

Production will doubtless be greatly stimulated by the order of the Fuel Administrator granting an increase of 60c. a ton for coal mined in the central Pennsylvania district. This will go far toward encouraging the investment of further capital in development work.—*Coal Age.*

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New England Suspends Heatless Mondays

BOSTON, Feb. 27—The New England states, which continued "Heatless Mondays" after fuel administrators of the other states suspended them have also suspended them, under the fuel administration order of Jan. 17.

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Cleveland Truck Dealers Organize

CLEVELAND, O., Feb. 26—The Commercial Car Dealers Assn. of Cleveland was formed here last week by 40 truck distributers. H. L. Schneider, manager of the Republic Motor Sales Co., who presided at the first meeting, has appointed a committee of five men to draft a constitution. This local organization will foster the work of the truck committee of the N. A. C. C. The formation of the committee was in response to suggestions made at a recent convention of truck manufacturers by Christian Girl, who is director of production of the Government's military truck division; Hugh Chalmers, chairman of the automobile industries committee, and by Roy D. Chapin, chairman of the highways committee and president of the Hudson Motor Car Co. This week will see the local association completely organized.

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War Truck Inspection in Cleveland

CLEVELAND, Feb. 26—An office has been opened here in charge of Captain A. A. Gould for the furtherance of inspection and production of Class B, Class A and Class AA war trucks which are being constructed and which will be constructed in Ohio and neighboring states. Captain Gould was formerly in the designing department of the Peerless Motor Car Co.

Iron and Steel Industry Shows Big Improvement

The improvement in iron and steel works operations has gone further, as indicated by 75 per cent blast furnace operations at Steel Corporation plants, accompanied by 85 per cent active ingot capacity and 80 to 85 per cent in rolling mills. Some companies have not fared so well. Eastern Pennsylvania, which was hardest hit, it still very short of coke, and blast furnaces there have scarcely exceeded a 50 per cent operation, with steel works at 60 per cent or less.

Pittsburgh and nearby districts are suffering from new car shortages. Loaded cars have left the mills, but are not returning, and the giving of special priority to food shipments has resulted in the sending of empty cars all the way from the East to the far West. Coke shortages are much aggravated from this cause.

Want Prices Stabilized

Steel manufacturers will confer in New York on Friday preparatory to a meeting with Government representatives to consider the prices that will prevail after April 1. Steel producers, after months of hamperings, with steadily advancing costs, now ask for stabilized prices over a period of six to nine months. The uncertainty as to prices and pig-iron and steel supply is beginning to affect consuming industries in a number of lines, and the next conference at Washington is considered of more moment than any that have preceded it.

Foundry operations have been curtailed here and there for lack of pig iron, but there are also cases in which the demand for castings has fallen off because certain industries in the less essential class have found their sales diminishing or have had to stop for lack of fuel.

Fabricated steel business dropped to 95,000 tons in January, from the 205,000 ton total of December. When the rush for munitions plants had run its course in 1915, culminating in 208,500 tons of fabricated work in December of that year, the total for January, 1916, fell to 119,000 tons. The recent large lettings of fabricated steel for ships now leave little before the bridge and structural shops.

The scrap trade is accepting the new rulings of the regulating committee, notwithstanding the deviations from long established price relations. Opposing views on the question of commissions to holders of yard stocks have not yet been threshed out and meanwhile authority for the payment of commissions is lacking. On the decision hangs the movement of a considerable tonnage of heavy melting steel, which would require some inducement to draw it to the Pittsburgh district.—*Iron Age.*

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Mitchell Making F. W. D. Trucks

RACINE, WIS., Feb. 26—The contract accepted by the Mitchell Motor Car Co., for the manufacture of F. W. D. trucks, licensed by the Four Wheel Drive Auto Co., Clintonville, Wis., is being filled. The Mitchell company became a sub-contractor under the contract which the latter company received from the government. As soon as this initial contract was given, another and larger contract was awarded direct to the Mitchell company. It is impossible to state the exact volume of these contracts, but they will doubtless aggregate $15,000,000.

The Mitchell plant has been increased in size to take care of this large volume of business.

Wilson Body to Make Airplane Parts

BAY CITY, Feb. 26—The C. R. Wilson Body Company has received an order from the Government for 1000 sets of parts for airplanes, the production of which will commence in 30 to 40 days.

Republic Buys Los Angeles Factory

ALMA MICH., Feb. 22—The Republic Motor Truck Co. has purchased a steel structure located in the 3-mile circle in Los Angeles, including 12½ acres of ground. This is to be used as a branch factory to supply dealers in the South and West and also to attend to the foreign business of the company in Japan, China, Hawaiian Islands, the Philippines, Mexico and South America.

American Truck to Succeed Blair

NEWARK, O., Feb. 26—The Blair Motor Truck Co. will within a week or 10 days sell all of its assets to a new corporation to be styled the American Motor Truck Co. The new corporation will continue to manufacture the truck and will take over the entire good will of the Blair organization. The new company is in the process of organization at the present time and will announce its new offices shortly.

Tire Machine Patent Infringed

CLEVELAND, Feb. 27—The DeLaski & Thropp Circular Woven Tire Co. has been granted an injunction restraining the Miller Rubber Co. from using tire making machines built under patent No. 1,011,450. The Miller company stated in its answer that the patent was not infringed and that the use of machines had ended before the beginning of the suit. Judge D. C. Westhaven held, however, that the DeLaski & Thropp company is entitled to an injunction and if desired a master may be appointed to state an accounting of profits and damages.

Second Chicago Used Car Show

CHICAGO, Feb. 27—The second annual used car show of the Chicago Automobile Trade Assn. will be held at the Coliseum during the week beginning March 30. The main building will be devoted exclusively to passenger cars, and in the annex accessories and trucks will be shown.

Current News of Factories

Notes of New Plants—Old Ones Enlarged

White Erecting War Buildings

CLEVELAND, Feb. 27 — The White Co. is erecting two new buildings to be devoted to war work. They will cost approximately $500,000.

To Auction Pathfinder and Springfield Body Plants

CHICAGO, Feb. 26—Two well-known automobile plants will be auctioned by Samuel L. Winternitz & Co. The first is that of the Springfield Body Co., Detroit, which will be put under the hammer within 30 days. On March 5 the entire stock, machinery, equipment and finished cars of the Pathfinder Motor Co. of America, Indianapolis, will be auctioned. The property inventory amounts to more than $500,000.

Termaat & Monahan Wind Up Business

OSHKOSH, WIS., Feb. 25—The affairs of the Termaat & Monahan Co., maker of machine tools, gas engines and shop specialties, have been wound up with the distribution of a first and final dividend of 23.45 per cent, amounting to $21,-332.50. The company went into the hands of a receiver last September. A reorganization committee took over the plant and business shortly after, and the organization, under the style T. & M. Mfg. Co., has been in production ever since.

Hower Manager of New London Factory

TOLEDO, Feb. 25—Henry H. Hower, manager of the Willys-Knight division of the Willys-Overland Co., will become manager of a large plant manufacturing navy supplies at New London, Conn. His change of position is only for the duration of the war, when he will return to his former duties with the Willys-Overland company.

Detroit Body Enlarges Plant

PONTIAC, MICH., Feb. 25—The Detroit Weatherproof Body Co. is enlarging its plant and expects to increase its daily production of sedan tops from 150 to 250. The manufacture of truck cabs and probably other divisions of the body building business will be engaged in by the company.

Editor Automotive Industries: Through some misunderstanding we find that the specifications given out covering our 1918 model cars showed the bore and stroke as 3⅛ x 4¼, and the tires 32 x 4. Please take note of this error, the correct engine size being 3 x 4¼ and the tires 33 x 4.—Elgin Motor Car Corp., Chicago.

Detroit-Wyandotte Plant to Be Sold

WYANDOTTE, MICH., Feb. 26—The plant and business of the Detroit-Wyandotte Motor Truck Co., maker of the Horner truck, is being offered for sale by the Security Trust Co., receiver for the organization. The Detroit-Wyandotte company went into receivership in January, with inventoried assets of $200,000 and liabilities of $85,000. The plant covers 2½ acres.

Dodge Brothers Plan Arsenal

DETROIT, Feb 25—Contracts are being let for the erection of a one-story brick and steel arsenal building for Dodge Brothers.

Carde Stamping Starts Production

SAGINAW, MICH., Feb. 25 — The Carde Stamping & Tool Co., maker of tools and stamped parts used by the Hupp and Studebaker concerns, has purchased the old Bransfield-Billings plant and is starting operations. The concern is entirely financed by outside capital, but was brought to the city through the efforts of the Board of Trade. Sufficient tool equipment to give employment to 35 toolmakers is already in operation, and it is expected that the stamping department will be ready by May.

Alexander R. Pribl of Detroit is general manager, and associated with him are Clyde P. Crane, Detroit, and C. B. Castle, Cleveland.

Osborn Co. Plans Addition

CLEVELAND, Feb. 26—The Osborn Co., manufacturer of tires and tubes, is planning a factory addition in Garfield, N. J. This will be equipped to turn out 500 tires and 1000 tubes daily.

Maxwell Raises Prices

DETROIT, Feb. 26—The Maxwell Motor Sales Corp. will increase the price of all passenger car models $80 on March 1, and all truck models $100 on March 1. The prices follow:

Model	New Price	Old Price
Passenger Cars		
Touring car	$825	$745
Roadster	825	745
Touring car with winter top.	935	855
Roadster car with winter top.	910	830
Berline (6-passenger town car)	1175	1095
Berline, with wire wheels (optional)	1275	1195
Sedan with wire wheels	1275	1195
Chassis with cowl	735	655
Chassis with commercial delivery body	810	730
Trucks		
1-ton truck chassis	1085	985
1-ton truck chassis with cab and windshield	1125	1025
1-ton truck chassis with stake gate	1180	1080
1-ton truck chassis with combination box stake	1175	1075
1-ton truck chassis with combination box	1135	1035
1-ton truck chassis with canopy body	1195	1095

The prices for Canada and foreign countries will remain the same.

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May Revive Racing in United States

CHICAGO, Feb. 24—Motor racing in America for the next year or so may not be taken wholly off the boards if the plans of three different sets of promoters materialize as they expect. When, in response to what is believed to have been government suggestion, the American Automobile Assn. announced last December it would sanction no more races during the war, a decided damper was put on racing as a whole, because the A. A. A. for years has been the official arbiter of organized speed contests. The A. A. A. and those in sympathy with it felt that the need of transportation facilities, fuel, and skilled drivers and mechanics was such that the continuation would be unpatriotic. It was believed that the services of the skilled drivers and mechanics could be better given to the government, either in the aviation or motor transport section.

The stepping aside of the A. A. A. from racing has made it possible for some of the organizations which heretofore have been looked upon as outlaws to have a chance at the A. A. A. stables. Of the organizations which have staged races of more or less local importance without A. A. A. sanction in previous years, two at least and several local promoters have announced plans for a rather ambitious racing season.

The whole situation is rather hazy at the present moment, but if the announcements of the promoters can be believed, and if the government does not put its foot down on racing by prohibiting fuel for transportation, it seems that we will have races at Sheepshead Bay, New York, Providence, Uniontown, and Philadelphia, as well as at the state fairs, promoted by the International Motor Contest Assn.

—

Enlist Mechanics in Milwaukee

MILWAUKEE, Feb. 25—The Milwaukee County Council of Defense is endeavoring to supply 1500 machinists and 250 toolmakers for ordnance work at the Rock Island Arsenal, in accordance with the request of Col. George W. Burr. Although many skilled mechanics have already been obtained for government service in this district, the labor situation has not been affected seriously, and the working forces of builders of truck and aviation engines, as well as military trucks, have been kept practically intact.

—

Firestone Film to Stop Waste

AKRON, OHIO, Feb. 26—The Firestone Tire & Rubber Co. has produced a propagandist motion picture play entitled "Over the Roads to War." This is intended to show the importance of rubber in the war and to prevent waste. The film shows the simple errors in driving that cause the waste of enough rubber yearly to equip 100,000 fighting motor cars, and has been indorsed by the Government for its contribution to national thrift.

—

391 Miles in 60 Hours

LANSING, Feb. 25—A Duplex motor truck completed a run from Lansing to Pittsburgh, a distance of 391 miles, in 60 hr. Fifty-nine gallons of gasoline, 5 qt. of oil and 1 pt. of water were required. The cost of the trip, including everything, was $56.11.

Bids for Mail Airplanes

WASHINGTON, Feb. 22—Three bids have been received to-day for building the five airplanes for the Post Office New York to Washington Aerial Service. These were received from The United Eastern Airplane Co., $59,000, delivery in 30 days; Standard Aero Corp., $68,000, delivery in 63 days; West Virginia Aircraft Co., $72,500, delivery in 90 days.

Second Assistant Postmaster General Otto Praeger yesterday left for a trip through Philadelphia and New York for inspection of landing sites for the airplanes.

—

Madison Has Automotive Show

MADISON, WIS., Feb. 23—The sixth annual motor show conducted by dealers and distributers here on Feb. 20, 21 and 22 was one of the most comprehensive displays ever made in Wisconsin, and, for practical purposes, may be characterized as a miniature of the 1918 Minneapolis show because it devoted exceptional attention to trucks, tractors, etc., rather than concentrating on passenger cars.

The show was held in the new warehouse of the Union Transfer & Storage Co. and covered about 45,000 sq. ft. The decorative scheme used by the Milwaukee Automobile Dealers, Inc., at the tenth annual Milwaukee show in the Auditorium, Jan. 17 to 26, was used. The management of the show this year was in the hands of the Automobile Dealers' Division of the Madison Assn. of Commerce, successor to the Madison Automobile Dealers' Assn.

Calendar

ASSOCIATIONS

April 15-19—Little Rock, Ark., United States Good Roads Assn. Sixth Annual Session.

June 5-12—Hot Springs, Va. National Assn. Automobile & Accessory Jobbers.

June 17-19—Dayton, O., Society Automotive Engineers, Annual Midsummer Session.

SHOWS

Feb. 23-Mar. 2—Brooklyn, N. Y., Brooklyn Motor Vehicle Dealers' Assn., 23d Regiment Armory, I. C. Kirkham, Mgr. Passenger cars Feb. 23-Mar. 2; Trucks, Mar. 5-9.

Feb. 23-Mar. 2—Omaha, Neb., Omaha Auto. Trade Assn., Auditorium. Clarke G. Powell, Mgr.

Feb. 25 - Mar. 2—Indianapolis, Indianapolis Automobile Trade Assn., Diamond Chain Work Bldg. John B. Orman, Mgr.

Feb. 25-Mar. 2—Muskegon, Mich. Second Annual, Merrill Auditorium. John C. Fowler, Mgr.

Feb. 27-Mar. 2—Columbus, O., Auto Exhibitors' Co. W. W. Freeman, Mgr.

Feb. 27-Mar. 2 — Burlington, Iowa. Cars, Trucks & Accessories.

Feb. 27-Mar. 6—Boston, Mass., Salon, Boston Automobile Dealers' Assn., Copley Plaza Hotel. Chester I. Campbell, Mgr.

Mar. 1-15—Lyons, France, Third Sample Fair.

Mar. 2-9—Boston, Mass., Boston Auto Dealers' Assn., Mechanics' Bldg. Chester I. Campbell, Mgr.

Mar. 2-9—Pittsburgh, Pa., Automobile Dealers' Assn. of Pittsburgh, Motor Square Garden. John J. Bell, Mgr.

Mar. 4-9—Utica, N. Y., Utica Motor Dealers' Association, Inc., State Armory.

Mar. 6-9—Clinton, Ia., Clinton Automobile Dealers' Assn., Coliseum.

Mar. 6-9—Watertown, N. Y., Automobile Dealers, Inc., State Armory. Arthur E. Sherwood, Mgr.

Mar. 6-9—Mason City, Iowa, Annual Car and Truck. Automobile Dealers' Assn.

Mar. 6-9—St. Joseph, Mo., St. Joseph Automobile Dealers' Assn., Auditorium. John Albus, Mgr.

Mar. 6-9—Sioux Falls, S. D., S. D. Automobile Dealers' Assn.

Mar. 11-16—Cedar Rapids, Ia., Cedar Rapids Auto Trade Assn., Auditorium.

Mar. 12-15—Fargo, N. D., Gate City Auto. Show Co., Auditorium. J. W. Murphy, Mgr.

Mar. 13-16—Raleigh, N. C., Auditorium. John Kelley, Mgr.

Mar. 13-16 -Warren, Pa., Warren Automobile Dealers' Assn., Russell Garage.

Mar. 13-16—Peoria, Ill., Peoria Auto. Accessories Dealers' Assn. W. O. Ireland, Mgr.

Mar. 15-20—Great Falls, Mont., Montana Automobile Distributors' Association, Lexington Garage. A. J. Breitenstein, Mgr.

Mar. 19-23—Vancouver, B. C. Western Canada Automobile Show Assn., Horse Show Bldg. D. A. Hamilton, Mgr.

Mar. 20-22—Houlton, Me., Second Annual, Houlton, Motor Car Dealers' Assn., Bangor St. Exhibition Hall. J. D. Luther, Mgr.

Mar. 20-23 — Holdredge, Neb., Second Annual of Southwest Nebraska.

Mar. 20-23 — Trenton, N. J., Trenton Auto Trade Assn., Second Regiment Armory. John L. Brock, Mgr.

Mar. 25-30—Rochester, N. Y., Tenth Annual, Rochester Auto. Trades Assn., Exposition Park. C. A. Simmons, Mgr.

Mar. 25-30 — Bridgeport, Conn., Fourth Regiment Conn. Home Guard State Armory and Casino. B. B. Steiber, Mgr.

Mar. 27-29—Fort Fairfield, Me., Reed's Garage. R. F. Reed, Mgr.

Mar. 30-April 6—Hartford, Conn., Eleventh Annual, Hartford Automobile Dealers' Assn., Inc. State Armory. B. F. Smith, Mgr.

Mar. 30-Apr. 6 — Atlantic City, N. J. Second Annual. Garden Pier. S. W. Megill, Mgr.

Apr. 1-6—York, Pa., York Auto Dealers' Assn. T. F. Felffer, Mgr.

Apr. 6-8 — Green Bay, Wis. Brown County Automobile Trade Assn.

Apr. 6-13 — Red Bank, N. J., Monmouth County Auto. Dealers' Assn., Armory. E. C. Von Kattengell, Mgr.

Apr. 8-13—Reading, Pa. Reading Automobile Trade Assn.

Apr. 9-13—Stockton, Cal., Third Annual San Joaquin Auto Trade Assn. Samuel S. Cohn, Mgr.

Apr. 17-19—Davis, Cal., Tractor Demonstration. University of California.

Apr. 17-20—Calumet, Mich., Upper Peninsular Show. Copper County Automobile Dealers & Garage Owners' Assn., Coliseum.

Sept. 23-28 — Chicago, National Accessory Show for Fords, Coliseum.

ENGINEERING

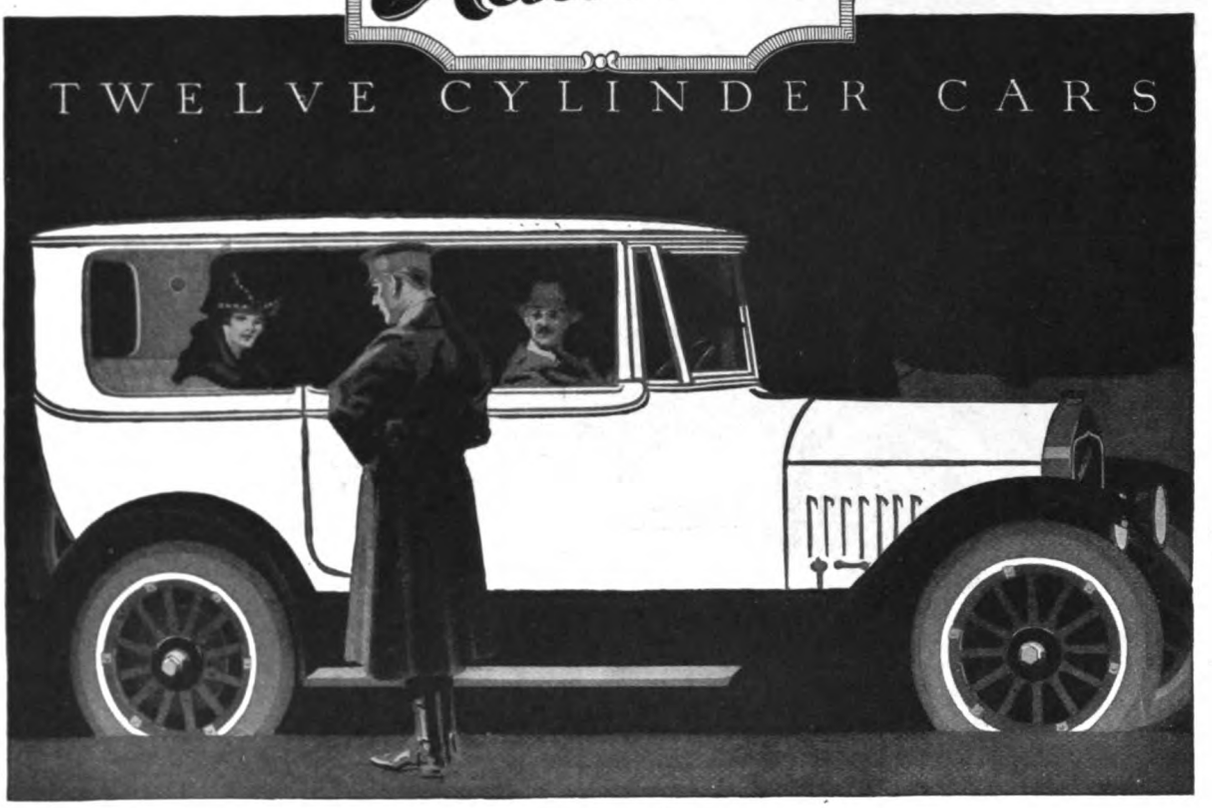
American Society of Heating and Ventilating Engineers.

Mining and Metallurgical Society of America.

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National

TWELVE CYLINDER CARS



A CAR OF SOUND ECONOMY

THE greater proportion of new owners of this National Convertible Sedan are straight-thinking citizens who realize that a saving in the first cost of an automobile by no means presupposes a saving in final cost.

They quickly determine, in those cases where the price of this car is higher than others, that it represents greater intrinsic value for every dollar paid.

They appreciate that this National Convertible Sedan affords more in engine efficiency, in chassis stamina and in general durability for strenuous and incessant service.

In its sureness and reliability of action, and its extraordinary freedom from even the common automobile ills, this car most effectively conserves the time and energies of its owner and, thus, most diligently saves his money.

Powered with either the six- or twelve-cylinder (airplane-type) motor, it satisfies all needs of ready transportation with moderation in fuel, tires and maintenance costs.

Its well-equipped carriage is easily opened for summer or closed for winter, and in either form the car retains its full ability for town and country work.

National dealers find that the buying public is most favorably inclined towards the National Convertible Sedan because this car is of that unusual caliber that best meets the unusual demands of present conditions.

NATIONAL MOTOR CAR & VEHICLE CORPORATION - INDIANAPOLIS

Eighteenth Successful Year

Six and Twelve Cylinder Models

7-Passenger Touring Car, 4-Passenger Phaeton, 4-Passenger Roadster,
7-Passenger Convertible Sedan, 2-Passenger Roadster (12-cylinder Special)

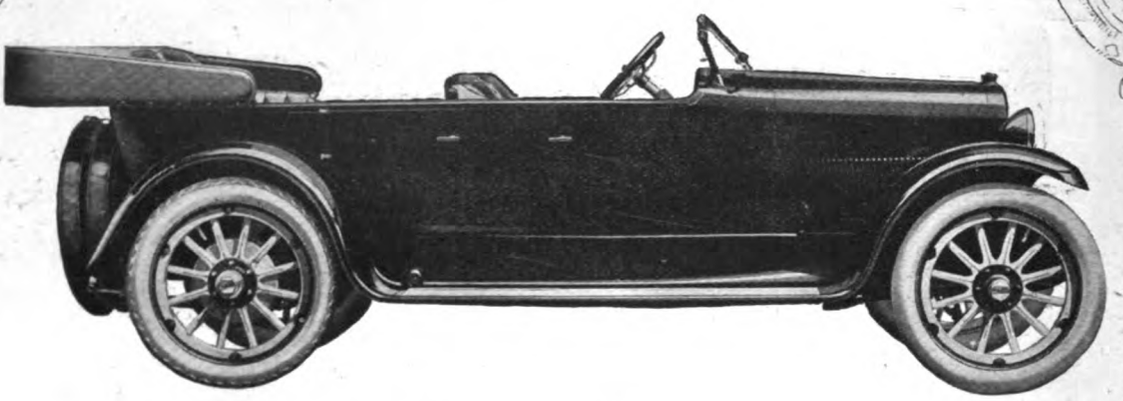
Open Car Prices—The Six, $2150; The Twelve, $2750

The Six Sedan, $2820; The Twelve Sedan, $3420

Government's War Revenue Tax Extra Charge

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CASE SIX



Three-Way Economy

Comfort and Utility Without Extravagance

THE New Case Six is timely indeed. Or, better said, the times are making more people appreciative of Case Standards. For Case Cars have always been consistently built to serve the thrifty. Case always produces a car that by every standard should be priced higher. The Case Six embodies to a greater extent than heretofore supreme values at a price much lower than asked for other cars of its class.

So an initial saving is made. You may prove this conclusively for yourself by making comparisons. The New Case Six, as our Engineers have designed and built it, combines in one car all those proven features that are bound to insure steady service at minimum cost.

These Features Convince

In this car you find a Case-Continental motor, Westinghouse Electrical Equipment, a Rayfield Special Carburetor, Stewart Vacuum Fuel Feed, Borg & Beck Clutch, Grant Lees Transmission, Columbia Axles with Bock Bearings, Harvey Semi-Elliptic Springs, Jacox Steering Gear, and dozens of standardized, proven features.

All are combined under our own supervision and unified into a car of superior performance and durability.

This insures a second saving. As you examine the New Case Six and drive it, you are assured that the Case way of construction is a guarantee in itself.

Case construction likewise leads to economy of operation. In choosing only standardized and proven units, the aim was also to include those which reduce the mileage cost.

Maximum power at minimum cost—this is a Case principle. And in our New Case Six we reach greater efficiency than ever before. Do not decide on which car to buy until you know the New Case Six. It will save you much in the beginning and in the years to come.

J. I. CASE T. M. COMPANY, Inc. *Founded 1842* 234 Liberty Street, Racine, Wis.

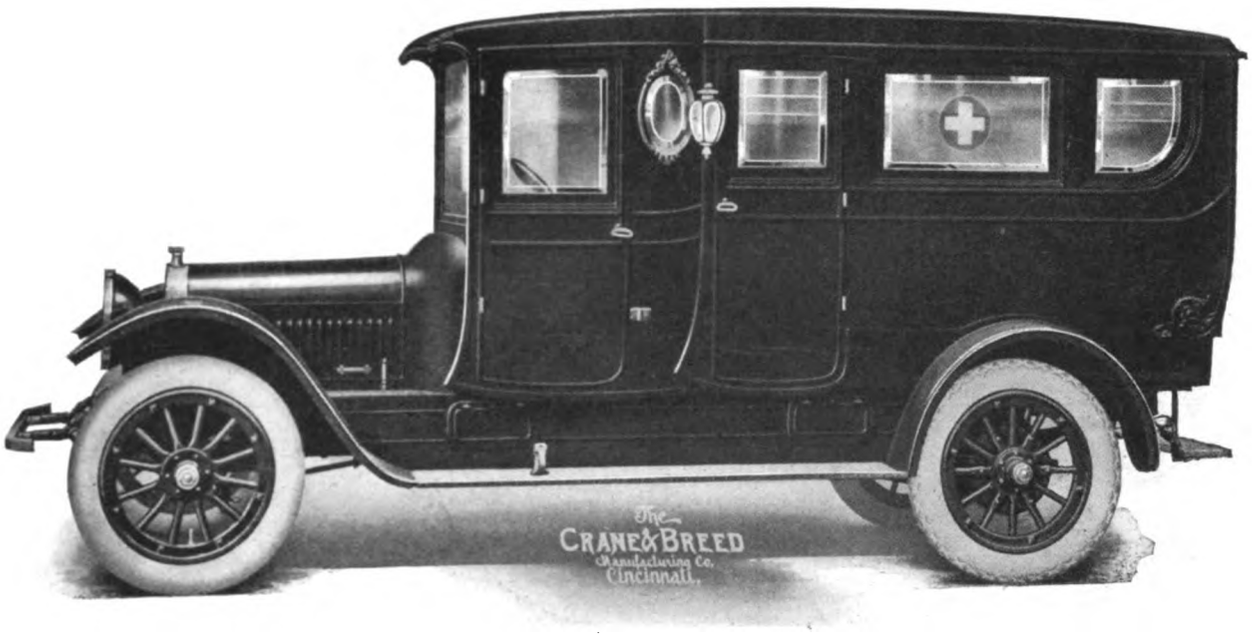
DEALERS: There are several splendid opportunities for Case dealers in different parts of the country where the New Case Six is receiving marked attention from the public. Write today to ascertain if this applies to your community.

Family Touring car for 7 or 5 people, color dark blue, $1875

All-Seasons Model, Springfield Type, for 7 or 5 people, color dark blue, $2375

Sport Model for 4 people, color periscope green, $1875

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Crane & Breed No. 1134 Ambulance Equipped with

The Waltham Automobile Clock

Over 250,000 Now in Use as Standard Equipment

The high class cars which are equipped with the Waltham Automobile Clock are an index to the reliability of this super timepiece. Has two mainsprings, a red signal on the dial to tell you when winding is needed, and is built to keep accurate time even though the roads are rough and the temperature variable.

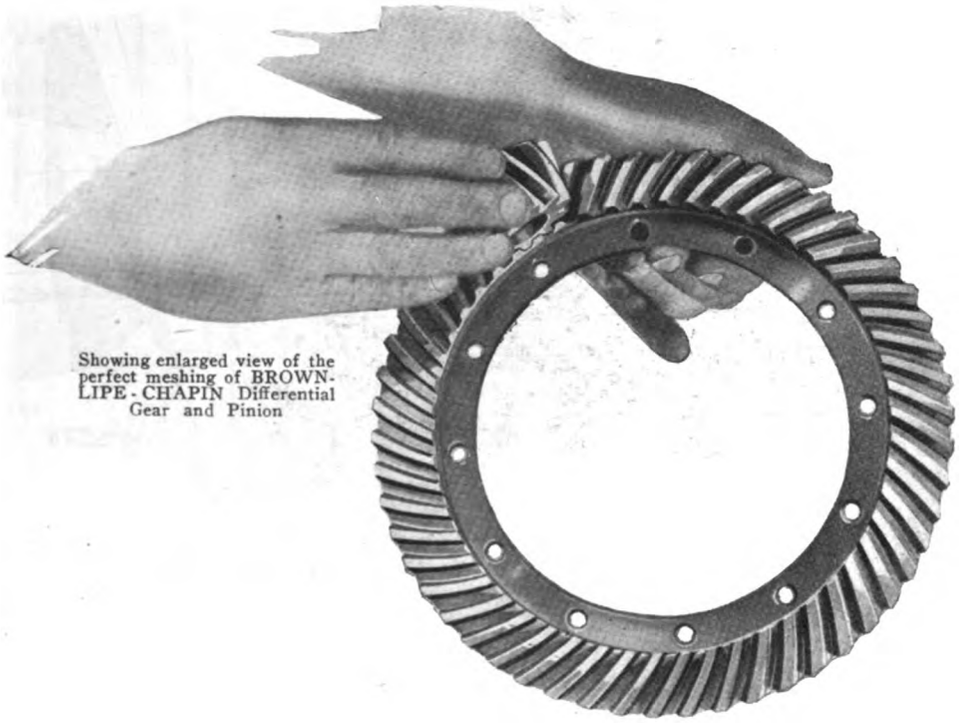


THESE CARS ARE EQUIPPED WITH THE WALTHAM AUTOMOBILE CLOCK

Anderson 6-40	Jordon
Apperson	Kissel
Brewster	Locomobile
Cadillac	Marmon
Chalmers	Mercer
Cole	Murray
Crane	Owen-Magnetic
Cunningham	Packard
Detroit-Electric	Pierce-Arrow
Doble	Rauch & Lang
Fergus	Rolls-Royce
Franklin	Simplex
Hal	Stearns
Haynes	Studebaker
Hudson Super-Six	Willys-Overland
	Winton

WALTHAM WATCH COMPANY
WALTHAM, MASS.

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Showing enlarged view of the perfect meshing of BROWN-LIPE-CHAPIN Differential Gear and Pinion

Feel How They Roll Into Mesh

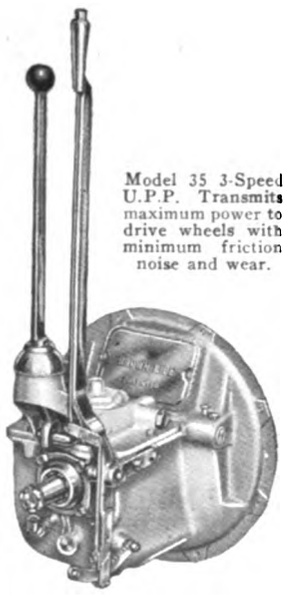
It is essential that these gear teeth roll into mesh, *perfectly, smoothly, accurately.* That means the least possible friction—quiet running gears, with the ability to deliver the maximum of power to drive wheels.

BROWN-LIPE-CHAPIN
DIFFERENTIALS

are perfect in design and mechanical details. All parts are made of highest quality materials with perfect relation to one another.

For this reason and many others over 80% of the prominent passenger car and truck manufacturers use as standard equipment either one or both BROWN-LIPE Transmissions and BROWN-LIPE-CHAPIN Differentials.

Our engineering departments will help solve your transmission and differential problems. Write for particulars.



Model 35 3-Speed U.P.P. Transmits maximum power to drive wheels with minimum friction noise and wear.

BROWN-LIPE GEAR CO.
TRANSMISSIONS

BROWN-LIPE-CHAPIN CO.
DIFFERENTIALS

SYRACUSE N. Y.

REPRESENTATIVES:
New York: Thos. J. Wetzel, 29 W. 42d St.
San Francisco: A. H. Coates, 41 Speare St.
Foreign Agent: Benjamin Whitaker, 2 Norfolk St., Strand, London, W. C.

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Champion Toledo

Dependable Spark Plugs



Keeping Champions Profitable for the Jobber

Not merely profitable, but very much *more* profitable!

Against gross profit you Jobbers must charge general overhead, carrying cost and selling expense to find your net profit.

You can make your carrying cost almost negligible on Champions because they move in such large volume and such steady volume.

We make your selling cost almost negligible by steadily, persistently and forcibly stimulating the tremendous natural sale of Champions.

Our investment in advertising is many times that of all other producers of spark plugs combined.

And that investment is returned *to the Jobber* many fold in lessened selling expense.

That is our conception of advertising—a means to increase profit by decreasing selling expense—for ourselves—for the Jobber—for the Retailer.

In the Saturday Evening Post, Literary Digest, Collier's and other general-circulation periodicals—in twenty-five of the leading farm papers we use bigger space and vastly more total space than all other spark plug producers combined—a total of more than one hundred million advertisements printed and circulated this year.

All this is working steadily to establish, maintain and increase the Jobber's profit by decreasing selling expense and accelerating turnover.

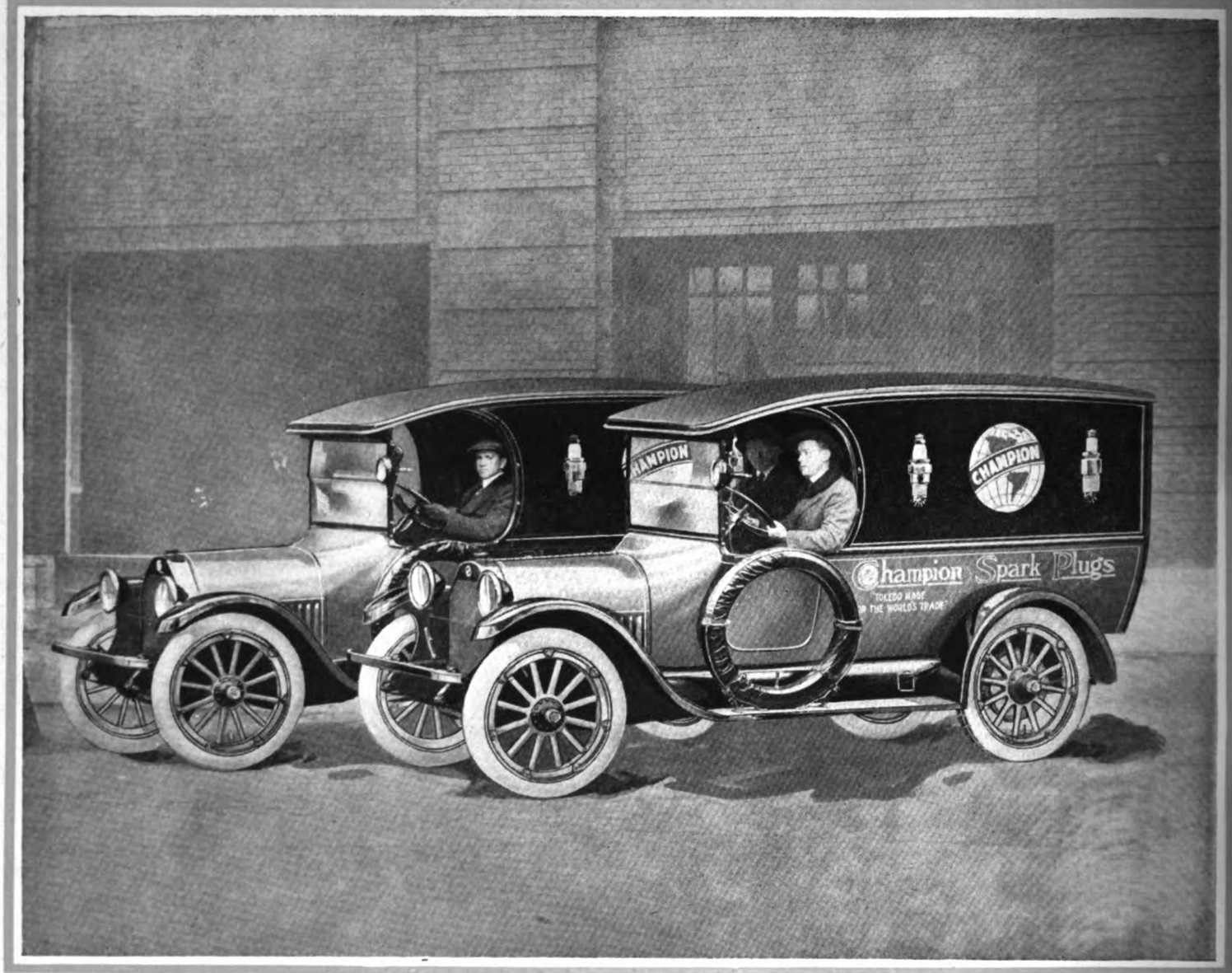
All this is working to make Champions not merely profitable but very much more profitable for the Jobber than any and all other spark plugs.

Champion Spark Plug Company
Toledo, Ohio

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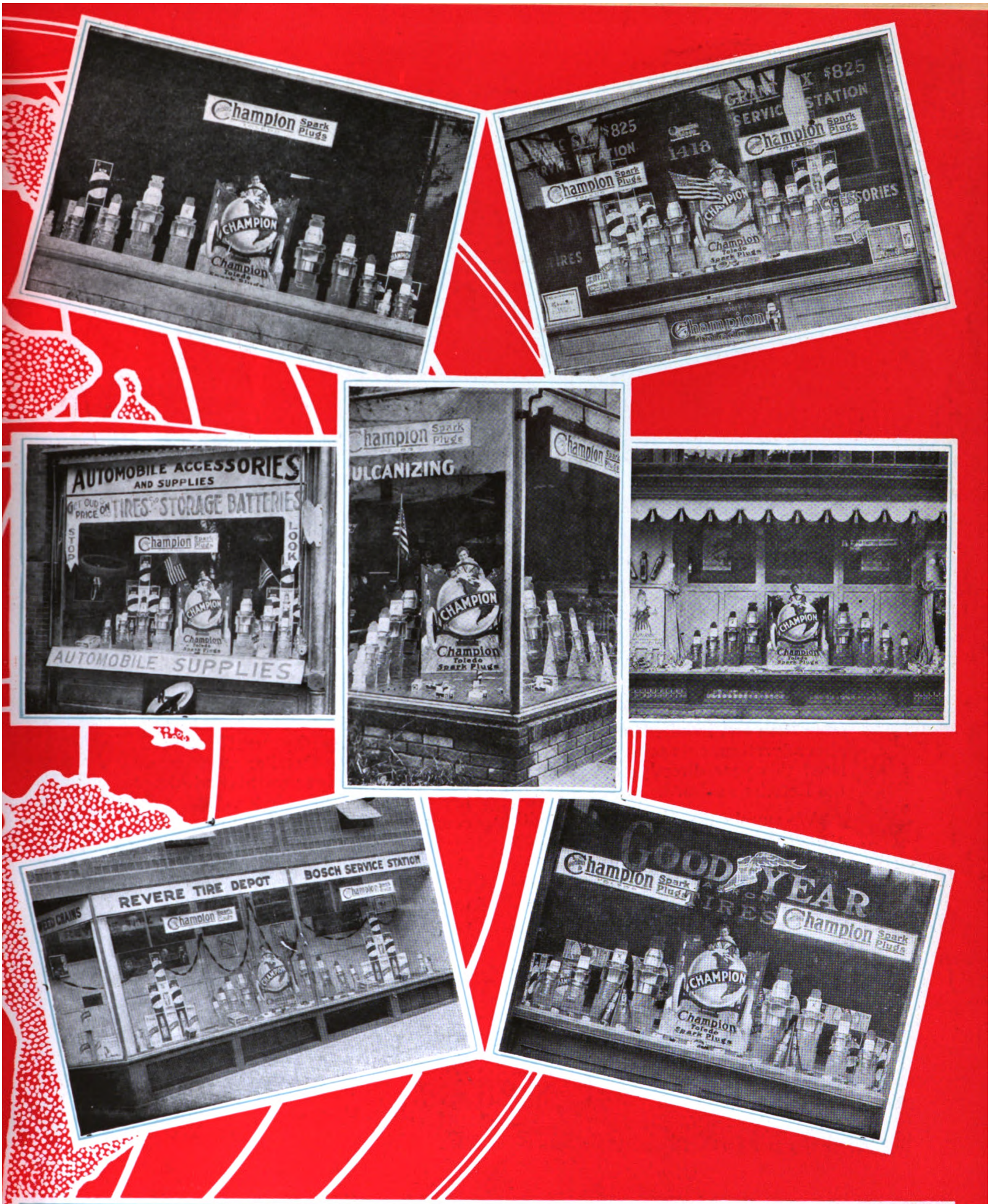
Champion Toledo

Dependable Spark Plugs



Here are two of twenty-three Advertising Cars, each carrying a crew of trained window trimmers over the entire country and cooperating with the Jobber and Dealer in the Champion Spark Plug merchandising and advertising compaign.

Digitized by Google



Their job is to arrange window and counter displays for supply dealers, hardware stores and garagemen to localize the full force of our national advertising on the Retailer's store or garage.

When they come to you, let them arrange a display that will give your spark plug profits a big boost.

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Champion Toledo

Dependable Spark Plugs



Establishing, Maintaining, Increasing the Retailer's Profit

Just as the Jobber's profit is increased by Champion advertising so is the Retailer's profit also increased.

And to bring the great force of the more than one hundred million Champion advertisements printed and circulated this year directly to bear upon the Retailer's sales.

We supply the Retail Dealer with attractive counter display and window display matter to focus the local force of all this advertising directly upon his store or garage.

The cost of all this advertising is returned to the Retailer many fold in lessened selling expense and accelerated turnover.

And the Retailer's opportunity to directly cash in on the force of all this advertising is more favorable than our own opportunity or the Jobber's.

We distribute it broadcast, the Jobber profits by its general force in his territory but the Retailer can focus all its local force right on his individual business by using the window display and counter display matter which we furnish.

To increase his spark plug profits, the Retailer has only to keep a full, clean stock of Champions and focus the force of our advertising on his store or garage.

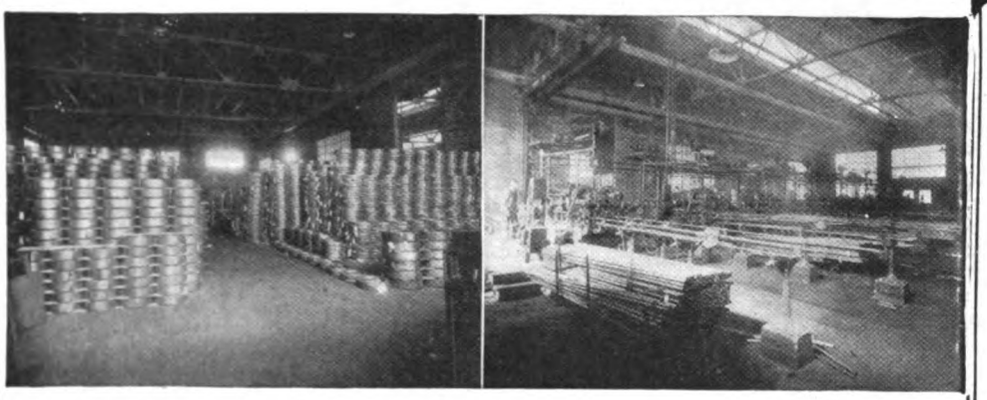
It is a vastly greater force than any similar force behind any or all other spark plugs.

Champion Spark Plug Company, Toledo, Ohio



CHAMPION SPARK PLUG COMPANY
SALESMEN AT THE ANNUAL CONVENTION
DECEMBER · 1917

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Why We Deliver Promptly

Having our own strip steel mill, we produce "Elisco" tubing from the raw material to the finished product in our own plants.

This assures for our customers the advantage of prompt and regular deliveries on all orders for—

ELISCO

Light-Gauge, Cold Rolled STEEL TUBING

—the only welded steel tubing made by automatic machines combining ***all six*** operations in ***one.***

TUBING:

Cold drawn; ¼ inch to 3 inch O.D. light gauge. Hot-rolled, high carbon, butted and brazed; ⅞ inch to 2⅜ inch O.D., 11 to 17 gauge.

STRIP STEEL:

Cold rolled; .035 and thicker, width up to 12 inches. Hot-rolled, .065 and thicker, widths up to 8½ inches.

BARS:

Hot rolled. Square bars 1¼ inch to 2½ inch inclusive. Flats, widths up to 8½ inches.

SHAPES:

Channels, 3 inch, 4 lb., 5 lb., 6 lb., and 4 inch, 5¼ lb. sections. Angles 2½ and 3 inch equal leg. U-bars and special shapes of moderate dimensions in hard and soft steel.

Let us figure on your requirements.

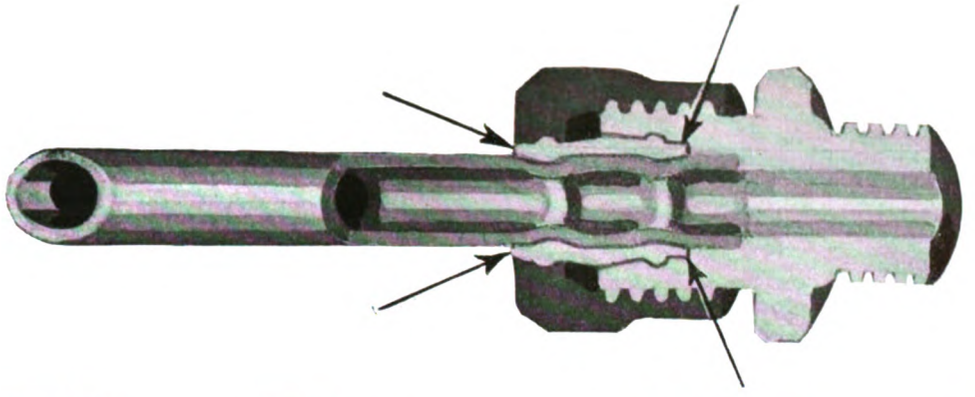
THE ELYRIA IRON & STEEL CO.

East 131st Street CLEVELAND, OHIO

Chicago Office, 1243 Peoples Gas Bldg. Detroit Office, 1934 Dime Bank Bldg.
Atlanta, Ga., Office....Candler Bldg. New Haven, Conn..504 Colonial Bldg.

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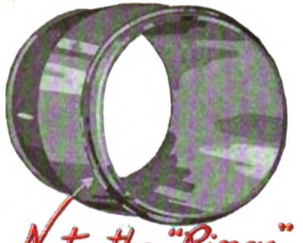
Please mention Automotive Industries when writing to Advertisers





The several parts of the Dohner coupling consist of the main body of the coupling, the tapered nut and the tapered thimble. In adjusting, the end of the tubing is slipped through the nut and thimble into the body of the coupling up to the shoulder, and by simply tightening up the nut the operation of fastening the tube in place is automatically performed.

The Rings "Bite" Into the Tubing



The "Rings in the Thimble" constitute one of the main features of the Leakless Dohner High Compression Coupling—which engineering experience **proves** is the **only really effective** coupling.

These "Rings" bite into the tubing. Tightening the coupling nut automatically compresses or transfers the rings from the outside to the inside of the thimble.

Thus the rings, "bit" into the tubing, produce a **practically welded joint**—absolutely air tight and entirely unaffected by vibration.

The Dohner "Leak-Proof" Coupling can be disconnected by loosening the nut in the ordinary way, and connected again by tightening the nut,—the coupling remaining as effective as when first used.

Because of the labor saving insured by the Dohner Coupling, it is regarded by engineers and production managers as the most economical coupling made. Its quickness and simplicity of installation cuts a considerable percentage off production costs.

Well engineered and efficiently produced motors, such as Maxwell and Buick, use Dohner Couplings exclusively;—Buick will install 3,000,000 "Dohners" this year. The Baldwin Locomotive Works,—famous for careful engineering—after exhaustive tests adopted the Dohner Coupling for its locomotives.

Dohner Couplings are particularly well adapted for aircraft because of their light weight, stability, quick reconnectability and efficiency.
We will gladly supply further information on request.
Note: The Dohner line is complete, including unions, Ells, Tees, etc. Pat'd. June 13, 1916.

THE OHIO METAL PRODUCTS COMPANY

Sales Office: 616 Free Press Bldg., DETROIT, MICH.

Factory: DAYTON, OHIO

DOHNER HIGH COMPRESSION COUPLINGS

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Ponderous in Weight—Nimble in Action

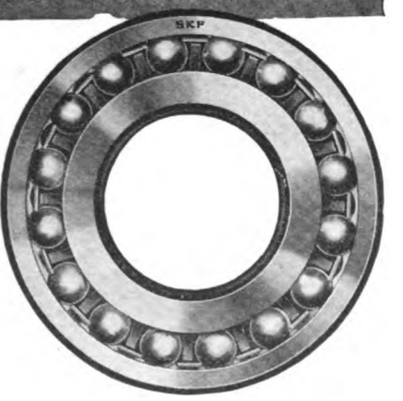
The clang of the fire alarm must find the mechanism of the big self-propelled fire apparatus in fighting trim. Every part must be tuned to concert pitch and operate at maximum efficiency. The double row of balls and the self-aligning feature of SKF prevent wear and heating due to weave of the chassis. Under heavy overloads and sudden shocks the inner race, balls and retainer are free to pivot in the outer race. The pump mechanism too is another vital place—and SKF at this point are used by the Ahrens-Fox Fire Engine Co. No matter for what service SKF with their highly tempered races and balls are adequate to any emergency.

SKF BALL BEARING CO.

HARTFORD 305 CONN.

SKF

BALL BEARINGS



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DRIDEK—

With the Leather Finish

TRADE DRIDEK MARK REG.

DrideK with its leather finish, is an entirely new creation, based on many years' experience in furnishing tops and upholstery for the majority of the cars that have been put on the market.

DrideK looks as well as the best of leather. The distinguishing features in the wear of DrideK are: that you cannot scratch the finish; that it retains its color until entirely worn out; and that it is absolutely waterproof.

The product is unquestionably superior, and the price is within reach of your specifications. Made in black and many attractive colors.

Send for Samples and Price List

L. J. MUTTY COMPANY

Boston, Mass.

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Duesenberg

The Power of the Hour

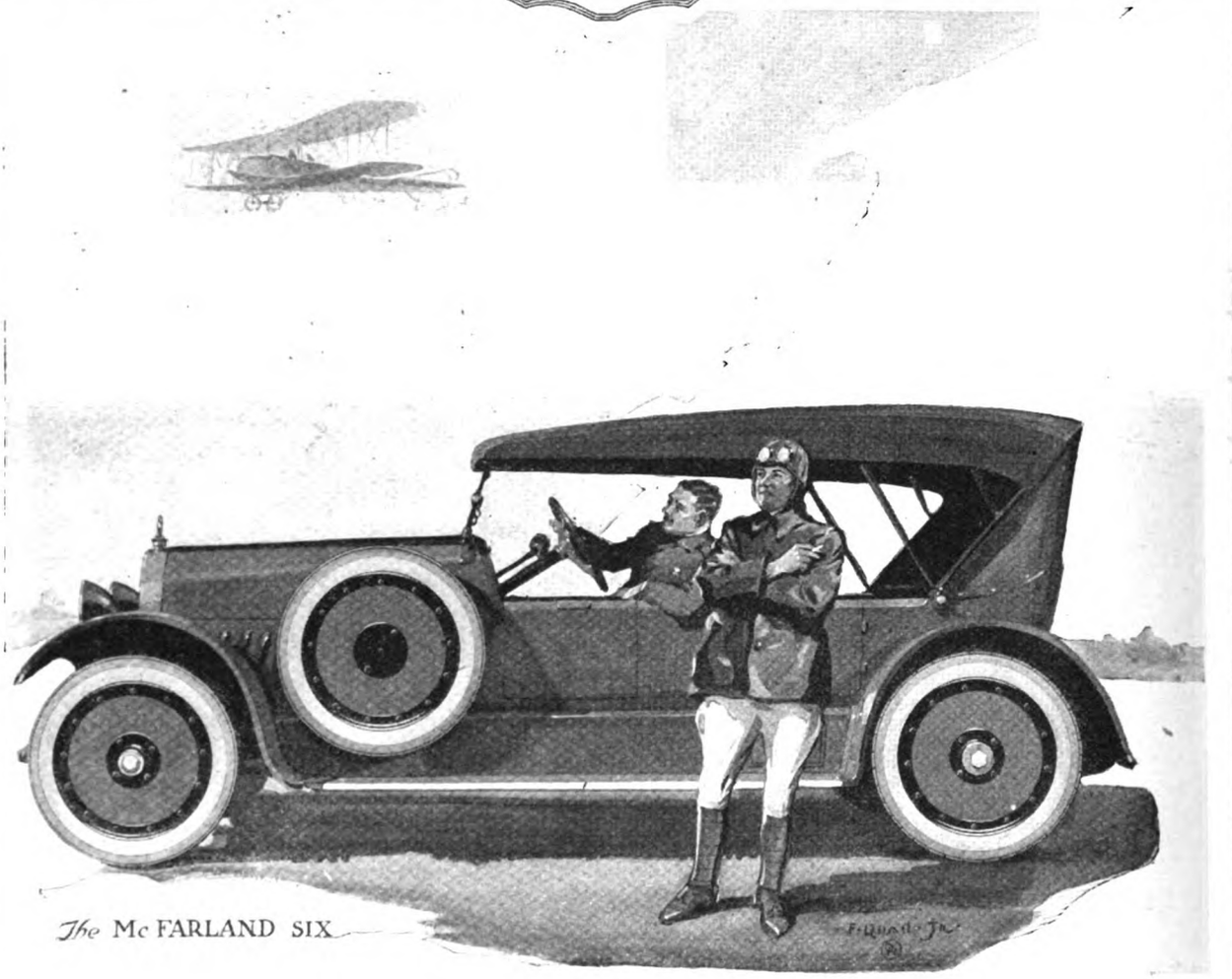
Aeroplane Automobile Marine Engines

THE entire productive ability of the Duesenberg Organization is concentrated on work for the United States Government. We will again be at your service After the War is Won.

DUESENBERG MOTORS CORPORATION, 120 BROADWAY, NEW YORK CITY
Contractors to the United States Government

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DISTEEL WHEELS



DISTEEL WHEELS

Greater Beauty, in addition to greater comfort, security and ease in motoring, is the prime reason for the design, popularity and admitted superiority of Disteel Wheels. No matter how beautiful the lines of the car, Disteel Wheels enhance and complete that beauty. The arrival of the Disteel Wheel is an event as epoch-making in motor car design as the introduction of the electric starter.

Dealers selling medium priced and high priced cars to discriminating owners will be interested in our proposition

DETROIT PRESSED STEEL COMPANY
1800 Mt. Elliott Ave. Detroit, U.S.A.

DPS

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ATWATER KENT

SCIENTIFIC IGNITION



Says Mr. Repairman to Mr. Car Owner:

"An Atwater Kent System will replace your magneto with more dependable ignition. Its big, hot spark at all motor speeds facilitates starting, increases motor power, reduces gear shifting and motor stalling, and the improved combustion saves gas."

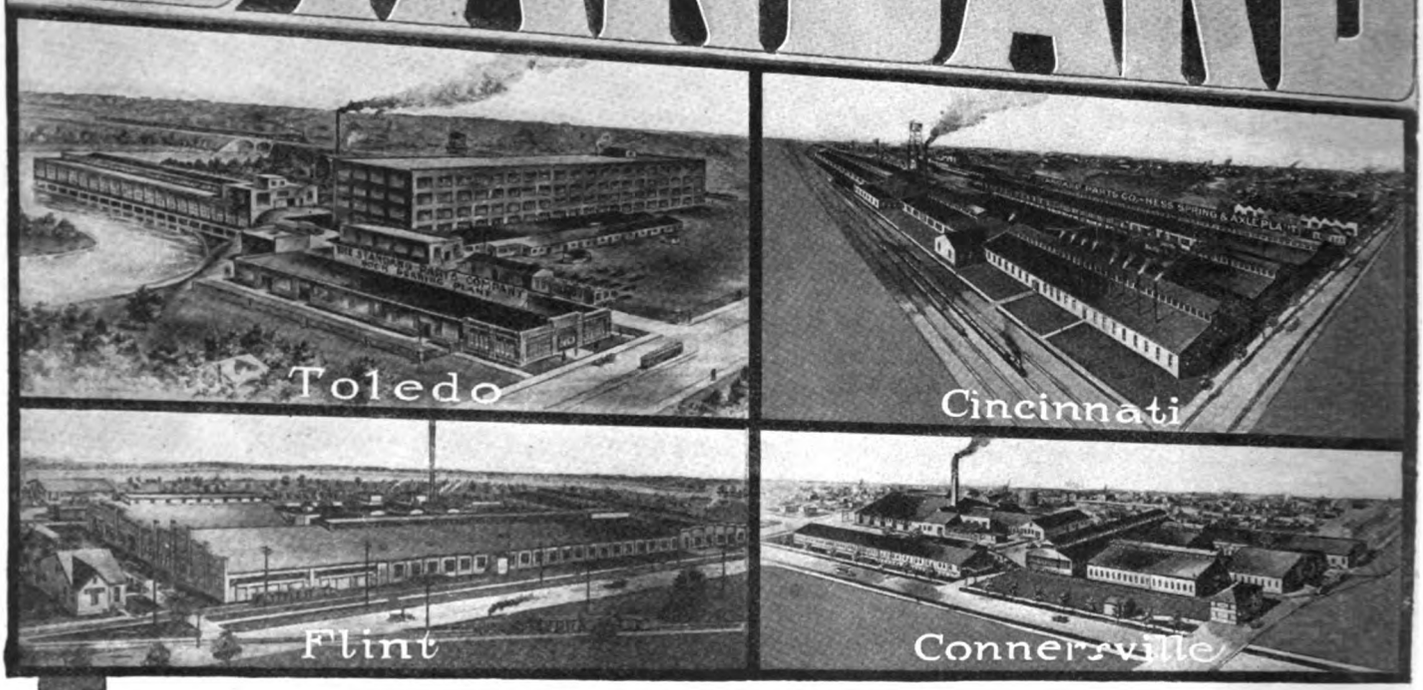
There is an Atwater Kent System for every car electrically equipped or not

ATWATER KENT MANUFACTURING WORKS, PHILADELPHIA

WRITE FOR DEALERS' PROPOSITION TO 4938 STENTON AVENUE

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STANDARD



A Dependable Source of Supply

A company is known by the customers it keeps.

The great majority of representative manufacturers of motor cars, motor trucks and other finished products of the automotive industries are our steady patrons.

All the resources of an extensive and efficient organization, including:
Large Manufacturing capacity
Well grounded engineering
Thorough laboratory work
Ample capital and
The economies of large buying power
Advantages of expert traffic management

Standard Parts For Motor Cars,

The Famous

Axles
Axles (dead rear)
Axles, trailer
Bock Bearings
Hubs
Perfection Springs
(regular and thin leaf)
Perfection Heaters

Rims—clincher, detachable and demountable for single and dual equipment
Clincher Rims
Detachable Rims for Wire Wheels, special
Millimeter Rims, all types
Rim Tools
Flanges and Fittings Solid Tire Demountable Equipment
Tire Bases in Demountable and Pressed on Channels

We also manufacture parts for Airplanes, Tractors, Motorcycles,

The Standard Parts Company,

Digitized by Google



for the Automotive Industries

Pleasant sales relations, and Both length and breadth of experience, are placed at their disposal.

Standard Parts products have contributed to the growth of many manufacturing enterprises. Similarly, these have contributed to the growth of the Standard Parts Company.

The same resources, the same efficiency and service are offered to all alike.

Our vast operations and the strategic location of our numerous factories merit the producer's confidence in our institution as a dependable, economical, efficient source of supply.

Trucks and Other Vehicles

Stanweld Products Including:

Brake Rod Assemblies, complete
Starting Cranks
Electric Welding of Parts
Exhaust Tubes
Forgings for Convertible Trucks
Bands S. A. E.
Formed Tubing
Ignition Wiring Tubes
Lamp Brackets
Mast Sleeves
Oil Tubes
Radiator Rods
Starting Gear Rings and Boxes
Straight Steel Tubing
Steering Gear Tubing
Tail Pipes
Torsion Tubes
Truss Rods
Tubing
(straight and formed)

Bicycles, Fire Arms, Carriages, Wagons and other vehicles

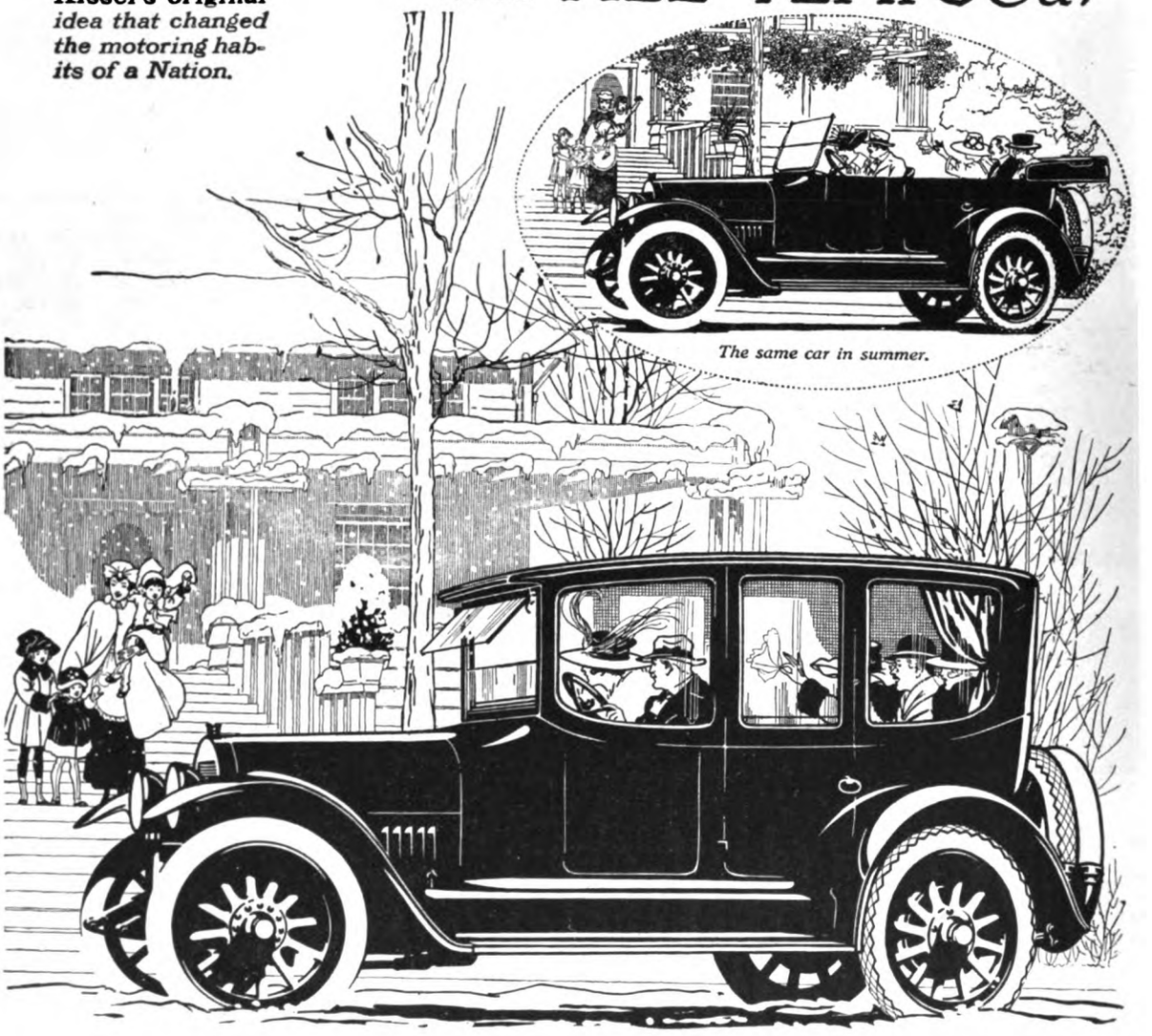
Executive Offices, Cleveland, Ohio

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KISSELKAR

The ALL-YEAR Car

Kissel's original idea that changed the motoring habits of a Nation.



America's Efficiency Producing Automobile

The ALL-YEAR Top is built-*in*, not *on*, giving you a closed car to continue your business efficiency and economy during the wet, chilly spring months. In summer, by removing the ALL-YEAR Top, you have an open roofless touring car complete in every detail.

Inspect the 4-passenger ***Sedané*** with the latest detachable ALL-YEAR Top, in which the windows may be lowered full length. See your nearest Kissel dealer today.

DEALERS—The exclusive selling features of the ALL-YEAR Car insure a profitable business from the start. Wire us for agency details now.

KISSEL MOTOR CAR COMPANY, Hartford, Wis., U. S. A.

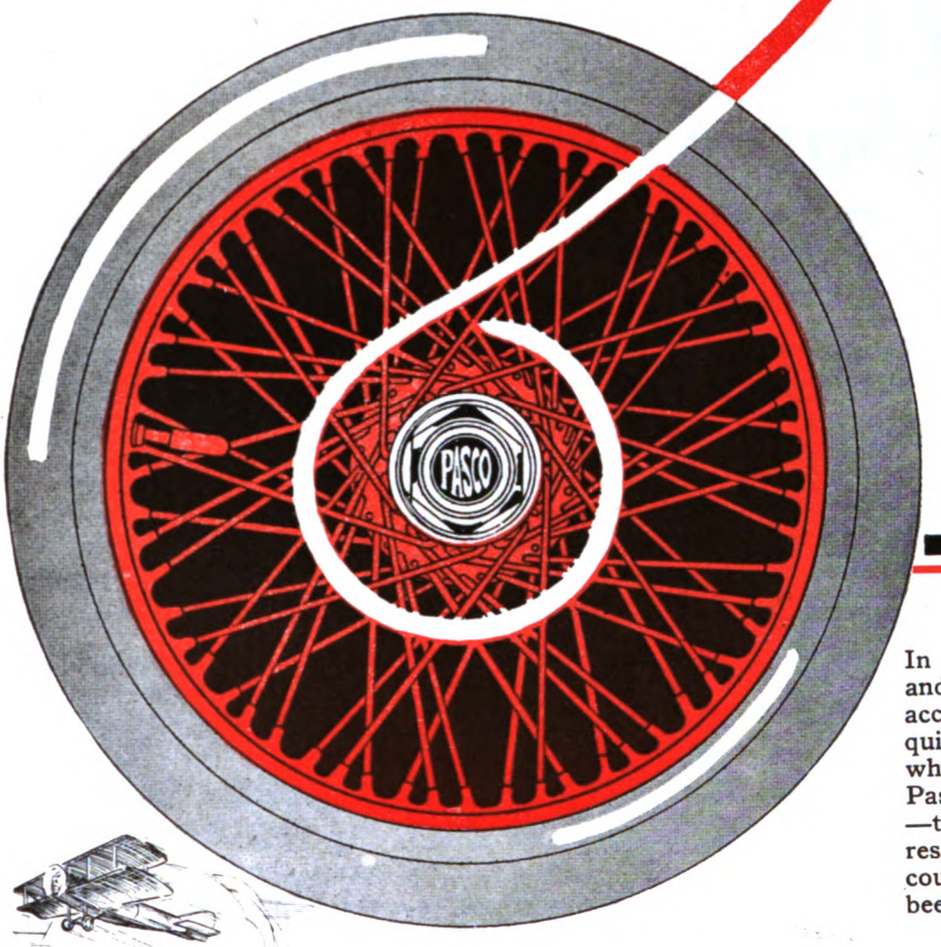
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What "Pasco" Means on the Hub Cap

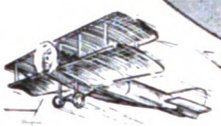
1—The strongest wire wheel because of the patented spoke lacing. Each spoke, in both front and rear rows, crosses four other spokes—as against two or three crossed spokes in other makes.

2—The safest wire wheel because the hub cap and wheel are locked on by the patented locking device and can only be removed by loosening the lock and using the Pasco wrench.

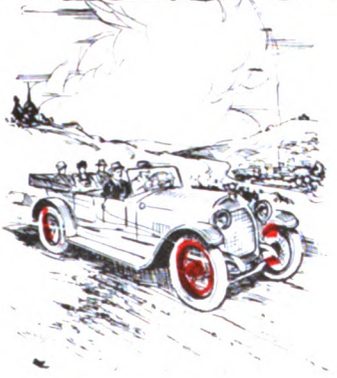
3—The wire wheel with an indestructible Hub Cap. A Hub Cap built sturdy, massive looking, attractive and capable of withstanding any conditions of jams or collisions where others strain or break.



In their simplicity of design and construction, in their easy accessibility of parts, in the quickness and facility with which they can be changed—Pasco Wire Wheels are unique—they are the wheels of progress—no whit of anything that could make them better has been neglected.



PASCO WIRE WHEELS



Pasco Wire Wheels are genuinely economical. They mean less upkeep expense, less tire expense, less fuel expense—and a distinct saving of time and trouble.

Their distinctive appearance, their look of speed and class and their beauty make, in Pasco Wire Wheels, the one great dealer opportunity of today.

Pasco air plane wheels are now in use on practically all types of air planes.

Dealers—Write for our selling proposition.

NATIONAL WIRE WHEEL WORKS, Incorporated

GENEVA, N. Y. U. S. A.

PASCO

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Know Harrison Radiators for Their Selling Value

If the cars you handle are equipped with Harrison Radiators you have a talking point that will help you sell them.

Show your prospects how Harrison construction, although the lightest per cubic inch, nevertheless has such "inbuilt" strength that a leakage from a frozen core is practically unknown.

Tell them the Harrison cooling system embodies greater fuel economy due to higher cooling efficiency.

Point out the big, free Harrison Hexagon air passages and explain why they promote cool, easy-flowing water circulation.

Tell them that Harrison lightness of weight, Harrison durability and other Harrison qualities are direct results of the peculiar arrangement and construction of the Hexagon cells, original with Harrison.

The list of Harrison users is another advantage to you. This representative list of cars, itself, adds prestige. Don't overlook the value of the name Harrison to you in making sales.

Look over this List of Harrison users

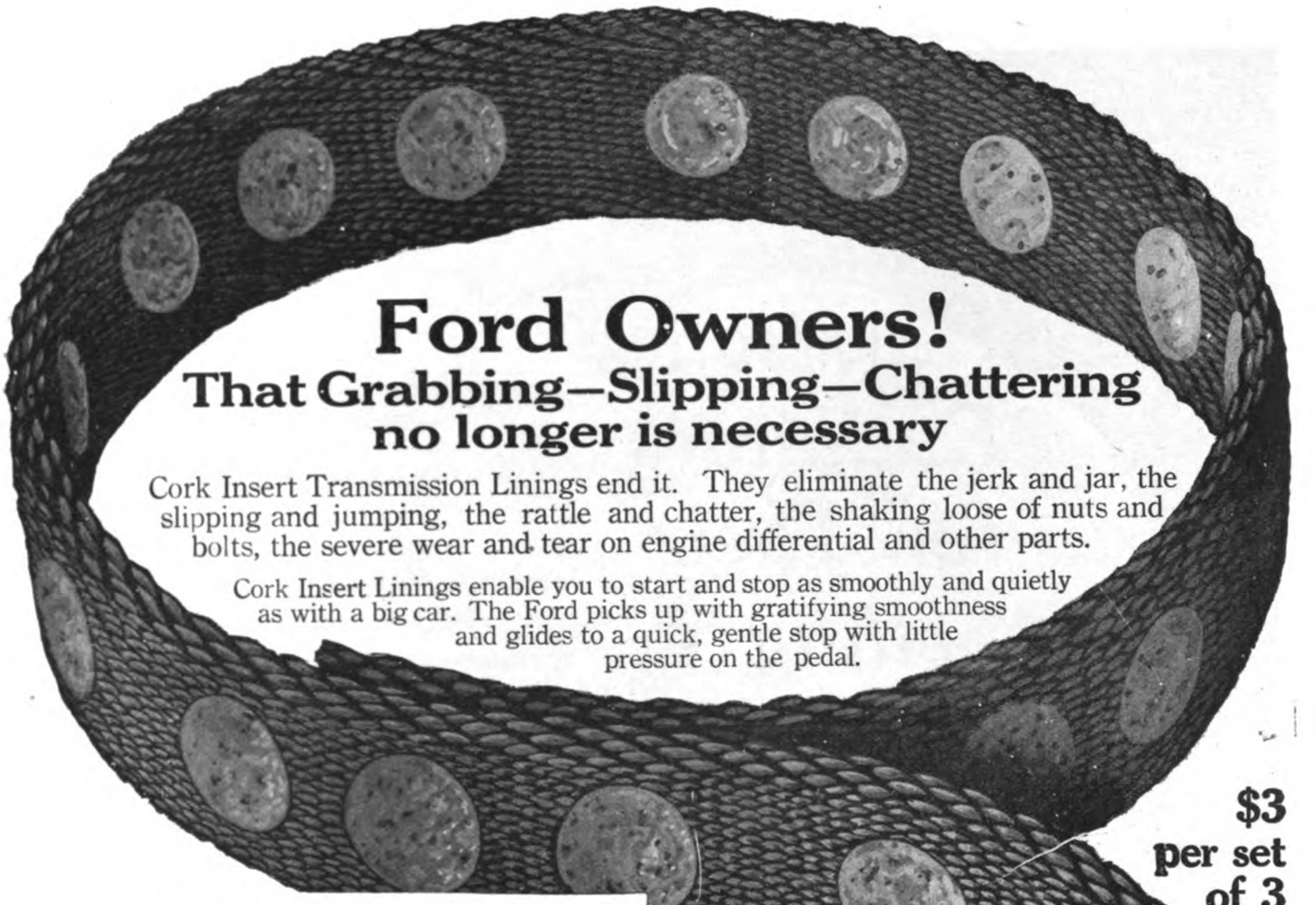
Chandler
Chevrolet
Hudson
Dort
Mitchell
Oldsmobile
Peerless
Columbia
also
Gramm
and
Federal Trucks

HARRISON

Original Hexagon Cellular
Radiators

Harrison Radiator Corporation
Lockport, New York

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Ford Owners!

That Grabbing—Slipping—Chattering no longer is necessary

Cork Insert Transmission Linings end it. They eliminate the jerk and jar, the slipping and jumping, the rattle and chatter, the shaking loose of nuts and bolts, the severe wear and tear on engine differential and other parts.

Cork Insert Linings enable you to start and stop as smoothly and quietly as with a big car. The Ford picks up with gratifying smoothness and glides to a quick, gentle stop with little pressure on the pedal.

$3 per set of 3

ADVANCE CORK INSERT

TRADE MARK REG. COPYRIGHTED 1917

TRANSMISSION LININGS FOR FORDS

stop the slipping through the use of buttons of cork—a patented feature no other lining can have. Cork never gets hard or polished. It's hard, polished linings that cause all the trouble in ordinary transmission linings. Cork Insert Linings don't slip—don't grab. They make the smoothest, safest, most economical linings for Ford transmission ever devised. They give a better driving, better braking car, and a lining that outwears ordinary linings three to one.

Ford Motor Kept Cool—Fan Kept Fanning by Fan Belt that Doesn't Slip

When the Ford fan belt runs as it ought, the Ford motor is kept cool and overheating is avoided. But the fan can't fan properly if the belt is slipping and lays down on the job. The slippage of the ordinary Ford belt runs as high as 25% to 50%.

ADVANCE CORK INSERT

TRADE MARK REG. COPYRIGHTED 1917

FAN BELT FOR FORDS

stops slipping. The buttons of cork, unaffected by water or oil—grease or dirt—grip at the first turn of the motor and keep the fan fanning. Cork Insert Fan Belts outwear several ordinary fan belts and do the work better as long as they last.

DEALERS—Order From Your Jobber!

Order at least a dozen sets of Cork Inserts next time your jobber's salesman drops in. Cork Inserts mean better profits for you—better service and satisfaction for the user. They are the livest line in the field. Strongly advertised. Your customers know about them. Stock them and they'll move fast. Send coupon if your jobber can't supply you.

Advance Automobile Accessories Corp.
Dept. B16-1, 56 East Randolph Street, Chicago

FORD OWNER'S COUPON

Check and mail today
ADVANCE AUTOMOBILE ACCESSORIES CORP.
Dept. B16-1
56 East Randolph St., Chicago
Enclosed find $..... Send me:—

- ☐ 1 set Cork Insert Transmission Linings $3.00
- ☐ 1 Cork Insert Fan Belt for 1917 Ford 1.00
- ☐ 1 Cork Insert Fan Belt for 1916 or earlier Ford model ..... .85

Name .....
City ..... State .....
Dealer's Name .....

Dealer's Coupon Check and Mail today

Advance Automobile Accessories Corporation
Dept. B16-1 56 E. Randolph St., Chicago

- ☐ Send one dozen sets of Advance Cork Insert Transmission Linings for Fords.
- ☐ Send one dozen Advance Cork Insert Fan Belts, 1917 Ford.
- ☐ Send one dozen Advance Cork Insert Fan Belts, 1916 or earlier model Ford.

(Regular dealer discounts to apply.)

Name .....
City ..... State .....
Jobber's Name .....

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HOW few people realize that New Departure Ball Bearings bear the same loads and resist the same stresses, for which the massive truck axles and shafts are built!

That New Departures should be at once giants of strength and conquerors of bearing friction—what a triumph of American engineering genius.

It is an intensely practical matter—this laying out of New Departures for their chosen jobs. Chance or risk have had no place here. Each bearing has a *known* capacity and each recommendation a liberal "bridgebuilder's factor of safety."

When a layout has our engineers' O. K. you can *bank* on the performance of those bearings!

More and more men are learning that fact every day. If you are yet to be shown—all we ask is the opportunity.

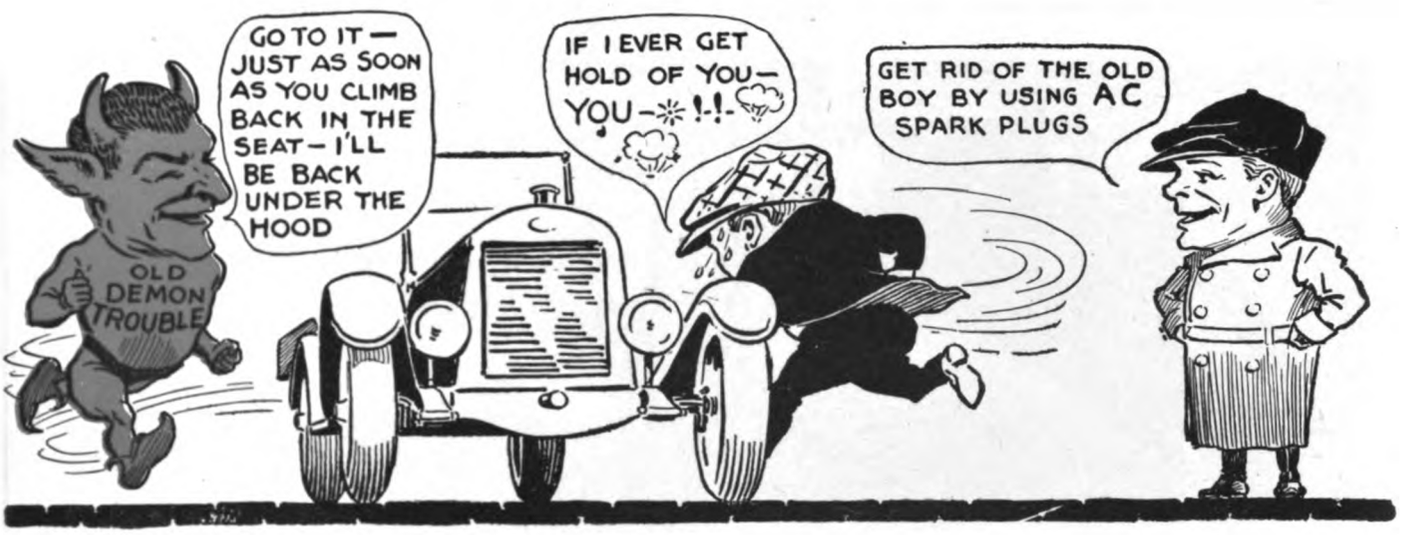
THE NEW DEPARTURE MANUFACTURING COMPANY
Bristol, Conn. Detroit, Mich.

Conrad Patent Licensee.

New Departure Ball Bearings

280

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The wise motorist knows that he can't conquer old Demon Trouble as long as he uses the wrong Spark Plug. That's why more and more motorists are refusing the "new fangled" fancy plugs and demanding AC equipment.



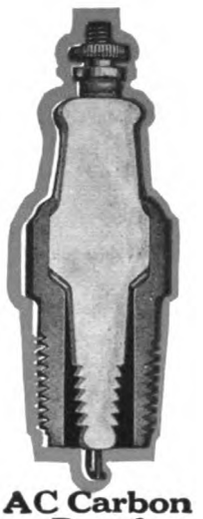
⅞ in. Regular AC Titan

After strenuous tests the manufacturers listed decided on A C. Can *you* afford to disregard their judgment?

Albert Champion means

AC SPARK PLUGS

The Standard Spark Plug of America



AC Carbon Proof
For Fords Overlands and Studebakers

LOOK FOR AC ON THE PORCELAIN
They Are Made For All Types of Motors

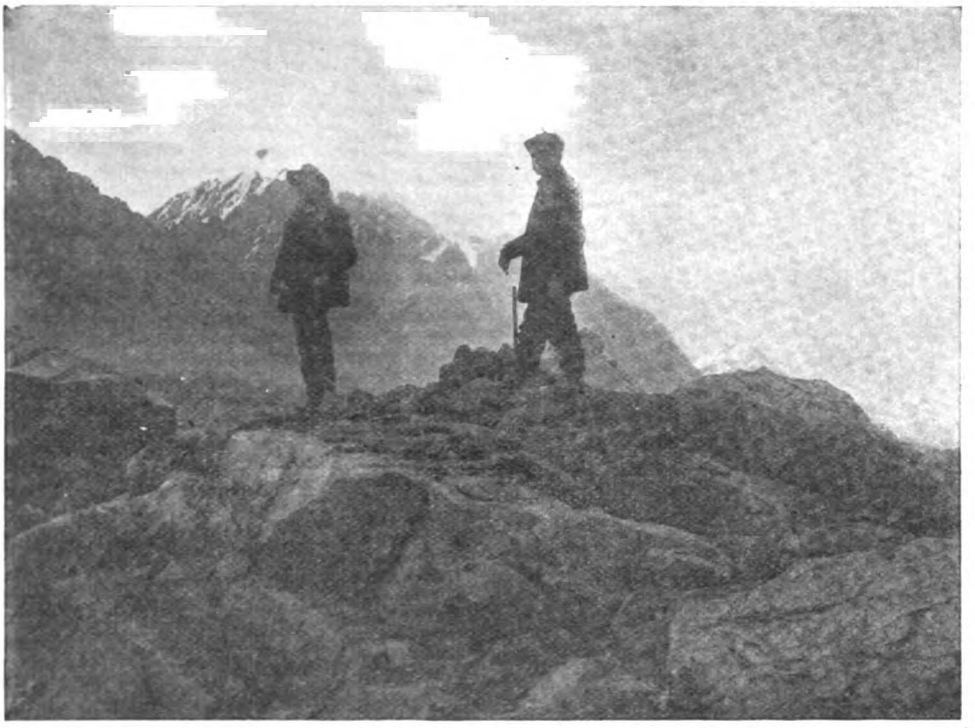
Ford, Overland and Studebaker owners, how often must you clean your plugs? This new AC is exactly what its name implies—*Carbon Proof*. Progressive dealers owe it to their trade to advise AC equipment exclusively.

CHAMPION IGNITION COMPANY
SOLE MANUFACTURERS, FLINT, MICHIGAN

These Manufacturers Use AC as Standard Equipment

Cadillac	Buick	Scripps-Booth	Dodge Brothers	Gabriel Trucks	Riker Trucks
Pierce-Arrow	Oakland	Crane-Simplex	McLaughlin (Canada)	Gramm-Bernstein Trucks	Stewart Trucks
Packard	Oldsmobile	Stearns-Knight	Duesenberg Motors	Moreland Trucks	Wisconsin Motors
Marmon	Nash	Saxon	American-La France	Wilcox Trux	La Crosse Tractor
Hudson	Kissel Kar	Stutz	Davis	Sterling Trucks	Advance-Rumely Tractor
Chalmers	Premier	National	Sanford	Republic Trucks	Buffalo Motors
Hupp	White	Stephens	Old Reliable Trucks	Diamond T Trucks	Continental Motors
Chandler	Delco-Light	Jackson	Titan Truck	F-W-D Trucks	Deere Tractors
Haynes	Murray	Apperson	Ford Tractors	G. M. C. Trucks	Northway Motors
Chevrolet	J. I. Case	Anderson	Acme Trucks	Sandow Trucks	Rutenber Motors
Dort	Jordan	Locomobile	Netco Trucks	Signal Trucks	Sterling Motors
Cole	Liberty	Daniels	Federal Trucks	Brockway Trucks	Smith Motor Wheel
Reo	McFarlan	Westcott		Samson Tractor	Van Blerck Motors
Paige	Paterson	Singer		Menominee Trucks	Wallis Tractors
Peerless	Lexington-Howard	Dorris			Waukesha Motors
Pilot					

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AT THE TOP

Through sheer force of superior merit, under conditions where none but the best is good enough,

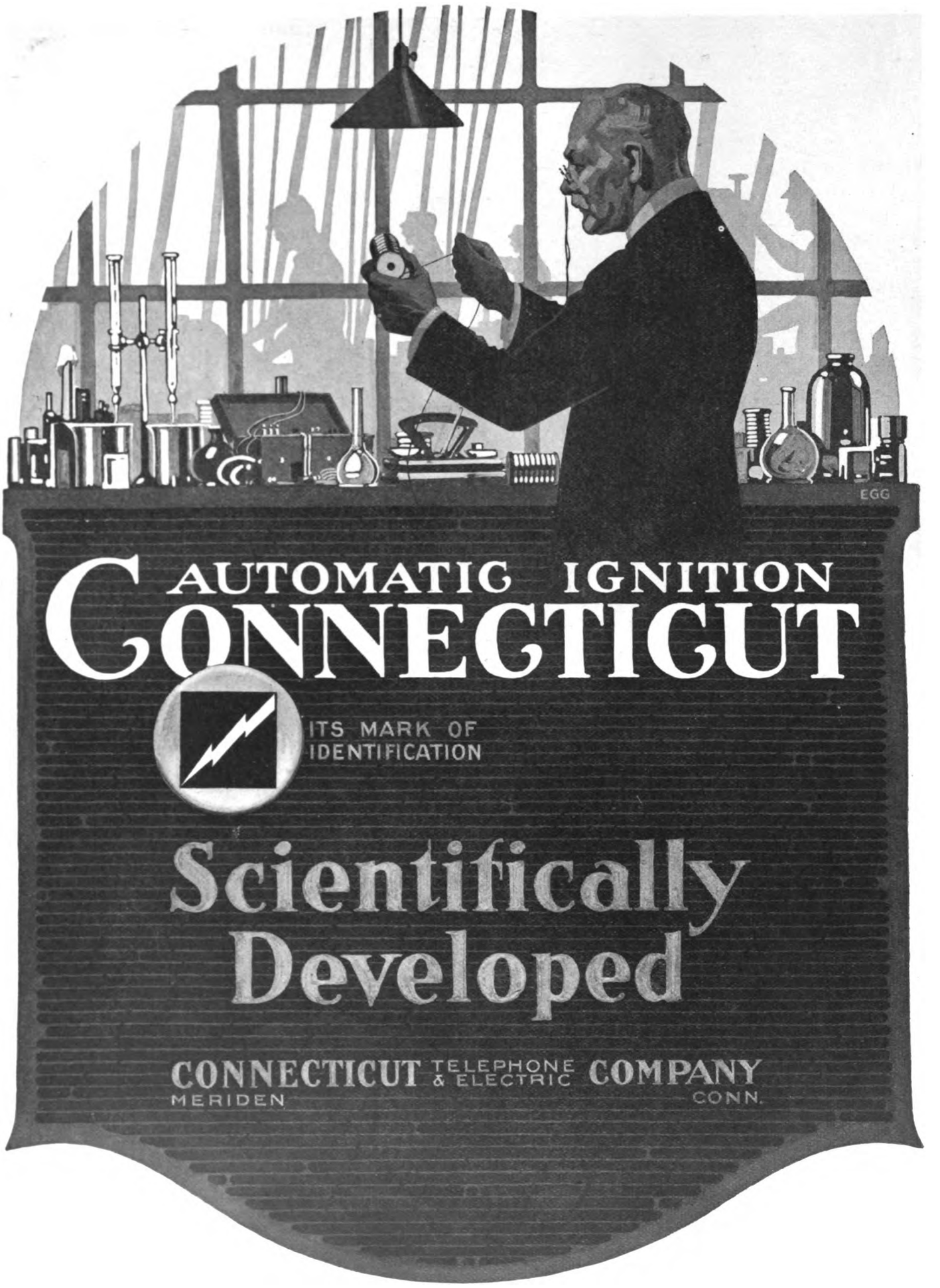
VANADIUM STEEL

now stands unquestionably in engineering judgment at the top of the list of high quality steels for all purposes where the highest combination of strength and toughness, resistance to wear and repeated shock and vibration is required.

American Vanadium Company

NEW YORK PITTSBURGH LONDON

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The Height of Lens Development

THE Dillon Multi-Vision Lens marks a new era in lens performance. Not only is it a radical departure in design, but it is evolutionary in results.

The central bull's-eye, for instance, is an exclusive advantage of the Dillon. This bull's-eye has an important function—that of concentrating and magnifying the light on the road. This light is made glareless by the light from a carefully determined proportion of clear glass above the bull's-eye. The clear glass at the bottom provides the necessary front and side lighting.

The Dillon is the only lens made that gives you TWICE the lighted area, by projecting a SQUARE path of light. It is also the only lens made that projects entirely beyond the rim.

In no respect is the Dillon excelled and any of its chief features alone make it supreme in its field.

Write for literature, or send cash, check or money order, together with make and model of your car if you cannot obtain Dillon Lenses.

National Distributing Co.

Exclusive Distributors for the Dillon Multi-Vision Lens

Oliver Building,
Pittsburgh, Pa.

Dealers—

Get in touch with your jobber or write us at once. Liberal proposition, exclusive talking points, selling co-operation, national advertising—everything you need for success.

DILLON MULTI VISION LENS

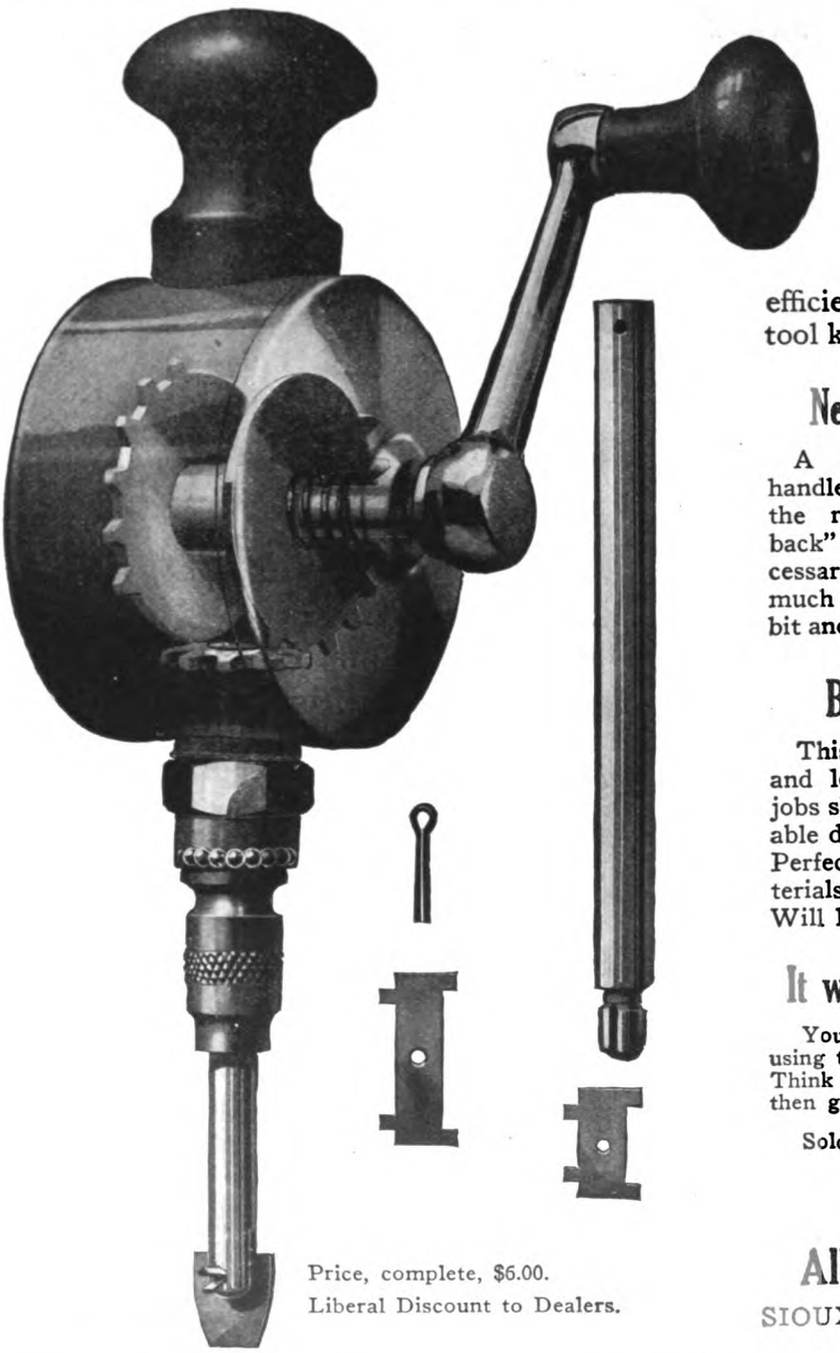
$3.50 per pair

Any Size—Anywhere in U.S.A.

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THE SIOUX VALVE GRINDER

Every Mechanic Needs One



Price, complete, $6.00.
Liberal Discount to Dealers.

Have one for your very own—keep it where you can always find it when you need it. Don't depend on one tool for the whole shop—don't waste your time trying to work with a makeshift outfit. Get one of these strong, efficient grinders for your own tool kit.

New Principle Saves Labor

A continuous movement of the handle in one direction gives the valve the reciprocating or "forward and back" motion, which is absolutely necessary for perfect valve grinding, much faster and easier than the old bit and brace or screwdriver method.

Ball Bearing Throughout

This feature insures easiest action and least wear on bearings — makes jobs short and easy. Five interchangeable driving points—will fit any valve. Perfect balance and perfect stroke. Materials and workmanship of the best. Will last a lifetime.

It will Pay You to Investigate

You are wasting your time, if you are not using the most efficient tools you can buy. Think how much you need this grinder—then go and examine one—today.

Sold by all live jobbers.

Manufactured by

Albertson & Company

SIOUX CITY - - IOWA

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Opportunity has a hot foot and a crick in her neck

She can't look 'round and won't turn back for the man who misses his date with a big chance. From confidential sources we learn that she's headed your way with the best proposition of the year—the Maxwell truck. Dealers who have sold several thousand Maxwells since August of this year have a very convincing bunch of balance sheets, and retailers, manufacturers and producers in scores of different fields are ready to furnish further evidence that there's more money to be made in a hurry and without a worry through a Maxwell truck agency than any equal investment of time and a little capital has yielded in a coon's age. Somebody in your town is going to profit handsomely through the smashing advertising campaign soon scheduled to break: in words of the well-known song "It might as well be you." (Set the alarm clock early, see your banker and get busy.)

MAXWELL MOTOR COMPANY, Inc., DETROIT, MICH.



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How Much Can You Trade It In For?

The test of automobile value is the price you can get for a used car; and that price is increased or decreased according to the condition of the engine, bearings, gears, and other moving parts.

Are you protecting those parts?

Figure how the yearly cost of the machine's operation, repairs or depreciation may vary.

Compare it with the slight yearly cost of scientific lubrication. Scientific lubrication does more than protect the service of your car; it protects the price you get when you trade it in.

The next time you buy oil or grease for your motor car, remember the actual saving you will make by insisting on scientific lubricants.

Automobile owners, manufacturers, machinery owners: this is the time of all times to consider operating costs and how they might be reduced by scientific lubrication.

Permit us the opportunity of offering the benefits of our 65 years' experience. Write for details.

Booklets on
Scientific Lubricants for Scientific Lubrication
on

SPECIALTIES

Automobile Division

These products can be obtained from most good dealers and garages. Send direct for complete information, mentioning your dealer's name.

☐ **GEARESE**—A correct lubricant for motor car transmissions and differentials.

It follows the gears continuously, leaving no spot where metal can touch metal. Gearese insures against wear, reduces friction and insures a silent, smooth-running car. Gearese maintains its lubricating consistency under all temperatures—does not cake on the walls in coldest weather, nor break down and run out, under heat.

Gearese should be packed into your gear case and differential about once a year.

☐ **CUPESE**—A special quality cup grease, produced by the exclusive Acaloric Process. It is made in all densities, from very light to extra heavy. Its uniform functioning under all conditions, makes it ideal for wheel bearings, brake connections, gear and clutch levers, universals, spring leaves and bolts, steering arms and knuckles and axle caps.

Cupese spreads rapidly, adheres to the bearing surfaces, is tenuous and elastic, absolutely prevents metal-to-metal contact. It does not liquefy or evaporate under intense heat—does not cake at low temperature—does not clog bearings or leave residue in cups. It is **all** lubricant.

☐ **MOTUL**—A superior quality oil for the protection of automobile motors. Motul is made by a special process which insures super heat-resisting qualities. Although the heat of explosion in the cylinders is terrific, Motul maintains its lubricating consistency—keeps friction under control—protects your motor, bearings and cylinders. Under test Motul shows a minimum of carbon residue.

☐ Check here for descriptive literature.

For Foundries

☐ **ICORUL**—A special quality liquid core binder that meets the eleven essentials of uniform and economical core making for malleable and gray iron casting.

☐ Check here for descriptive literature.

SPECIALTIES

For General Machine Use

☐ **SLO-FLO**—A super-lubricant, made by the Acaloric Process. Does not climb, drip or spatter. It is adhesive and cohesive—heat and pressure resisting—non-volatile. It is extensively used:

—particularly for delicate, fast-running machinery in textile and other mills, in printing shops, etc., where neither a fluid oil nor a dense grease is practicable. Slo-Flo stays "put," yet lubricates instantly and constantly.

—for roller bearings in mine cars, automobiles, etc.—for hydraulic pumps, line shafting, lighting dynamos in railway cars.

—in railway and machine shops, in industrial and power plants where excessive heat and bearing pressures must be overcome and where oil is impracticable or grease impossible.

☐ Check here for descriptive literature.

Miscellaneous

☐ **TEXTUL**—A special oil compound which has all the good qualities of Red or Lard Oils—yet offered at far less cost. Textul saponifies readily—carries well through the carding process and needs no alkali added for emulsion.

☐ **ASBESTESE**—A special asbestos and wool-mixed grease combination for steam, electric and logging railways, traction lines, contractors'- and mine-car journal lubrication, etc.

☐ **AERUL**—A practical quality oil for aeroplane motors.

☐ **MARINUL**—A world-known special oil, produced to meet the excessive stresses of marine service.

☐ **TALESE**—Die-swabbing requires a product which will perform an absolute separation of the metals, have a low flash tendency and function with a minimum of smoke. These requirements are met by Talese at surprisingly small cost.

☐ **EXESE**—The 600° F. lubricant for oven gears, bloom cars or lubrication under excessive heat conditions anywhere.

☐ **VESUVESE**—A waterproof lubricant, for exposed gears—for wire cable dressing.

☐ **LARCUL**—A practical, economical metal-cutting lubricant.

Also—☐ Atlas Cutting Oils, ☐ Atlas Tempering and Quenching Oils, ☐ Atlas Leather Oils and Greases, ☐ Atlas Fish Oils, ☐ Atlas Spindle and Loom Oils, ☐ Atlas Wool Oils.

Automobile and hardware accessory jobbers and dealers are offered unusual co-operative opportunity with a quality line. Write for details.

S-F Automobile Division

To specialty jobbers, selling to mills, factories, foundries, mines, railways—there is an opportunity to profit through the country's realization of the need of scientific operation. Write for details.

S-F Industrial Division

SWAN AND FINCH COMPANY

Main Office
165 Broadway, N. Y.

Works
Bayway, N. J.
Syracuse, N. Y.

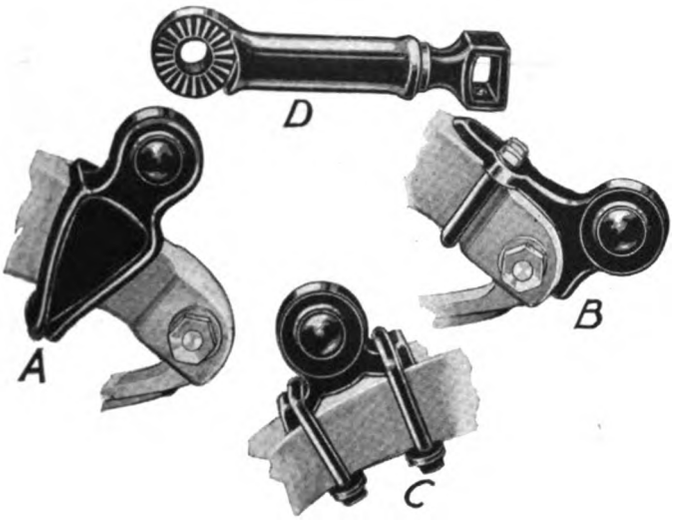
Branches
Providence
Cleveland
Philadelphia
Chicago
San Francisco

SCIENTIFIC LUBRICANTS for SCIENTIFIC LUBRICATION

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HALLADAY STANDARDIZED BUMPER UNITS

The Greatest Bumper Proposition Ever Offered the Dealer



A complete line for Front and Rear of 90% of all cars with extension frames or three-quarter elliptic springs built up from A STOCK OF ONLY FOUR FITTINGS and HALLADAY bumper bars.

Write for details or see your jobber

L. P. HALLADAY COMPANY **Streator, Illinois**

DISTRIBUTORS:

ASCH & Co., 16-24 West 61st Street, New York City
E. L. THOMPSON CO., 817 Boylston Street, Boston, Mass.
GRAY-HEATH CO., 1440 Michigan Ave., Chicago, Ill.
SANFORD BROTHERS, Chattanooga, Tenn., Southern Distributors
NORMAN COWAN CO., 433-435 Rialto Bldg., San Francisco, Cal., Pacific Coast Distributors

Are Your Needs *Similar?*

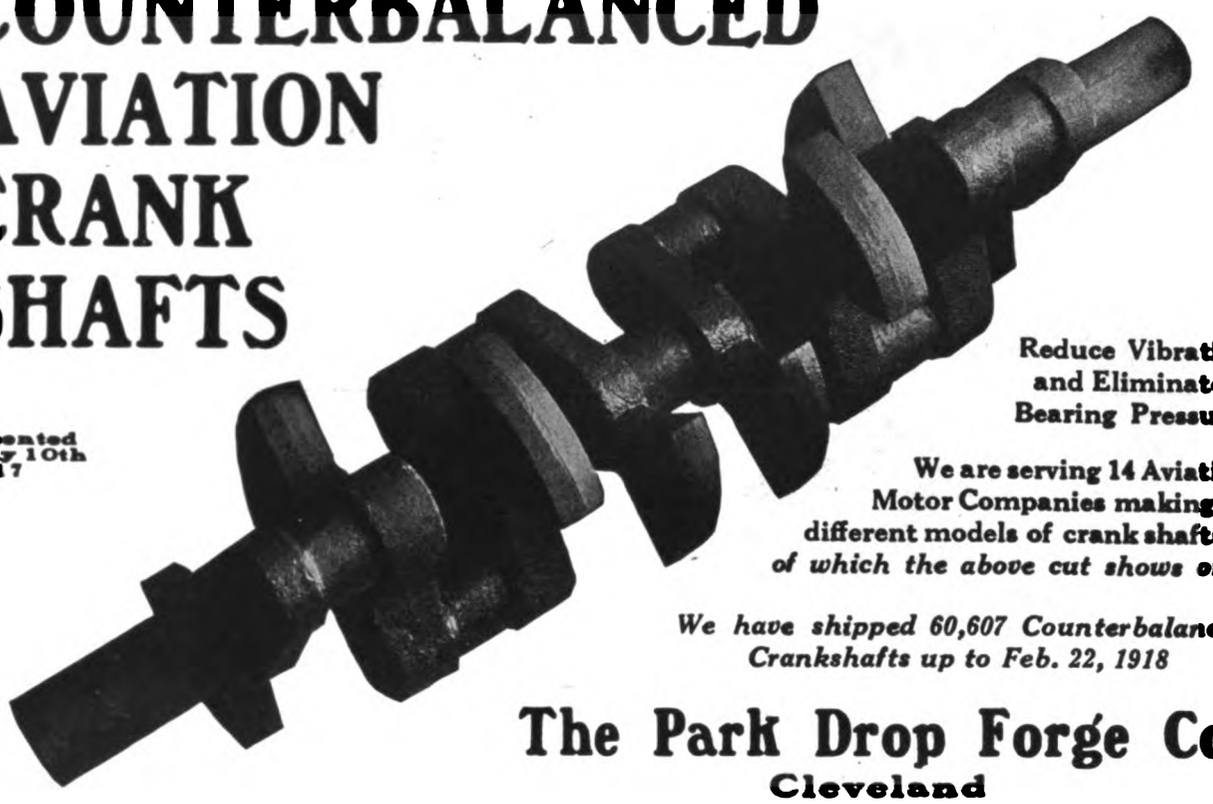
FIFTEEN Manufacturers have indicated to our CONTRACT WORK DEPARTMENT that they could use to advantage information as to where they could place the following lines of surplus manufacturing work:

Castings (steel, brass, bronze or aluminum)
Dies
Tool
Metal Stampings
Punch Press Work
Screw Machine Work
Machine Parts
Gear Cutting
Grinding
Cam Cutting
Bar and Clutch Work
Forgings
Drop Forgings
Lathe and Milling Machine Work
Patterns (wood & metal)
Plating
Automobile Stampings
and other lines.

In this connection you can consult with profit our ***Contract Work Department***, page 96 in this week's issue.

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COUNTERBALANCED AVIATION CRANK SHAFTS



Patented July 10th 1917

Reduce Vibration and Eliminate Bearing Pressure.

We are serving 14 Aviation Motor Companies making 18 different models of crank shafts... *of which the above cut shows one.*

We have shipped 60,607 Counterbalanced Crankshafts up to Feb. 22, 1918

The Park Drop Forge Co.
Cleveland

ZAPON

NECESSITY

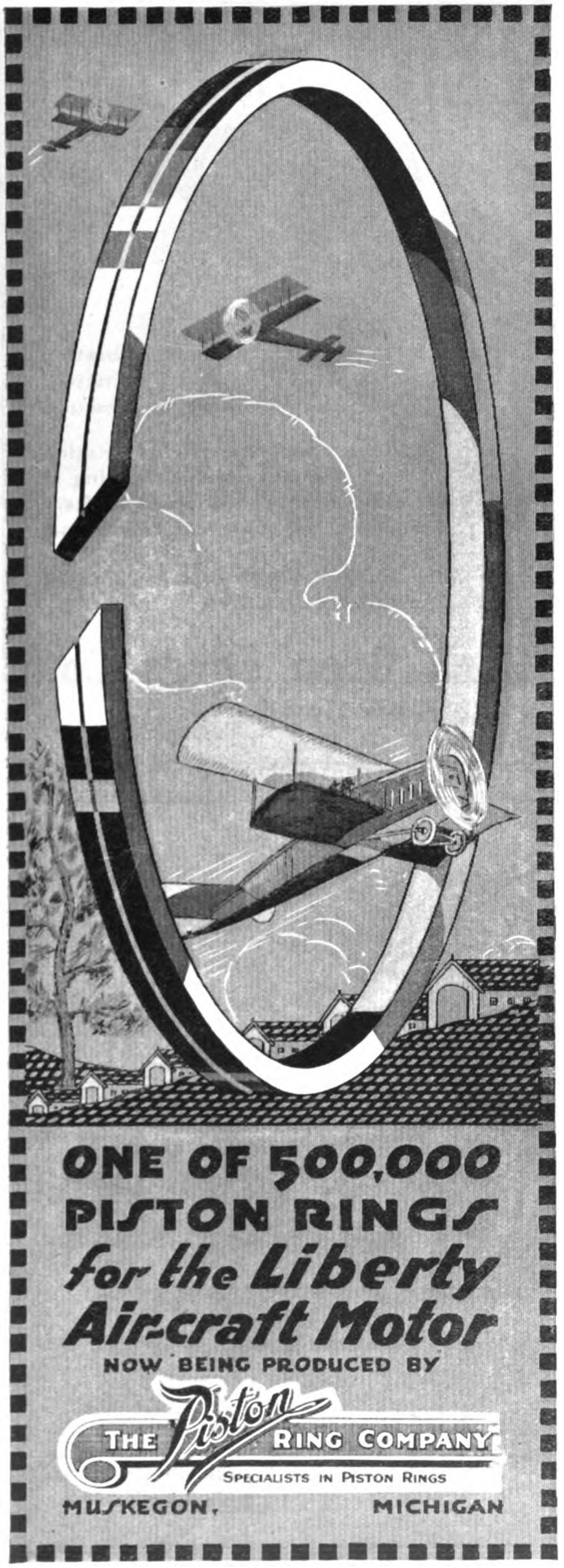
"The mother of invention, so 'tis said"

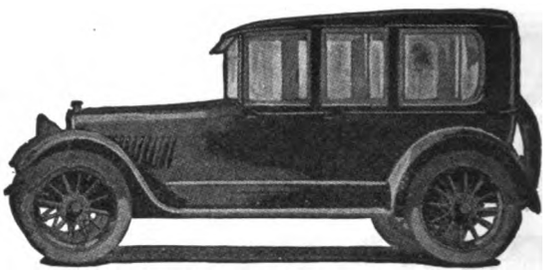
We recognized the necessity for a good leather substitute over a score of years ago. ZAPON LEATHER CLOTH, today, as then, is still a necessity. Necessary, now, to the final finishing touch of the modern automobile.

The test of time alone tells the story!

ZAPON LEATHER CLOTH CO.
New York **Detroit**

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Save Money Without Sacrificing Appearance

In this time of nation-wide economy, are you finding ways of cutting costs—and **still** retain **quality?** One item of saving—and it's no inconsiderable part of motor equipment either—is

GLASS

We have a highly acceptable substitute for Polished Plate, useful for closed cars, windshields, clock faces and oil gauges.

Write us your requirements, and let us tell you why this glass will serve your needs so well, why it costs less—and all about it.

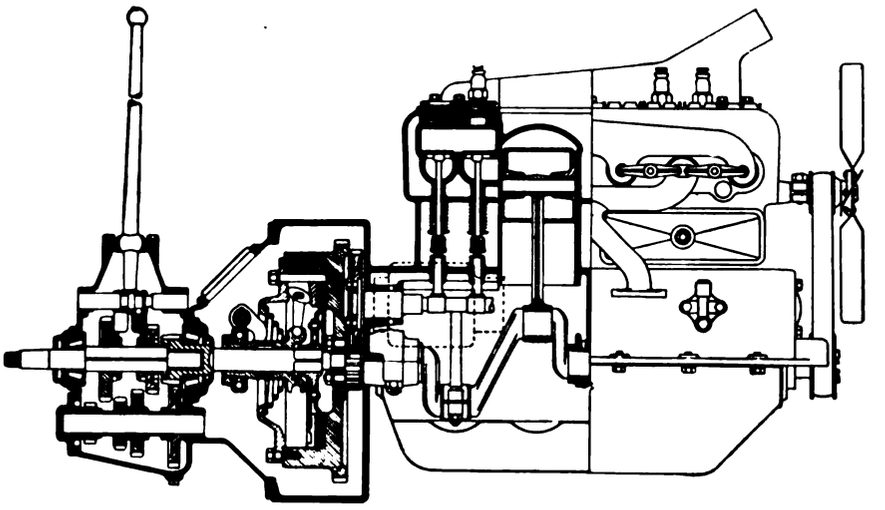
AMERICAN WINDOW GLASS CO.
World's Largest Producer
General Offices, Farmers' Bank Building
Pittsburgh, Pa., U. S. A.

THERE are hundreds of Machine Shops throughout the country that are fully equipped to handle surplus or special manufacturing work.

For further information see page 96 of this week's number.

CONTRACT WORK DEPARTMENT

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Motordom's Latest —the A. B. R. Unit Power Plant

A new but highly efficient power plant that is bound to become one of the most popular in the motor truck industry. Read over a part of the startling specifications:

30 H. P. (4 cylinders cast en bloc)

3¾ bore x 4" stroke

3 speeds forward—1 reverse

Non-adjustable Disc Clutch (own make)

Wright tapered Roller Bearings

Splash and Pump lubrication System

The complete A. B. R. Unit Power Plant includes spark plugs, wiring, generator and carburetor. Capacity production for 1918 20,000 units. Write today for complete specifications and literature.

A. B. R. Motor & Engineering Co.
Stamford, Connecticut

SRB Annular Ball Bearings (Single and Double Row)

SRB Improved Type Taper Roller Bearings

Standard SRB Taper Roller Bearings (Special for Fords)

STANDARD ALLOY STEEL BALLS

Rudge-Whitworth Wire Wheels

MAYO Radiators

Factory resources and service go hand in hand with STANDARD ROLLER BEARING PRODUCTS

Sales Offices:

DETROIT	936 Woodward Avenue
CHICAGO	2206 S. Michigan Avenue
INDIANAPOLIS	822 Hume-Mansur Building
BOSTON	163 Massachusetts Avenue
CLEVELAND	2062 Euclid Avenue
SAN FRANCISCO	41 Spear Street

STANDARD ROLLER BEARING CO.
Philadelphia, U.S.A.

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A Flying Start!

The race goes to the swiftest. A flying start at the get-away is a big step toward victory.

A flying start in the cleaning department means more speed all along the line—more production and more profits.

Put more speed and energy into your cleaning tanks with

OAKITE

Get the jump on grease and oils—set a pace in your cleaning department that will keep it laps ahead of the rest of the plant. You can do it—with OAKITE.

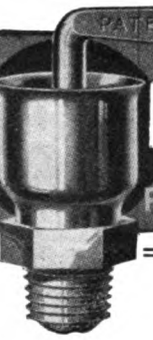
OAKITE is guaranteed to do all we say. But the best way for you to be sure is to ask us to prove it. We are always ready and glad for the opportunity. Just say when.

THIRTY-DAY TRIAL OFFER

Write for details of our offer to send a barrel of OAKITE on 30 days' trial subject to the terms of our Positive Guarantee

OAKLEY CHEMICAL CO.
28 Thames St., NEW YORK CITY

PATENTED
KANT KLOG
THE PRACTICAL PRIMING CUP



The Kant-Klog Primer

is rapidly being adopted as standard equipment by automobile builders because—

it is an innovation of efficiency and low cost—

it solves the problem of cold weather starting to the entire satisfaction of the user and can't clog with carbon because of its very construction.

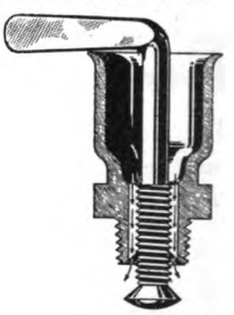
The simplicity of the Kant-Klog Primer is seen in the sectional view. No part of the valve is exposed. There is plenty of clearance for the free flow of gasoline direct without waste when priming. There is no chance of carbon getting past and collecting on the seat. There is no need of removal even after months of non-use.

The more Kant-Klog is used the better its seating action.

Quotations on variations of our standard design to suit different type motors—promptly furnished.

Kant-Klog prices are surprisingly low.

Write today for particulars and free sample.



Note the Simple Construction

The Taylor Machine Company
Cleveland, Ohio



DEALERS!
Wire Wheels are *sellers!* Get particulars of wire wheel service and sales agent's propositions.
Ford distributors and accessory dealers should write for special service and sales proposition for HOUSE type Wire Wheels for *Ford* cars.

Wire Wheel Corporation of America
(Successors to Houk Mfg. Co.)
835 Eleventh Ave., at 57th St., New York



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Get Maximum Power

WHAT you need is a hot, efficient and perfectly timed spark under all conditions.

Present-day, low-grade fuel makes this a matter of prime importance if you are to run your engine most efficiently and economically.

Bosch Magnetos

the self-contained, troubleless ignition systems, excel in power-producing features.

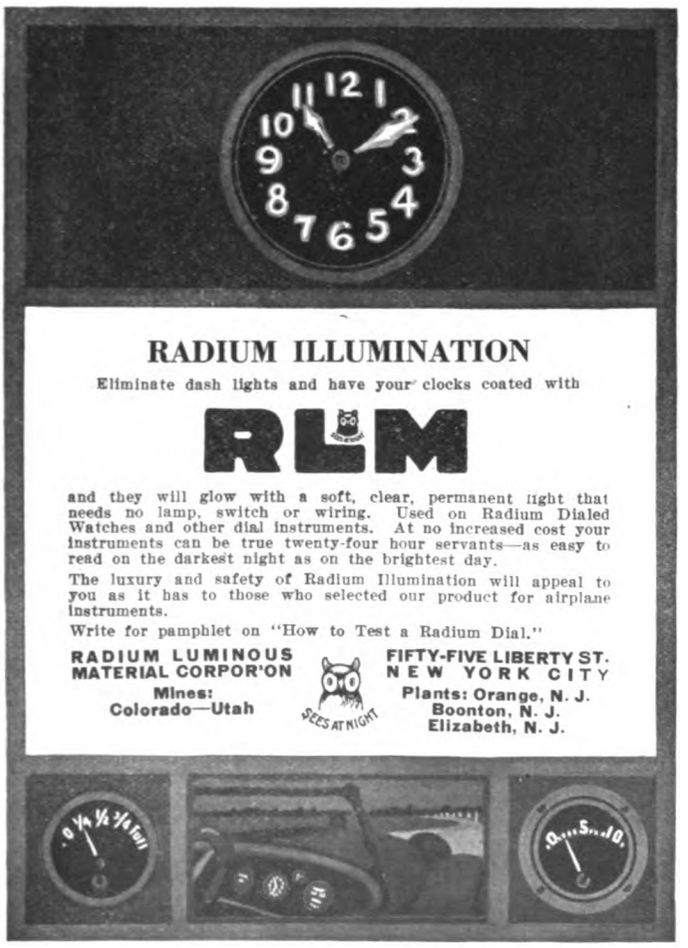
Be Satisfied *Specify Bosch*

Correspondence Invited

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Chicago San Francisco Detroit

Service Stations in Every State



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Eliminate dash lights and have your clocks coated with

RLM

and they will glow with a soft, clear, permanent light that needs no lamp, switch or wiring. Used on Radium Dialed Watches and other dial instruments. At no increased cost your instruments can be true twenty-four hour servants—as easy to read on the darkest night as on the brightest day.

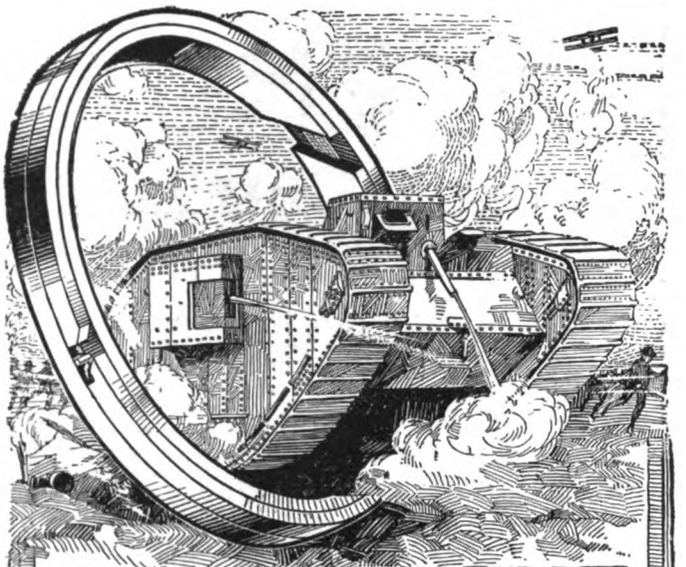
The luxury and safety of Radium Illumination will appeal to you as it has to those who selected our product for airplane instruments.

Write for pamphlet on "How to Test a Radium Dial."

RADIUM LUMINOUS MATERIAL CORPOR'ON
Mines:
Colorado—Utah

SEES AT NIGHT

FIFTY-FIVE LIBERTY ST.
NEW YORK CITY
Plants: Orange, N. J.
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EVER TIGHT
PISTON RINGS

Sensible Gas Conservation

Power saving is imperative. Duty and sound sense both demand, "Stop that waste in leaky cylinders."

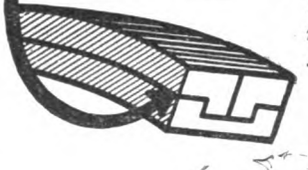
Dealers and Repair Men can eliminate waste and cure balky motors by fitting Ever-Tight Piston Rings.

They are gas-tight, oil-tight, elastic. Conform precisely to cylinder walls, even if out of round. Insure perfect compression and effective suction. Obviate carbon deposits and reboring. Prevent power loss from imperfect mixture, smoky exhaust and fumes. Demand them and avoid imitations.

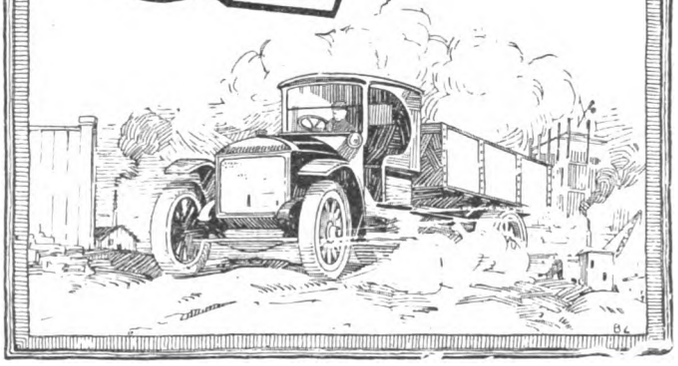
To the Motor Trade: Ever-Tight Piston Rings satisfy your customers and pay you a good profit. Write your jobber.

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The right-angle interlock is your safeguard



This perfect three-piece construction justifies the name—EVER-TIGHT. These close fitting right angles are absolutely gas-tight.



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17 VENUS degrees
from 6B softest to 9H hardest
all perfect!



FREE

This trial box with five VENUS Drawing Pencils and VENUS Eraser sent free! Write for it.



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245 Fifth Ave. New York
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ECLIPSE-BENDIX DRIVE

Transmits Starting Power on 153 Makes of Automobiles

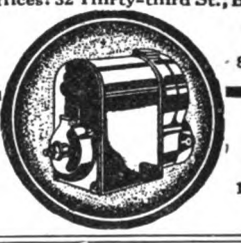
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ELMIRA, N. Y.

EISEMANN MAGNETO

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Sales General Offices: 32 Thirty-third St., Brooklyn, N.Y.

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Standard
Equipment for
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Starting—Lighting—Ignition

Electric Auto-Lite equipment for automobiles is as famous for the service that backs it as for the reliability and economy of its operation.

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DUPLEX IGNITION

—with a second system to spur the motor to super-service.

COMBINES two separate and distinct systems in one—a Single Spark System, most economical of gas and offering vastly increased power. A Secondary or High Frequency System which delivers to each cylinder a stream of a thousand sparks a second—overcomes abnormal conditions, such as foul spark plugs, poor fuel, poor carburetion, and cold cylinders—*offers 100% Assurance against ignition failure.*

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Dyneto

TRADE MARK REGISTERED

Electric Starting and Lighting Systems

SINGLE UNIT and TWO UNIT Equipments

Booklet on Special Ford Equipment

DYNETO ELECTRIC CO., Syracuse, N. Y.

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"THE CAR OWNER'S WEEKLY"

PUBLISHED AT CHICAGO.

Central location and frequent issue mean you get the news without delay.

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United Alloy Steel Corporation
Canton, Ohio

Schatz "Universal" Annular Ball Bearing

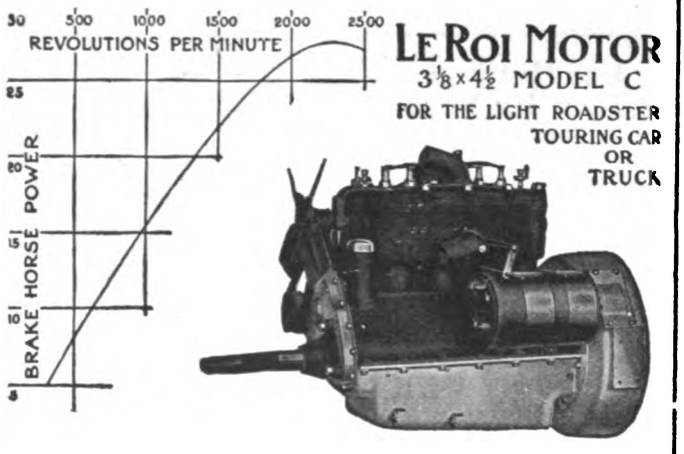
Inner Race a third deeper than the average, gives **greater strength and safety.**
Outer Race, on two integral cups or rings, **prevents binding strain under thrust load.**
Separator free from rivets, rivet holes and distance pieces; nothing to work loose and injure the bearing.

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LE ROI MOTOR
3⅛×4½ MODEL C
FOR THE LIGHT ROADSTER TOURING CAR OR TRUCK

Used by leading manufacturers of best-known American-made light trucks.
The business of manufacturing Le Roi Engines, formerly conducted by Milwaukee Machine Tool Co., is now carried on by

LE ROI COMPANY

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CABLE LE ROI MILWAUKEE

MARVELITE
Alight at Night

Marvelite applied to dials of any description makes them easily readable in the dark—the darker it is the better. No lights required.

Marvelited Dials

are the kind to use on autos and aeroplanes and on gauges and other instruments, because—

1st. MARVELITE is made with real radium.
2nd. MARVELITE is the product of the famous Schlesinger Laboratories—one of the largest producers of radium in the world.
3rd. It is permanent for all practical purposes.
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5th. Prominent manufacturers have also selected it from the field because of its demonstrated qualities.
6th. MARVELITE is not dependent upon exposure to artificial light for its luminosity. Such phosphorescent products are short lived and unsatisfactory.

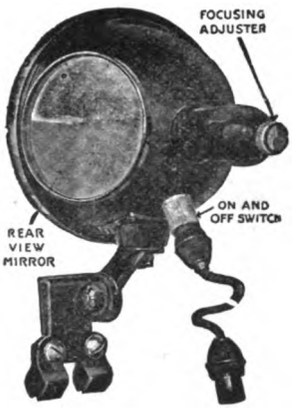
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Ask for Booklet No. 2—Valuable information about luminous compounds.

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HIGH SPEED
NON-GRAN
BEARING BRONZE
For Bushings
AMERICAN BRONZE CORPORATION
BERWYN, PENNSYLVANIA
Sole Manufacturers of Non-Gran and Largest Exclusive Manufacturers of Bearing Bronze in the World

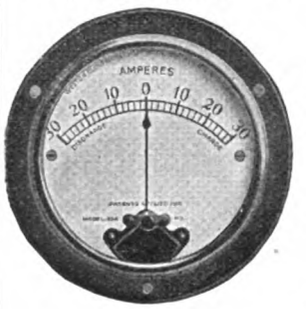


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DETOUR to RIGHT
This sign can be seen perfectly with an E & J Spotlight No. 94, and the dangerous ditch that will upset you can also be avoided.
The E & J Spotlight has been approved by more drivers than any or all of the others.
See your source of supply or write the
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HOOVER STEEL BALL CO., Ann Arbor, Mich.
HOOVER
Steel Balls

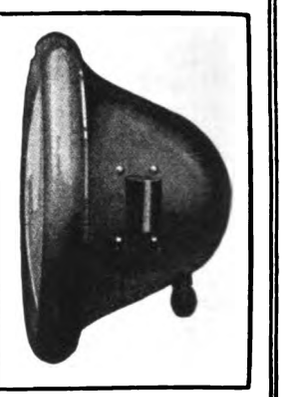
Reduce the Risk of Accident!
Suppose your lights went out suddenly, without warning, on a black night, with a bad road. Don't chance it. Put a



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It is the reliable means of determining the proper rate of charge or discharge of your battery for various speeds. It enables you to determine that the generator is working and that the storage battery is receiving its proper charge. Write us.
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In Gurney Bearings the balls are bigger and there are more of them. This gives bearings a larger factor of safety and longer life.
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BALL BEARINGS

Use Headlights That Identify Your Car
Distinctive types of electric headlights for all cars. Lights that identify your car. Built by the largest manufacturer of automobile lamps.
The John W. Brown Mfg. Co.
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Long Life Bushings In Spite of Neglect
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13 Accurate Records—measures individual mileage for four tires in service and two spare. Gasoline and oil consumption — car speed — trip mileage —season mileage — indicates necessary adjustments at end of each 500 and 1000 miles.

Made by the same men who make The Hamilton Watch, "The Railroad Time-Keeper of America."

The Hamilton Corporation, LANCASTER, PA., U. S. A.

82 WATCH THIS GROW

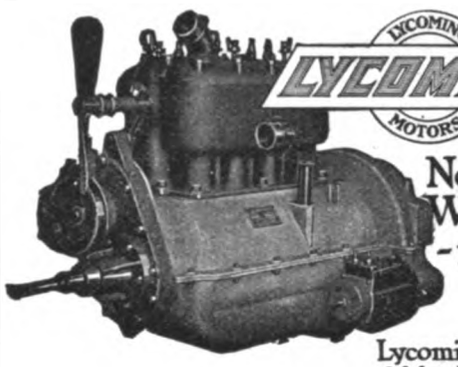
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Spring shackle bolts, valve lifts, bushings, wrist pins, harden and ground Truck and pleasure car parts.

Automatic machine pieces from 1/8" to 2". An organization backed by 10 years of successful manufacturing.

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Brake Lining and Clutch Discs

are backed by three-quarters of a century's experience in weaving, and the combined facilities of thirty-seven factories.

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Rockwood friction-- Transmission

Better Transmission

Fibre friction transmissions are Superior to toothed gears — because higher speed, quicker starts and instant stops can be secured — without damage to transmission or machine.

Fiber Friction Filler Repairs

We furnish friction fillers for all friction drive cars—Give name and model of car and if possible the approximate inside and outside diameter and face width of the ring.

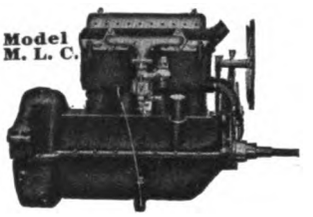
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"Friction Transmission." It contains valuable data and formulæ for engineer, designer, or manufacturer. Please mention firm connection.

The Rockwood Mfg. Co., 1917 English Avenue Indianapolis, Ind.

"THE MASTER MOTOR"

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For Trucks and Tractors

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4-CYLINDER MOTORS

The Motors of Distinctive Character

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"The Sterling Joint"

A tested and proven Universal Joint, typical of its name, for motor trucks and passenger automobiles.

THE BEARINGS COMPANY OF AMERICA
Sterling Plant, Lancaster, Penna.
WESTERN SALES OFFICE:
1012 Ford Building, Detroit, Mich.



GEARS

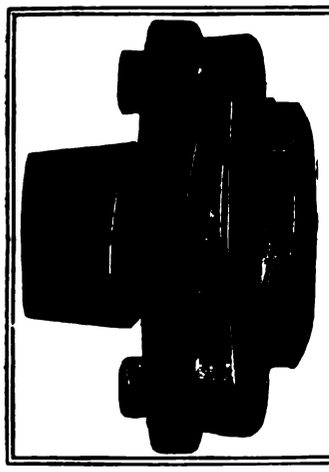
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GEARS for transmissions; spur bevel and helical.

GEARS FOR ANY SERVICE

MADE TO ORDER — IN ANY QUANTITIES

NEW PROCESS GEAR CORPORATION
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MAGNETO COUPLINGS
Patented

FLEXIBLE
ADJUSTABLE
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Positive Locks for Every Thread

FLEXITE DISCS
for all purposes

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SHELDON AXLE & SPRING CO.
WILKES-BARRE : : : : : PENNA.



Absolutely Accurate Crankshaft Machining

20 years experience. New machinery of the latest design.
Highest quality work and prompt delivery guaranteed.
Ample capacity for large orders.

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We are able to offer manufacturers universal joints manufactured by specialists in one of the largest plants in the world.

The wearing surfaces of HARTFORD UNIVERSAL JOINTS are hardened and ground, the grinding being accomplished by a specially devised machine whose use eliminates depressions or elevations so common in steel parts that have been simply reamed.

The reputation of your car demands the best universal joints that can be made, and we have them.

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A worm drive truck axle combining extreme light weight with exceptional driving power and load carrying capacity

WAGNER AXLE COMPANY
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Complete Line of

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Manufactured by
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Successors to THE WINKLEY COMPANY
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For Sheet Metal Stamping
of Auto Parts

THE CROSBY COMPANY
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LIGHT AND HEAVY METAL
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WORCESTER PRESSED STEEL COMPANY
WORCESTER MASS.

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Sheet Metal Stampings
of all kinds
Washers, Shims, Hind View Auto Mirrors
Our complete plant, superior equipment and efficient organization means quick and satisfactory service. Send us your blueprints.

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They find it good business to pay out a little more on first cost for quality gears, because this additional investment will be returned many times over in fewer renewals, in protection against breakdowns and in lower operation costs.

Carnegie Steel Company
General Offices: Pittsburgh, Pa.
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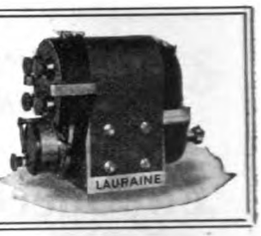
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MERCER MOTOR CARS

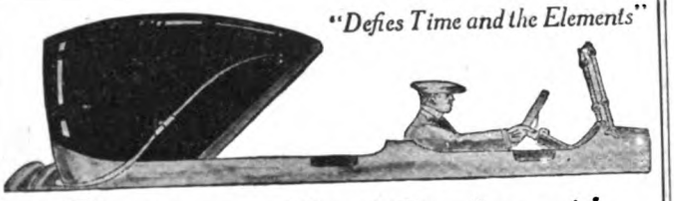
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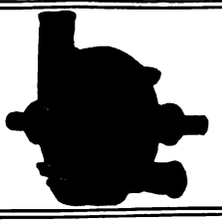
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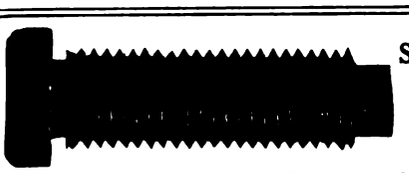
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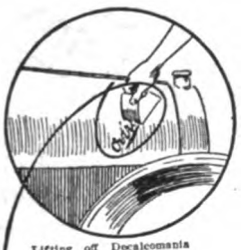
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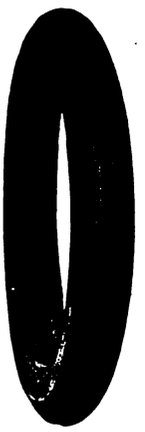
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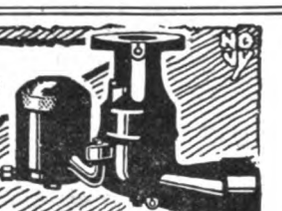
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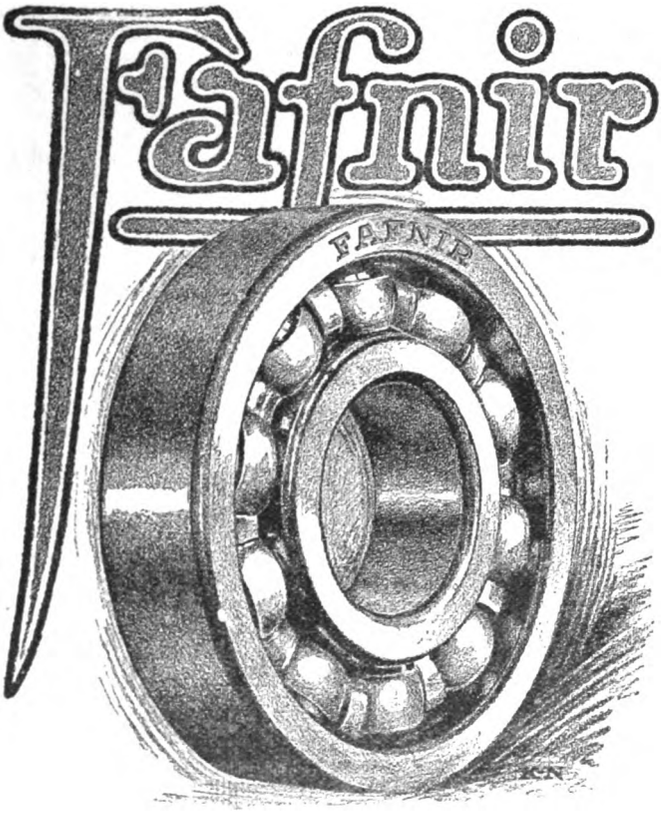
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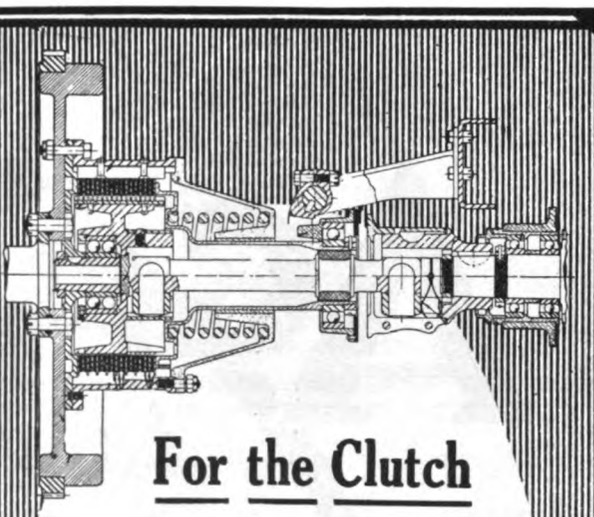
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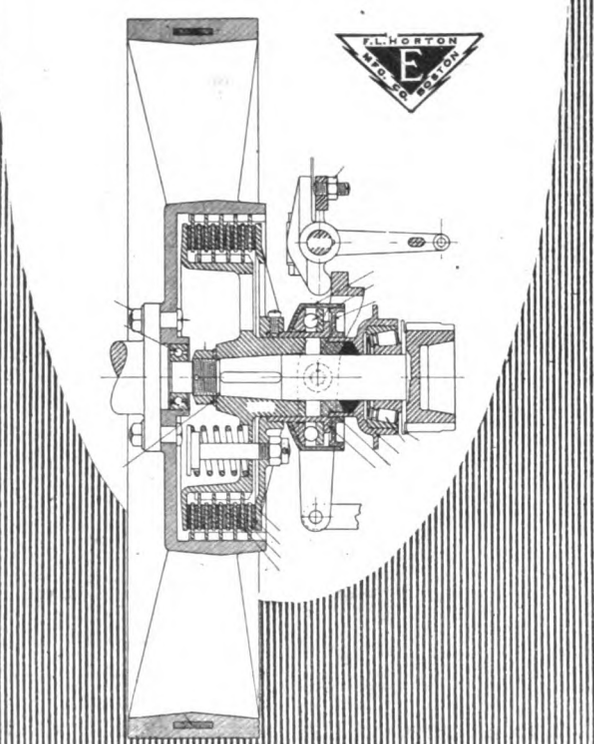
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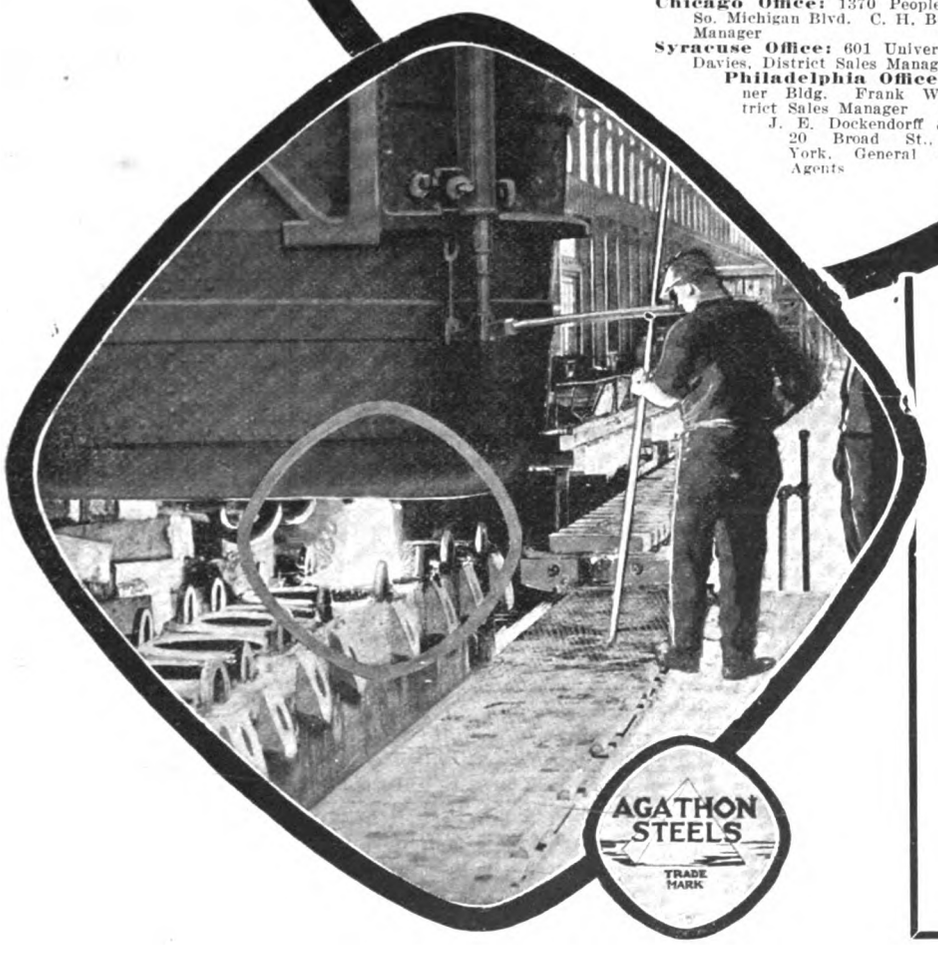
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AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

Vol. XXXVIII
No. 10

NEW YORK, MARCH 7, 1918

Ten cents a copy
Three dollars a year



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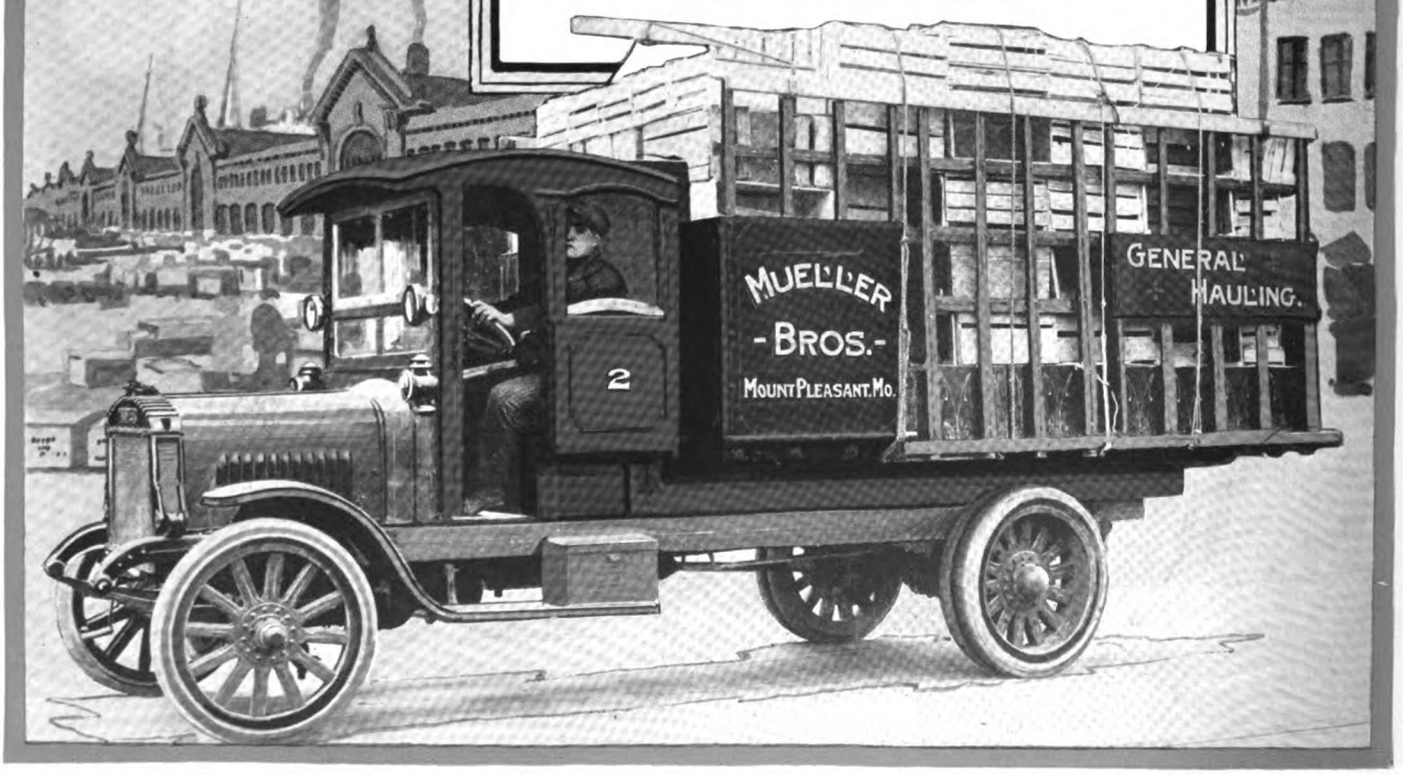
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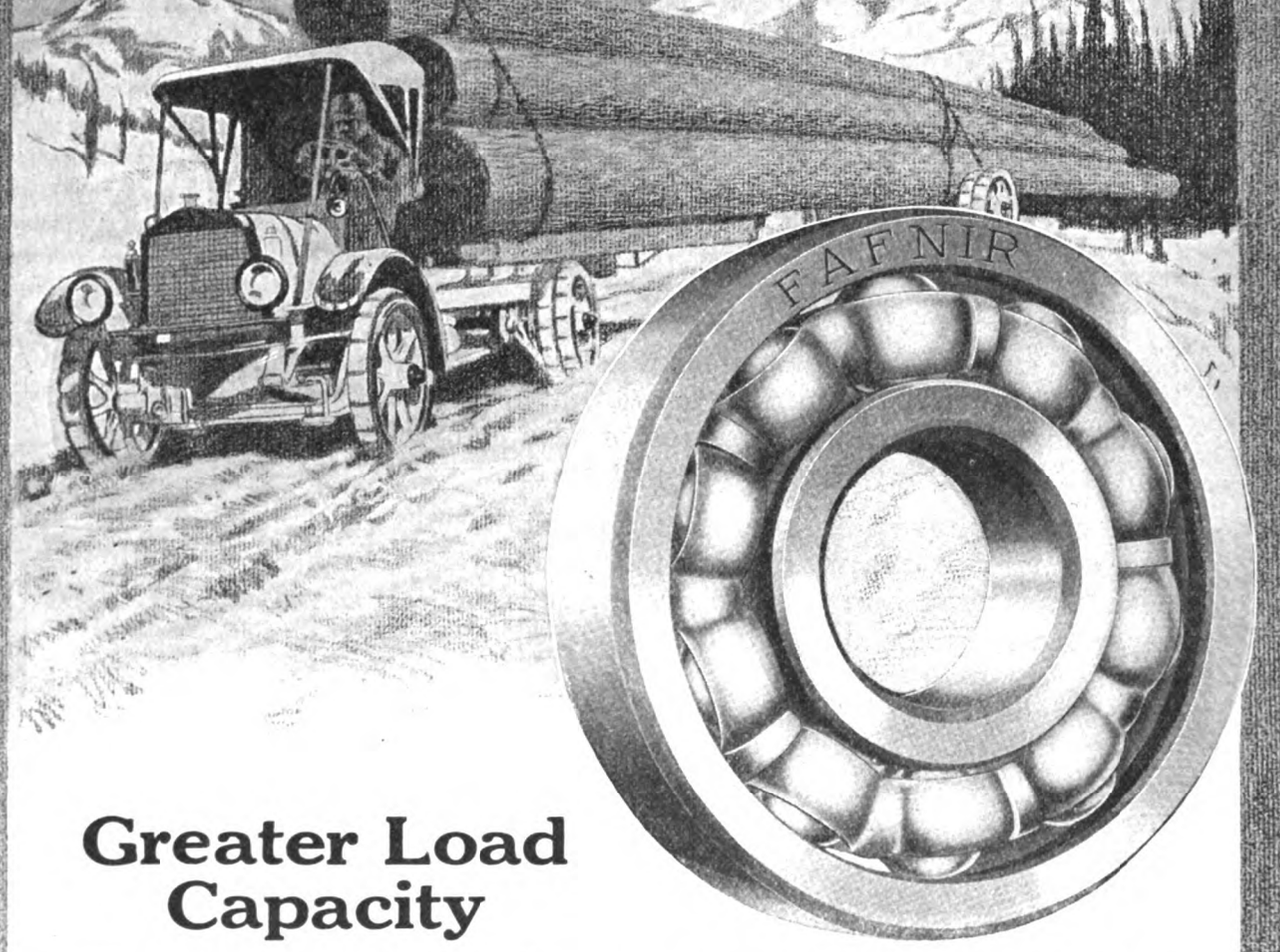
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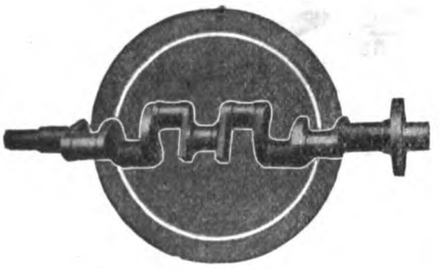
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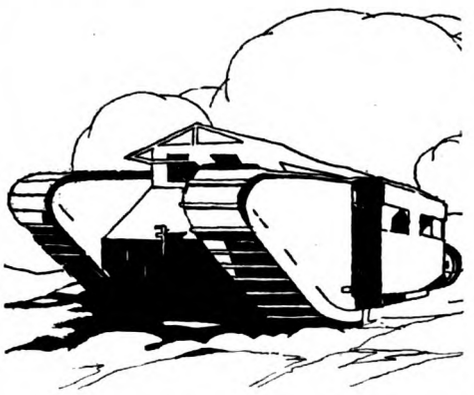
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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XXXVIII NEW YORK—THURSDAY, MARCH 7, 1918—CHICAGO NO. 10

New York State Failed to Remove Snow

War Trucks Average 37.4 Miles Per Day in Empire State, but 67 Miles Per Day Over the Detroit-Seaport Route—Snow Removal Caused the Difference

By David Beecroft

MOTOR trucks for war use in overland drives from the factory where manufactured to seaport have been averaging 67 miles per day for distances up to 600 miles and higher, yet railroad freight cars in the same zone of country have only been averaging 21.1 miles per day. Both of these figures represent winter possibilities, although the motor truck performance was in the midst of exceptional snow, whereas the railroad car situation represented the average for the month of November in what is known as the Eastern railroading district.

These figures not only emphasize the ability of motor trucks for winter work but we have the unexpected fact that this motor truck average was made on the war truck route from Detroit to seaport through the States of Michigan, Ohio, Pennsylvania and Maryland, and not as many might imagine through such states as New York, New Jersey, Connecticut or Massachusetts, so justly renowned for their model highway systems.

War motor trucks traveling from Buffalo to seaport over the time-famous Boston-Albany route and thence down the scenic Hudson have no such favorable report to show on maintained speeds. The best speeds over this route have shown averages of only 37.4 miles per day, or very little more than one-half the sustained speed that has been made over the Detroit-seaport route.

Here we have what appears as a real paradox in so far as improved highways in relation to motor truck performance is concerned. From Buffalo to seaport, 666 miles, there is a veritable water-level highway of the most modern kind all of the way, as compared with over 250 miles of mountain roads on the Detroit-seaport route. If the Detroit route makes possible a sustained speed of 67 miles per day the Buffalo route by all rules of comparison should have made possible certainly a higher sustained speed.

Four States Removed Snow

The reason for this discrepancy, this condition which is diametrically opposite to what might be expected, lies in the snow situation. On the Michigan-Ohio-Pennsylvania-Maryland route all four of the states rose to the war necessity of removing the snow in order that the Government might drive its war trucks overland and thereby not only economize on railroad cars but train truck drivers and truck mechanics in the work that they must do when reaching France.

New York State, contrary to expectations, failed to respond in the snow removal work and instead of trucks averaging 67 miles per day over the fine state roads their average was cut to 37.4 miles per day. It was solely due to lack of snow removal.

From Buffalo to seaport, 666 miles, required eight-

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een and one-half days; from Detroit to seaport, 570 miles, required but eight and one-half days. Had the Buffalo trains averaged 67 miles per day, which they can with ease when the roads are clear, they would have made the trip in ten days and saved eight and one-half days on the trip.

At the time these trips were made General Pershing was cabling urgently for trucks and more trucks. It has apparently been necessary for the American expeditionary force to buy motor trucks in great quantities from some European countries. It has apparently been necessary to rent other trucks at high rentals from other European countries in order to meet our imperative requirements there.

What happened to New York State?

Why was it that Pennsylvania was able, beginning in December, to keep its highways clear of snow, including over 200 miles of mountain roads?

Why was it possible for the State of Ohio to keep its share of the Detroit-seaport route clear of snow as the war department desired?

Why was it possible for Maryland to keep its highways free of snow?

Why was it possible for the State of Michigan to literally build 10 miles of road on the Detroit-Toledo lap of the journey and keep the snow removed for the entire distance within its boundaries?

No State Fund for Snow Removal

But what happened in New York State? There are many legal and technical explanations: There was no State fund for snow removal. Such was not contemplated in the scheme of road maintenance expenditure within the Empire State. If snow had to be removed, the work must be done by the local authorities in the towns and cities and not by the State. The net result was that the snow was not removed. The trucks averaged 37.4 miles per day instead of 67 miles per day.

The same or similar snow handicaps existed in all of the States on the Detroit-seaport route. There were not any fat snow-removal appropriations dust hidden on the legislative shelves of the States en route. Pennsylvania, which cleared its share of the route beginning in December and kept it clear, financed the work by the State Highway Department. Here there were no special snow-removal funds, but use was made of $500,000 of a State emergency fund of $2,000,000. With this amount the State did not ask for volunteer work by farmers along the route, except in some instances at the first December snow blizzard. The State Highway Department organized for the work and carried it out.

What Was Done in Ohio

The State of Ohio did not have special snow-removal funds, but here the State government worked through the local authorities, and where local authorities had not sufficient money to do the job the State made necessary advancements, although there does not appear to have been any direct authority to warrant such expenditures. They were made as war emergency acts, in that the State had been asked to do its share of the snow-removal work and keep its route cleared of snow.

Michigan and Maryland, at both ends of the route, kept their respective stretches clear from the first snow fall, and in fact the State of Michigan went so far as to undertake to keep many of the main routes of the State open during the winter months.

But New York State, although specifically requested from Washington to clear its roads, failed to respond and we paid the price on the other side of the ocean. Apparently many failed to realize that in war times war emergency acts are not only desirable but necessary and justifiable. Apparently it was not realized that eight and one-half days saved by the trip from Buffalo to seaport is equivalent to eight and one-half days being saved with our forces in France.

610 Firms on War Work in New York

It is understood that there are 610 firms in the State of New York working on war contracts and that this number represents approximately one-quarter of the total number of firms in the country engaged on war contracts. If snow-removal activities bear any relationship to war contracts then New York State failed quite badly to give that account of itself which it should have given and which it should give as the premier State of the Union.

The States of Pennsylvania and Ohio, both great manufacturing centers, are reported to have within their boundaries one-quarter of the total number of firms engaged on war contracts. They responded to the snow-removal call.

Snow removal from main trunk highways has not yet been considered a necessary and highly essential part of the road maintenance work of a State. In other words, our improved State highways have been spring, summer and autumn highways, but only for fractional traffic in winter. War is no respecter of seasons, and while our troops on the front may be more or less inactive in wintry seasons those are the seasons when our home activities should be greatest in order to have ready for them at the opening of the spring drive all of the necessary sinews and munitions of combat.

War Demands New Methods

At home we must get this fact into our peoples and into our State governments. War emergencies and war necessities have demanded new orders of things. It is an example of new wine and new bottles must be used as well. The days of tying up our trunk highways from large manufacturing centers to seaport have passed. We do not send our soldiers to the shores of the Mediterranean to holiday in the winter months. They toil amidst snow and ice to get prepared for the spring. At home the same rule must apply. We are sharing the job with them and we must share it on as nearly equal basis as possible.

Our highways must be kept clear of snow. The war has made some of our great highways nearly as important as some of our major railroad systems. The coal crisis of a few weeks ago impressed the necessity of open trunk highways in the winter. Our steamboats do not stop crossing the ocean in the winter months and our capillary systems of trans-

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portation feeding the ports of embarkation for these steamers must be kept open. Winter is the period of lowest railroad efficiency and yet it is the one period when we have been willing to nearly entirely lose the use of our trunk highways. This old rule of things must in the cause of necessary protection for our armies in France cease. New York State will have to waken before another winter if she can possibly justify her good volume of war contracts and also her admirable system of roads which are equally good in winter as in summer if the snow is removed.

The State of Connecticut, which has received a liberal share of war contracts, has set an example to the nation in the work of keeping its main highways cleared of snow, and although not on any of the war truck routes to seaport and not specially requested to do anything, the State from its own internal initiative performed a wonderful work. It was able to keep the flow of munitions from factory to seaport moving steadily in spite of railroad congestion and exceptional weather.

New York State has in the Syracuse zone of 61 miles on the main Buffalo-Albany highway six bridges which are condemned so far as carrying maximum load. These bridges are permitted to carry only 2.5 tons, and the war trucks, instead of carrying their 5-ton load of merchandise to seaport, were compelled to carry 2 tons. Apparently there were no available appropriations to repair these bridges and yet nothing has been done as a war emergency measure to take care of this. We would scarcely feel proud of our army in France were our trucks there to be carrying only a fraction of their useful load because bridges were not strong enough to carry them with their full load.

Sixty War Trucks Leave Factories Daily

At present approximately sixty motor trucks per day are leaving truck factories under the Quartermaster's direction for seaport. These are being dispatched in truck companies of thirty trucks to the company. These companies are divided into three sections of ten trucks each, with a distance of approximately 1000 ft. between sections when traveling. The trucks in a section run about 100 ft. apart. Up to the present time eight of these truck companies have come over the Detroit-seaport route and all told about 400 trucks for war purposes have been driven overland. Were these shipped on railroad freight cars approximately 200 freight cars would be required and the length of time required for the shipment would be greater than what has been required in these overland drives.

The overland drives have had the advantage of training the men in the work. Each driver makes two trips from the factory to seaport. Previous to leaving the factory on the first trip he is given a short educational course in the factory, where he not only becomes familiar with the mechanics of the truck and repair work, but also is given instruction in driving the truck.

Great improvement has been made in time schedules since the first truck companies left Detroit in December. On the first trip eighteen days were required for the 570 miles. This has been cut in half and on every successive trip the daily average is being lengthened.

Some idea of the difficulties the trucks have encountered by way of snow is shown by the figures. One truck company leaving Buffalo was able to make only 6 miles in one day leaving that city. On another day 15 miles were covered, on a third day 16 miles. When roads from which the snow was removed were encountered the daily mileage rose to 95. The mileage on the last day reaching seaport was 104. The Detroit companies have found that it is possible to average pretty close to 90 miles a day, which should take the trucks from that city to seaport in a little over 6 days.

England's Example of Snow Removal

The problem of removing the snow from highways is not new, in fact nearly a century ago England gave an example of snow removal work. In the region of Sheffield, a large manufacturing city in the North, the great English snowstorm of December 26, 1836, presented a new problem of traffic. The snow did not hold up traffic at that time and the mail stage coaches were operated on schedule. There were drifts 4 to 8 ft. deep which were shoveled through by soldiers in order to keep the highways open. Bus routes running over heights at 1000 ft. above sea level were kept open.

Still a further reason why snow removal must be given more attention and increased is the development of the public rural express company, a recent example of which is the activity in the State of Maryland. These express companies are needed as much in winter time as in summer. At present the different rural express companies of Maryland have a schedule of 1574 miles covered on a regular time table. Of this distance only 300 miles is over the improved highway system of the state. In other words, this would indicate that the snow removal work will have to be extended in many states beyond main trunk lines. At present the Bureau of Markets is undertaking an investigation of rural express systems, with the object of discovering what should be a reasonable cost for such service in different sections in order to keep these companies in healthy condition. Such investigations are being made in western New York; in the zone of New York City; in the Philadelphia zone; the Detroit zone, and in Connecticut and Ohio.

The added flexibility to our food supply is well emphasized in connection with these systems. In the rural express routes out of Baltimore, anywhere from 25 to 40 gal. of milk are being brought from farmers who live 6½ to 7 miles from railroad lines, and which milk would not reach the population centers were it not for the express system.

An example of how time is conserved was shown by a farmer 12 miles out of Washington, who required four horses to draw his 3-ton load to the city. The horses were traveling by actual time study at 2 miles per hour. With a motor truck this speed is increased in actual service to 12 miles per hour. The development of rural express lines is certain to emphasize the demand for snow removal.

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Traction on Bad Roads or Land*

Comparison of Wheel and Chain-Track Methods of Drive—Braking and Side-Slip Problems—Free and Locking Differentials

By L. A. Legros

THE problems involved in the design of vehicles for traveling, or for the haulage of goods, or agricultural implements, or produce over the land or bad roads, depend for their satisfactory solution upon conditions that vary widely. The worse the condition of the road or land to be traversed, the more essential it is that due account should be taken of the nature of the ground, its inequalities, its resistance to load and to those shearing forces to which its surface is subjected by tractive effort.

The methods adopted for overcoming the difficulties peculiar to such traction problems can be divided into two main classes: The one class is that in which the driving power is distributed over more than two driving wheels; the other class is that in which the tractor drives through chain tracks which reduce the insistent load. The two classes of tractor are, consequently, applicable to different conditions, and while the methods cannot be considered as competitive, the limitations of each can be best appreciated by direct comparison of their respective peculiarities and advantages.

Under the ideal conditions of traction on rails the driving power transmitted through a single pair of wheels may suffice to haul a train of many coaches for wagons. Under the less favorable conditions of ordinary roads, a single pair of driving wheels may serve to transmit the power necessary for hauling two or more trailers. Traction on the ordinary road by metal-tired wheels, however, demands in the driving wheels a large diameter and great width of tread, in order that the insistent load may be reduced to reasonable intensity. How sensitive roads are to the loads that they carry may perhaps be best realized by considering a gravel road, on which ordinary devices can, in normal conditions, be used safely; the same devices may, however, cause serious damage when the load-carrying coefficient is even slightly disturbed, as, for example, by a thaw.

Renard Road Train

Among schemes for road haulage devised with the object of reducing the load per driving wheel may be mentioned the Renard road train, consisting of six-wheeled vehicles. The central wheels of each vehicle were metal-tired driving wheels, and the end wheels were fitted with rubber tires and Ackermann steering. The leading vehicle formed the power unit, and power was transmitted to the central axles of the other vehicles of the train by an articulated shaft. Under State subsidy the system had a fair trial in France, but it has not developed to any notable extent. The attempts at multiple-axle drive have, however, indirectly, led to the development of the four-wheel drive, a system which, while less ambitious, has considerable advantages for some conditions of traction over the ordinary two-wheel drive.

The four-wheel drive may be combined with either two-wheel steering or four-wheel steering. An example of the first of these classes, schemes for which were proposed as early as 1898, was the touring car built by Spyker, of Amsterdam, in 1903, and exhibited at the Crystal Palace in 1904. M. Brillé, in a paper read before the institution, treated of an improved motor truck of the second of these classes, driving and steering through all four wheels.

The four-wheel drive vehicles of to-day have much in common with the ordinary back-axle driven truck, in type and arrangement of the engine and its accessories, such as carbureter, radiator and clutch, and also in the arrangements of gear-box, springing and brakes. Those features only will be described, therefore, in which the four-wheel driven vehicle differs from the ordinary type.

*Paper read before the Institution of Mechanical Engineers, on Friday, January 18, 1918.

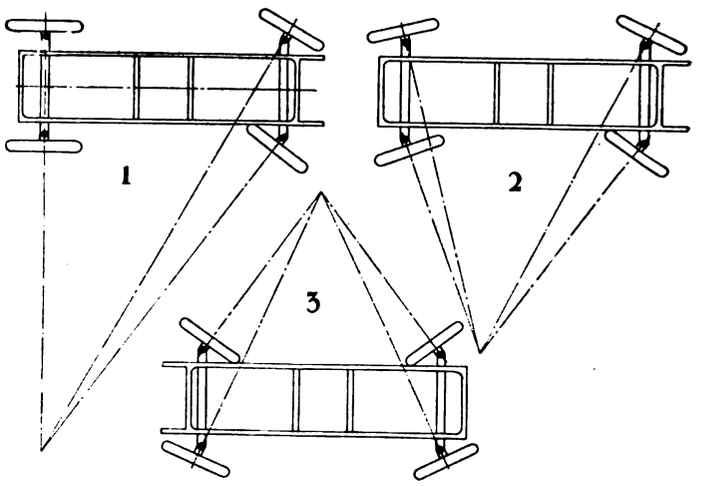


Fig. 1—Ackermann axle on front steering vehicle. Fig. 2—Non-symmetrical four-wheel steering. Fig. 3—Symmetrical four-wheel steering

Four-Wheel Steering

In the ordinary front-steering vehicle, fitted with the Ackermann axle, the design endeavors to meet the condition that in plan the axles of both front wheels shall intersect at a point on the axis of the back wheels, as shown in Fig. 1. In the four-wheel drive car with four-wheel steering the problem assumes a more general form, and the condition to be met is that the axes of all four wheels shall intersect at the same point, Fig. 2. So long as this condition is fulfilled it is not essential that the inclination of the axes to the normal shall be the same for the front and back axles; but in practice the steering is generally symmetrical, Fig. 3, and the virtual center about which the vehicle turns is situated on the normal center line. This results in a reduction of the radius of the turning circle approximately to one-half of that obtained with the same front axle and with front steering only. The vehicle has therefore much greater handiness in certain respects, but is subject to the disadvantage that if brought near a curb, and particularly a high curb, the wheels cannot be locked sufficiently to permit of taking a small turning circle in leaving. This can be a distinct disadvantage in cities, though it is to a great extent compensated for by the greater ease with which the vehicle can be manœuvred backwards.

The locking of the rear wheels restricts the space available for framing the body of the vehicle at the height of the chassis to a narrower width than with two-wheel steering. This does not affect the arrangement of a cylindrical tank or hopper-shaped body, but for the ordinary flat platform it is necessary to give greater height than in normal practice. Although the author has not found an example of the non-symmetrical steering, shown in Fig. 2, it is to be noted that conversion to this arrangement involves nothing more than altering the lengths of two levers, and that the increased width of body which could be carried direct on the chassis

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might well compensate for the slight increase in the turning radius.

For driving over country roads or fields with many irregularities or obstacles the four-wheel drive has undoubted advantages, because the percentage of load available for adhesion is nearly double that of a two-wheel drive.

The application of brakes on automobile vehicles running on ordinary or bad roads involves inevitably the possibility of side-slip. It is well known that, when the coefficient of friction for lateral displacement of the tires is small, and the brakes are applied too hard on a vehicle with rear wheel brakes, side-slip will result, and the back of the vehicle will "come round" unless prevented by the skill of the driver. The extent of the slip can be reduced by releasing the brake and steering to the side toward which the back wheels are moving. When ordinary side-slip takes place on a cambered road, and the back of the vehicle is tending to approach the curb, the difficulty of arresting the movement is increased for two reasons; first, because the front wheels must be steered toward the curb, thus reducing the space available for correction of the error of movement, and secondly, because the camber of the road tends to increase the lateral velocity of the vehicle. The paths taken by the wheels respectively in an ordinary rear-wheel side-slip, on a surface which is level transversely to the direction of movement, are approximately as shown in Fig. 4, in which for the sake of clearness the front wheels are shown narrower in track than the back wheels.

Front-Wheel Slip

There is, however, another form of side-slip which is much more dreaded by the expert driver, as it is harder to check; this is front-wheel slip. On greasy asphalt, wet colite, and damp clayey roads, under normal running conditions the driver may be warned in time by the failure of the vehicle to respond to movement of the steering wheel. With this form of slip, application of the brake, resulting in the transference of some of the load from the back to the front wheels, may produce a sufficient change in the conditions to enable the path of the vehicle to be corrected. It is necessary to consider this aspect of the problem in motor vehicles that are rear-driven. As usually designed, the axle loads are approximately equal when the vehicle is stationary; but this condition is changed when the vehicle is running, for the driving torque, corresponding to the speed of the periphery of the road wheels, acts on the back axle and relieves the front axle part of the static load. Practical recognition of this fact is seen in the racing car, the evolution of which has shown a progressive increase in wheel base accompanied by forward displacement of the center of gravity of the car. A racing car of 10-ft. wheelbase with a 70-brake horse-power engine, when running at 80 m. p. h., will have a torque at the back axle of about 353 ft. lbs., but the same vehicle if climbing a hill with a gear ratio of 3.5 to 1 (reducing the speed to 23 m. p. h.) will have a torque at the back axle of 1235 ft. lbs., transferring about 1 cwt. from front to back wheel. If, on the other hand, the rear-wheel brake is applied on an ordinary vehicle, the reverse torque so set up may easily be much larger than this; and the resulting change of load conditions on the wheels may therefore increase the insistent load on the front wheels sufficiently to obtain the necessary friction between road and wheel for steering. It is obvious that front-wheel driving implies heavier loading on the front wheels, and involves greater difficulty for the driver in correcting front-wheel side-slip should it occur.

For stoppage under conditions of good road grip the four-wheel brake acting equally on all four wheels is ideal; by the use of compensating gear the braking action can be distributed equally over the four wheels, and for any given speed the car can be stopped in a much shorter distance than with two-wheel braking. When, on the other hand, the surface is greasy, a skilled driver has greater control over a vehicle braked only on the back wheels.

Four-Wheel Driving

Starley's application of the differential gear to the back axles of vehicles as a means of compensating for inequalities in diameter or in travel of the wheels requires further extension in the case of the four-wheel drive. When the vehicle is driven mechanically by a single gasoline motor, it is not only necessary to provide a differential gear on each axle, but, when these are of the ordinary bevel or spur types, a third differential gear must also be interposed between the two axles to compensate for differences in the mean diameters, and consequently in the revolutions made by the respective pairs of wheels. This introduces a further complication in the problem of driving. In the ordinary two-wheel drive if one driving wheel is held and the other is off the ground, the latter will revolve, other things being equal, at double the speed at which the pair would revolve if both were free; whereas if with the arrangement of three differentials three wheels are held and one wheel is off the ground, this wheel will revolve at four times the mean speed at which the four would revolve if free or driving normally. Conditions under which the load on any one wheel is so far reduced as to allow of slipping occur frequently on very uneven ground owing to release of spring pressure, and they also occur on ground presenting considerable fluctuations in coefficient of friction. To enable the four-wheel drive vehicle, fitted with the usual bevel or spur-wheel types of differentials, to work under these conditions it has been found necessary to fit a differential lock to the main or central differential on the longitudinal driving shaft connecting the two axle drives.

This difficulty is not so serious in vehicles fitted with electric drives, in which it is, of course, possible to fit a separate motor to each wheel. An arrangement of this kind is used in the couple-gear car.

Automatic Differential Locking Gears

The problem of power transmission when one wheel is off the ground, or has no hold, as when in a clay hole or on ice, may, however, be solved in another way. The slipping or free-running of one wheel is due to the fact that the ordinary bevel or spur differential gear is perfectly reversible. If one wheel is jacked off the ground it will revolve at twice the normal speed corresponding to the engine revolutions; and *vice versa*, if the wheel is turned round by hand the engine will make half the corresponding number of revolutions. An attempt made by Hedgeland, about 1905, to solve this problem proved partially successful; but a really practical solution appears to have been found in the worm-gear differential.

The M. and S. differential is of this type. In this arrangement each axle end carries a crown worm wheel of the same hand, each gearing into a worm pinion carried in the differential box; the two worm pinions are geared into an intermediate worm also carried in the differential box. In practice the arrangement of secondary and intermediate worms is duplicated as shown in the figure. The inclination of the teeth is selected so that the worm pinion can be driven by the crown worm wheel, but that the action is not reversible.

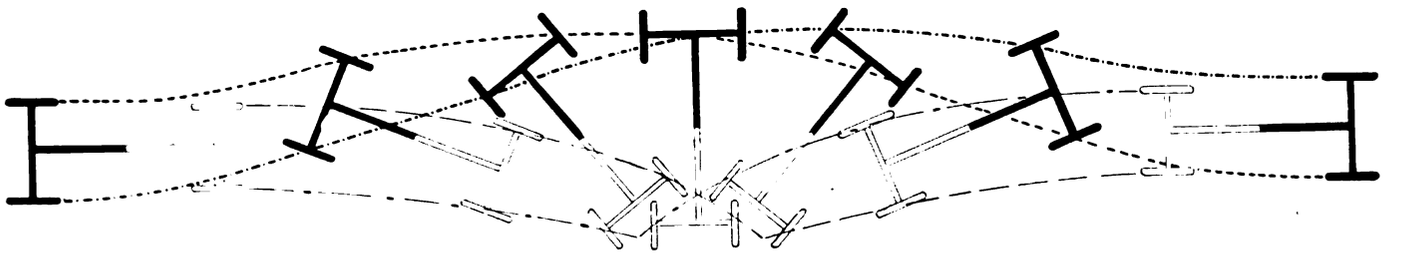


Fig. 4—Diagram of the paths followed by the four wheels of a vehicle during 180 deg. side slip

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The Walter automatic differential lock is also a worm-gear differential. In this form the half-axles each carry a crown worm wheel, and as in the M. and S. gear both are of the same hand. Each crown worm wheel engages with a worm pinion carried in the differential box; these worm pinions being both of the same hand are carried on axes, the one of which is advanced in relation to the other at an angle double that of the inclination of the worm pinion thread to its axis. This arrangement eliminates the intermediate worm pinion necessary in the M. and S. gear and thus shortens the overall length.

In this country (England) the problem of the automatic differential lock has been attacked by Wolseley Motors in a different way. In one example small multiple-plate clutches are arranged in the differential box at each side so that they are acted upon by the end thrust of the gears; this end-thrust exists already in the case of bevel or mitre-gear differentials, but in the spur form of differential it is obtained by making the satellite pinions (with axes parallel to the differential axis) alternately right and left-handed worms geared together and gearing respectively with left and right-handed worm wheels, of the same tooth inclination, carried on the respective ends of the axle halves; the end thrust of these worm wheels acts on the multiple-plate clutches in the same manner as in the bevel or mitre gear differentials.

The possibility that the automatic action may not insure complete locking of the wheel or wheels is provided for in a modification of the arrangement. In this form the multiple-plate clutch sleeves carrying the thrusting wheels (whether bevel or worm) are provided with collars against which forked levers pivoted to the differential axle casing can be made to press by means of a hand lever acting through appropriate linkwork. The gear thus forms a partial lock under normal conditions and becomes a complete lock when desired.

Another form of differential locking automatically is the Dorr Miller. This gear consists of the following parts: A central driving plate, eight steel balls carried in holes in the driving plate, two groove blocks with axially-waved races for the balls, and two friction plates, one on the back of each groove block, having one face bearing on the groove block, and the other on the inside of the differential box. As soon as spinning or skidding starts, the groove block which tends to move faster also tends to move away from the central driving plates by the action of the balls in the waved grooves. This action causes the outer surfaces of the groove blocks to bind against the inside surfaces of the friction plates, which in turn tend to bind on the inside of the differential box, thereby converting the differential temporarily into a solid unit. Under normal conditions it is claimed that the rolling of the balls over the waved grooves permits perfect differential action.

It is the author's opinion that it is desirable that comparative tests of the various forms of automatic differenial lock should be made by an independent authority, such as the National Physical Laboratory.

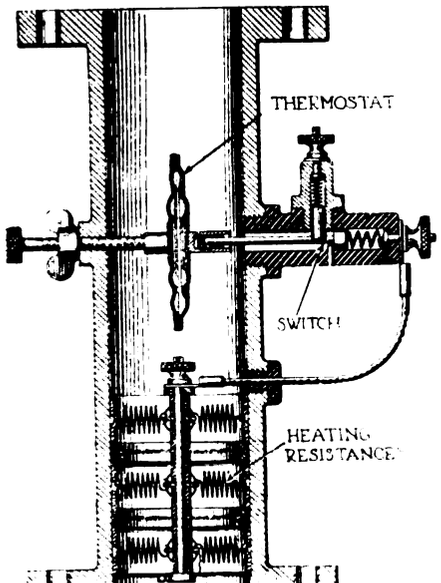
Four-Wheel Drive, Front Steering

The F. W. D. (four-wheel drive) car of Clintonville, Wis., is a four-wheel driven car with front steering, and is fitted with hand-operated differential locks to the central differential. A dog clutch is provided for locking the central differential, and making it inoperative as a balance gear between the two axles. With the central differential locked, one or other of the clutches on the short shafts, which transmit power to the front and back wheels respectively, can be disengaged by the corresponding dog clutch. By this means the vehicle can be converted temporarily into a two-wheel back-drive or front-drive vehicle, as may be best suited to the difficulty requiring the use of the differential lock. Actually two locking gears are provided, one for each end of the differential. For continuous work as a two-wheel drive car the lock is engaged which is next to the shaft that is being used in driving so as to avoid transmitting the locking action through the teeth of the differential gear. The position in which the differentials are placed out of the center of the car is in part constructional, and in part is selected with the object of obtaining greater central ground clearance than would be possible with a central drive.

(To be continued)

Scott's Electric Fuel Heater

W. E. SCOTT, a Detroit inventor, has applied for a patent on an electric fuel heater contained in the intake manifold, which is designed to preheat the fuel before it enters the cylinder. The heating apparatus consists of a number of resistance coils and the temperature to which the fuel is heated is controlled by a thermostat.



Section through fuel heater

As will be seen from the section herewith, the heating device is a fabricated structure composed of a number of independent heating units, and the fluid passing through the device impinges against the electrically-heated coils and also against screens or baffles, which are so designed as to prevent the possibility of liquid fuel being carried through the intake unless it strikes against the heated coils. These screens or baffles aid the heated coils in breaking up the fuel and putting it into its most advantageous state for combustion.

The thermostat is located directly in the path of the heated fuel and can be set to maintain the intake gases at any prearranged temperature. It acts by cutting in and out the desired number of heating coils. The ordinary type of carbureter may be used with any fuel which is improved in its combustion properties by pre-heating.

Above the heater and directly in the path of the fuel is a thermostat of the fluid type. It is so arranged that it can be mounted in the intake without making contact with the walls. At opposite sides of the fluid container are members which transmit the motion of the diaphragms to the coil switch, thereby maintaining the desired temperature.

It is claimed that with this arrangement the main supply of fuel may be kept at atmospheric temperature and the fuel then raised to a temperature insuring complete vaporization, by the device described. It is claimed also that the use of the thermostat control makes it possible to provide a uniform mixture regardless of climatic conditions.

WE are in receipt of copies of a number of bulletins issued by the National Safety Council. These constitute an orderly presentation in loose leaf form of accident hazards and the best practices for their elimination. The subjects dealt with in the different bulletins are: Castings, Couplings, Pulleys, Gearing—Engine Guarding and Engine Stops—Oiling Devices and Oilers. Copies of these bulletins can be obtained from the headquarters of the National Safety Council, Chicago, Ill., at 10 cents each.

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Boston Show New England Thermometer

Dealers Present in Greater Numbers—Trucks Show Big Gains—Tractors Selling Well—Connecticut Leads Territory in Car Density

BOSTON, March 6—Notwithstanding the intense winter weather which has gripped New England since December, and also the freight embargoes which have stopped car shipments from factories to the six New England States, as well as other handicaps, the annual Boston show of automobiles and trucks gives evidence of very general optimism throughout this section of the country.

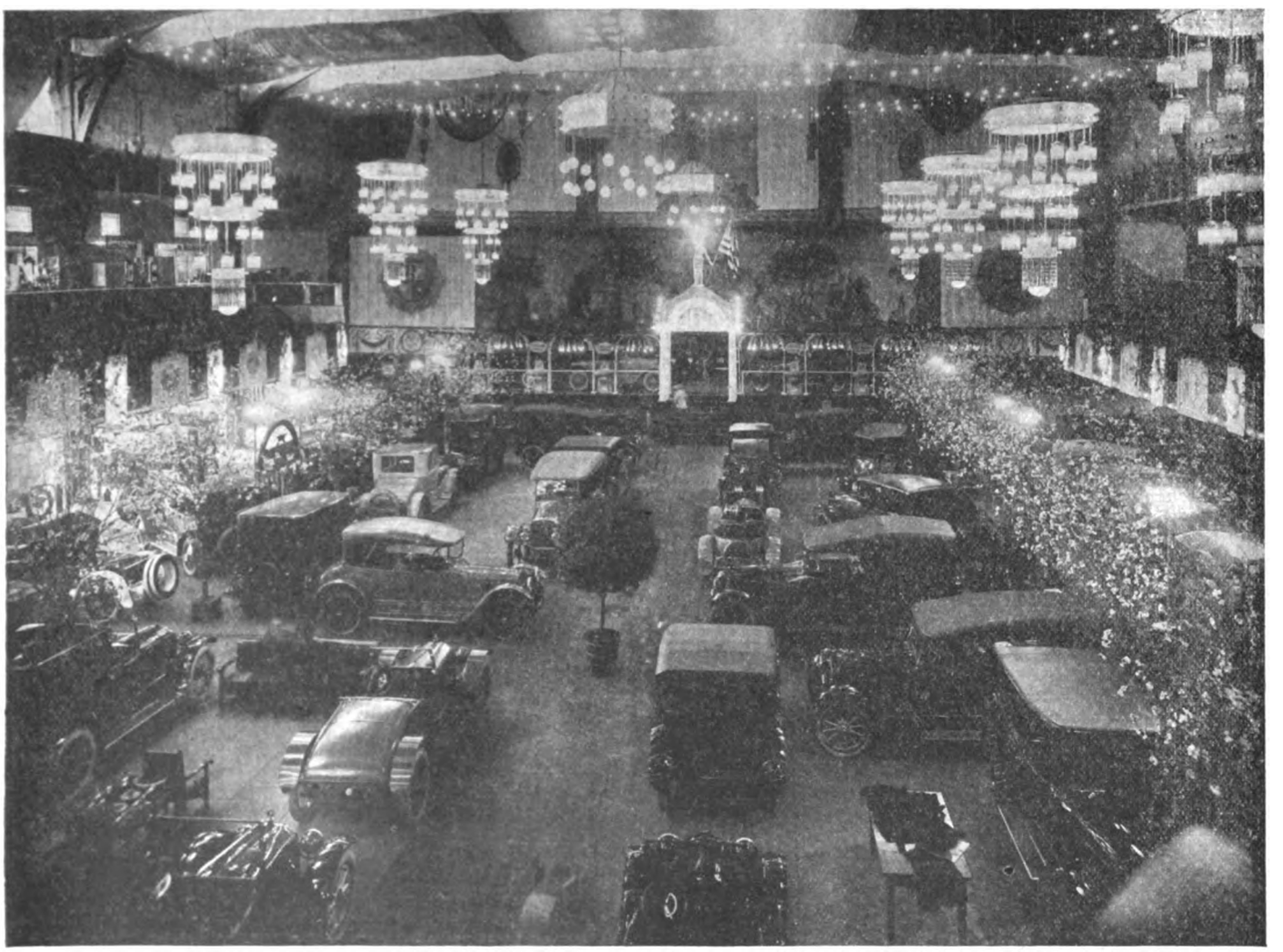
Already more dealers have registered than attended last year, a condition partly due to the excellent propaganda work which the New England distributors have been carrying on for months. The entire section has learned of the show. Posters have been in all of the railroad depots. Show cards for windows have been generously distributed for nearly 2 months, and every means resorted to to get the show injected into every corner of the territory.

This preliminary work was brought to a climax by a meeting of dealers at which over 400 attended. It was a general enthusiasm meeting, in which Alfred Reeves explained the Washington situation and LeRoy Pelletier gave a good talk on advertising in connection with show work.

Boston dealers feel duly proud of the fact that for years they have continued to exhibit motor trucks along with automobiles and accessories, and now that trucks are in such demand the dealers are justified in their consistent handling of the truck during its pioneering period.

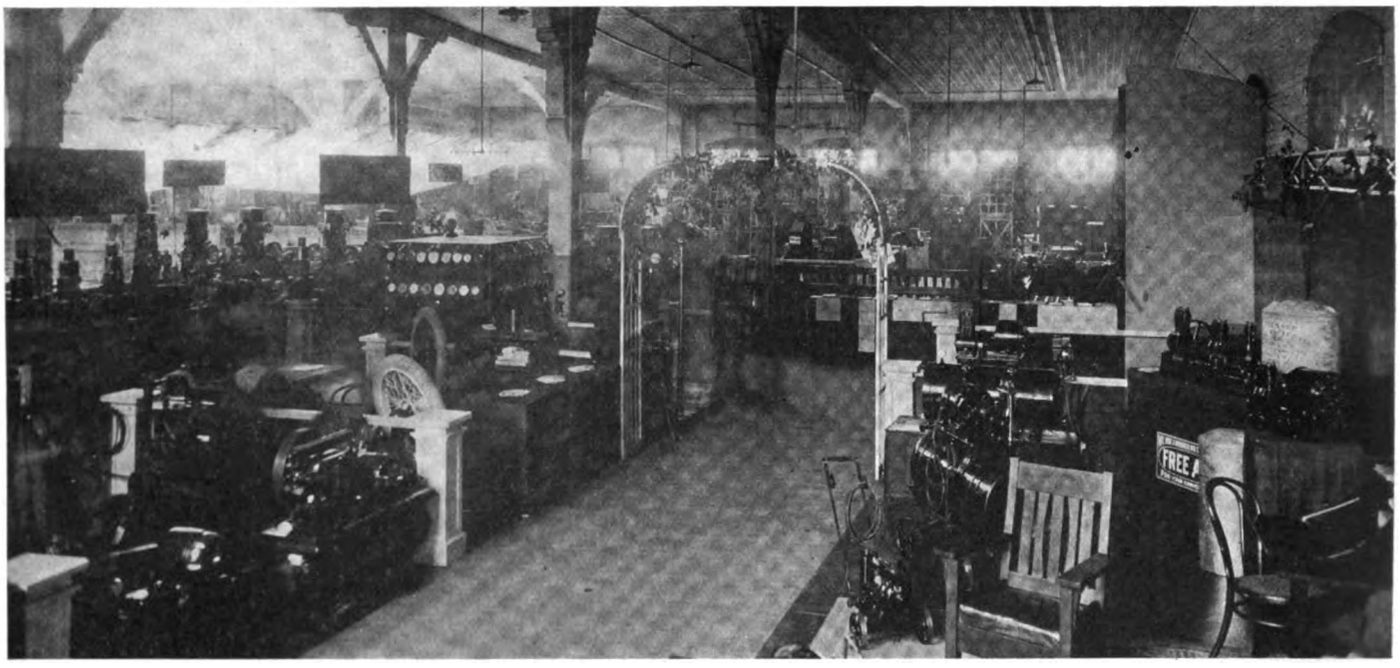
Farm tractors are getting started in New England, and approximately 1000 were sold last year in the six States. With the perfection of the small tractor, the New England dealer will very quickly work more and more into the tractor business, just as he has handled the truck line in addition to his automobile sales.

The calendar year of 1917 was not a banner automobile year in New England, due to dealers not being able to get all of the cars they could sell. It is almost impossible to estimate accurately the number of automobiles and



The Boston show has always been a beautiful one, this view showing the peach orchard effect which was obtained in Grand Hall, which housed one section of the passenger cars

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One of the aisles in the accessory section of the Boston show which this year was sanctioned by the Motor and Accessory Manufacturers' Association

trucks sold in the year, but from reports from the State secretaries it approximates 58,239 automobiles and trucks. The number of trucks sold during the year approximates 16,000, according to registration returns.

Massachusetts continues the big leader in trucks, and out of a total of 47,592 trucks registered in all New England, Massachusetts has 26,964, Connecticut almost 12,000, Rhode Island nearly 4000, and Maine 3000. Sentiment is general around the show that motor trucks are destined to make great gains in the coming year, that while the increase in 1917 over 1916 was nearly 58 per cent, this figure will be exceeded provided the trucks can be obtained.

The complete automobile and truck census shows on Jan. 1 a motor vehicle for every 22 persons in New England, with Connecticut having the densest vehicle population of one vehicle for every 17 population, as compared with one car to every 24 persons in Massachusetts.

The registration figures for all six States, as of Jan. 1, 1917, and also Jan. 1, 1918, as compiled for the separate States, are given below.

Motor-truck registration figures published herewith give some indication of the growth of that industry.

Increase in Automobile Registration in New England, 1917

		Jan. 1, 1918			Jan. 1, 1917	
	July 1, 1917 Census	Cars and Trucks	Pop. per Car	July 1, 1916 Census	Cars and Trucks	Pop. per Car
Connecticut	1,265,373	74,642	17	1,244,479	56,048	22
Vermont	364,946	18,550	20	363,699	14,251	26
Maine	777,340	38,499	20	772,489	28,951	27
New Hampshire	444,429	18,146	24	442,506	14,338	31
Massachusetts	3,775,973	155,044	24	3,719,156	136,790	27
Rhode Island	625,865	25,142	25	614,315	21,406	29
Totals	7,253,926	330,023	22	7,156,644	271,784	25

Increase in Motor Truck Registration in New England, 1917

State	Number of Trucks 1915	1916	1917	Increase, 1915-1916 Number	Per Cent	Increase, 1916-1917 Number	Per Cent
Massachusetts	11,960	18,194	26,964	6,234	52.0	8,770	48.0
Connecticut	4,847	7,759	11,919	2,912	60.0	4,160	58.0
Rhode Island	1,620	2,855	4,065	1,226	75.0	1,210	42.0
Maine	1,000	1,991	3,382	991	99.0	1,391	69.0
New Hampshire	550	*	*	*	*	*	*
Vermont	358	728	1,262	370	103.5	534	73.0
Total	20,335	31,527	47,592	11,533†	76.1†	16,065†	58.0†

*Truck and passenger car registration not separated. †For five states only.

MASSACHUSETTS REGISTRATIONS FOR 6 YEARS

Year	1912	1913	1914	1915	1916	1917	Total Increase Number	Per Cent
Motor trucks	4,087	5,948	8,236	11,960	18,194	26,964	22,877	559
Increase, number.	.....	1,861	2,288	3,724	6,234	8,770	Average Increase 4,575	45
Per cent..	.....	45	38	45	52	48		

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Dope Poisoning

Dangers of Tetrachlorethane in Doping Airplane Wings—Experiences in England and Germany—U. S. A. So Far Immune—Results of Investigations Made Last Summer—British Instruction for Factory Practice—Bureau of Labor Statistics Issues Comprehensive Report

WORKER'S poison in airplane factories among those laborers engaged in putting dope on the wings created such serious difficulties in England and Germany during the early years of the war that in the spring and summer of 1917 the Bureau of Labor Statistics, Washington, D. C., conducted an investigation of the various American factories engaged in this work to learn to what extent dope poisoning or dope sickness existed in this country and has published its findings. Due to the fact that at that time our airplane factories were relatively small, few indications of dope poisoning were discovered and thanks to the attention given to this by our manufacturers, there is little of this trouble present to-day. The situation last summer was so favorable that the Bureau of Labor Statistics declares in its report by Dr. Alice Hamilton that there has been no serious dope poisoning in American factories, and no authenticated case of tetrachlorethane poisoning resulting in toxic jaundice, as the disease has been termed in England, had been reported in this country up to last summer.

The use of dopes in airplane factories is relatively safe providing proper ventilation is furnished so that the poisoning fumes are kept away from the workers. With the great increase in airplane production, which we are at present entering upon, it is more than ever essential that not only adequate ventilation, but all other arrangements necessary in connection with the use of dope should be provided.

Dope poisoning was first heard of in 1913. In that year reports were published in the German medical journals giving accounts of such cases. It appeared in a Johannisthal airplane factory in Germany, and some of the cases proved fatal. It was only a few months later until reports on dope poisoning appeared in the British medical journals. In the early part of 1915 many cases of such poisoning were recorded and during 1916 and 1917 cases were reported, although every effort was made to counteract it.

The poison in dope is not due to the cellulose compound which is the base of the product and may be either the acetate or the nitrate, but is due to the various volatile compounds in which these bases must be dissolved. These solvents in their poisonous work exert their action on the central nervous system, or on the liver, kidney, and heart muscle, or on the constituents of the blood.

The form of poisoning found in British and German shops consists of an acute degeneration of the liver with lesions in kidneys and heart muscle. England calls the disease toxic jaundice.

In the investigation in America eighteen factories were visited, these being situated in Illinois, Michigan, Ohio, Florida, New York, New Jersey, Rhode Island, and Massachusetts. Few of these employed as many as ten dopers. When these investigations were made doping rooms were passably ventilated, considering the amount of work to be

Summary of Investigations on Dope Poison

The main conclusions with regard to airplane dope by the Bureau of Statistics are:

1—In the manufacture of airplanes there is one process which may involve danger of occupational poisoning, the application to the fabric of a water-proofing, tightening mixture, known as dope. This is usually a cellulose compound, the nitrate or the acetate, dissolved in various volatile substances, which are more or less poisonous to human beings.

2—Cellulose acetate dope was formerly made with tetrachlorethane as the principal solvent. It is now made also without tetrachlorethane, dissolved in a mixture of acetone, alcohol and benzol. Cellulose nitrate dope is made with amyl acetate and acetone and usually various alcohols and benzol.

3—Dope poisoning which appeared in airplane factories in 1913 in Germany and England was caused by the presence of tetrachlorethane in the solvent. This poison is very much like chloroform but four times as powerful. Acute poisoning causes drowsiness, confusion, dizziness, sometimes loss of consciousness, or nausea and vomiting and gastric pains. Repeated exposure to the fume causes more pronounced gastrointestinal symptoms and may set up an acute degeneration of the liver with jaundice. This condition, known as toxic jaundice, was the form of dope poisoning which occurred in airplain factories in Germany and Great Britain, and in several instances proved fatal. The British have in consequence recognized such dope poisoning as an occupational disease and have substituted for military and naval airplanes a dope free from tetrachlorethane.

4—The other solvents for cellulose acetate are acetone, alcohols (wood alcohol and grain alcohol) and benzol. These are all volatile and produce, when inhaled or when spilled on the skin, some disturbance of the central nervous system, but none has the effect on the liver and other organs which is exerted by tetrachlorethane. Benzol is the most poisonous and when inhaled in large quantities it may cause death, but in the proportion used in dope solvents such severe poisoning would not be looked for. The milder forms of acute poisoning would be more probable, dizziness, headache, slight symptoms of drunkenness, with excitement or depression, and, if exposure is long continued, symptoms of slow chronic poisoning with anemia, tendency to hemorrhages, and nervous and nutritional disturbances.

5—Acetone is the least dangerous of these solvents; indeed, there is no proof that acetone as used in industry is at all harmful. Methyl alcohol (or wood alcohol) may cause serious symptoms, even when present in small amount, for some people are very susceptible to it. The symptoms of chronic poisoning are much more serious than in chronic poisoning from grain alcohol, and may involve the eyes, causing impairment or loss of sight.

6—Cellulose nitrate dopes contain as solvents amyl acetate, acetone, or other ketones, various alcohols (ethyl, methyl and amyl) and benzol. Amyl acetate has a disagreeable odor and an irritating action on eyes and throat, but so far as is known at present it is not a dangerous poison. Amyl alcohol is said to be more rapid in its effects than grain alcohol and from four to seven times as poisonous.

7—In American airplane works the dopes used until very recently have been chiefly cellulose acetate dissolved in tetrachlorethane, or cellulose nitrate dissolved in amyl acetate and acetone. As cellulose nitrate dope is inflammable and cannot be used on war planes, and as tetrachlorethane is a dangerous poison, a third variety of dope has now come into use, which is made with cellulose acetate dissolved in a mixture of acetone, alcohol, and benzol. In the future it is probable that this dope will be used for war planes, while cellulose nitrate dope will continue to be used on airplanes being manufactured for training purposes.

8—There has been no serious dope poisoning in American airplane works as yet, and no authenticated case of tetrachlorethane poisoning resulting in toxic jaundice has ever been reported in this country. This is probably to be explained by the fact that though tetrachlorethane was used in our fac-

(*Continued on page* 494)

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done, but conditions then, so far as ventilation is concerned, were not comparable to the favorable conditions to-day. No doping rooms were seen so small and crowded as to suggest serious poisoning among the workers. The investigation, however, was made in warm weather, and in cold weather different conditions might rule.

The extent to which dope poisoning existed in England and Germany in December, 1913 was such that at the factory in Johannisthal four out of a force of eight workers were affected with a severe type and one died. The dope was applied to the wings by spraying as well as by painting, and the work was done in a poorly ventilated room. This dope consisted of acetate of cellulose in a solvent containing 60 per cent of tetrachlorethane. Tetrachlorethane is an organic substance which contains a high percentage of chlorine. It has come into special prominence of late due to the poisoning conditions surrounding its use unless special precaution is taken.

Reports from Germany show that two commercial dopes contained as much as 84 per cent tetrachlorethane and in experiments consisting of rubbing this into the skins of animals and exposing them to the vapors from it, there developed loss of weight, vomiting, bile and blood in the urine, death with fatty degeneration of the liver, and hemorrhages into serous and mucous surfaces and into the heart muscle. After several days of inhalation by animals these same stages were followed until death. It did not make any matter how the tetrachlorethane was administered. There was in many cases a striking resemblance to delayed chloroform poisoning. Tetrachlorethane has more than seven times the blood-dissolving power that chloroform has.

The danger from tetrachlorethane poisoning where good ventilation is not provided was shown in a German factory in 1914 in which case ten men were poisoned and one died. This person had worked only 2 months with a dope containing 40 per cent of tetrachlorethane. In another factory with fifteen dopers all but one had suffered from the poison and two died within 4 weeks. They were using dopes known as Aviatol and Emaillite.

In another German factory with eighteen cases there were two deaths, the dopes used containing 40, 60, and 84 per cent of tetrachlorethane. After these poison cases two Johannisthal plants gave up using dopes and 4 months later one of the workmen died from poisoning or toxic jaundice. Reports show that men and women who have been away for weeks or months from dope factories have developed cases. After the many German cases the use of tetrachlorethane was forbidden in German factories, but we do not know if this was literally carried out.

Great Britain has had more or less experience with poisoning from tetrachlorethane, her cases being similar to those in Germany. Great Britain's first case was in October, 1914, when a dope worker, after 11 weeks' employment, developed toxic jaundice and died. He was 36 years old. The liver was attacked and was found to be shrunken and green. An inquiry revealed ten more cases of inflammation of the liver in the same airplane factory. The ages of the men were 23 to 58 and the shortest period of exposure before illness was 3 weeks and the longest 16 weeks. Experiments were conducted on animals with the dope and these showed that the poisonous constituent was tetrachlorethane.

The second fatal case in England was a girl of 19 who began work in August, developed jaundice in December, and died Jan. 2. She died with all the symptoms of acute yellow atrophy of the liver. Another girl of 17 years after working 4 months developed a similar case. The third girl, 34 years of age, working through the fall months, developed sickness in December and died early in January. Another case was that of a man 60 years of age reported early in 1916 who died 13 days after consulting the doctor. He had worked barely 3 weeks and began complaining of diarrhea, vomiting and great prostration.

In England in February, 1916, it was known that up to that time forty-three cases of poisoning had occurred followed by seven deaths, five of which were women. Three deaths occurred among tapers.

In the investigation in America some work was conducted by the New York State Industrial Commission in the early part of 1917. Eight factories in New York State were visited, three of which were very small, and the other five employing five, six, seven, twelve and forty-five dopers. An examination of the health was made of fifty-two dopers and it was noted that some disturbance of health was present in thirty-five of these. In some it was very slight, such as a slight anemia, or yellowing of the skin, or reddening of the eyelids. Nine of the thirty-five were so classified. The remaining twenty-six gave histories of symptoms of ill health generally relating to the central nervous system or to the gastrointestinal or urinary system as follows:

Dizziness	14	Vomiting	4
Headache	6	Intoxication attacks	2
Drowsiness	14	Loss of appetite	1
Overcome by fumes	4	Burning of the stomach	1
Semi-conscious attacks	2	Burning micturition	1
Weariness	1	Dark-colored urine	1
Nausea	12	Changes in color of urine	1

Jaundice was observed in two workers and a third gave a history of former jaundice. One of the men with jaundice had dark urine. Almost 1 month previously he was attacked with acute vertigo, syncope. He became nauseated and vomited. All the symptoms except the vertigo lasted 1 day. He suffered a similar attack a week later. On both occasions he remained home and physical examination showed a marked jaundice. This worker was using cellulose nitrate dope, which was free from tetrachlorethane.

In two of the factories tetrachlorethane was used with six men engaged in doping. In the other factory employing sixty-five dopers, nitrate dopes were used with acetone as

Summary of Investigations on Dope Poison (*Continued*)

tories, the amount of dope used was usually small, doping was not continuous, and much of it was done in the open air. Moreover, dopers were continually shifting; not many remained more than a few months in the work.

9—The enormous increase in airplane manufacture in the United States is coincident with a gradual abandonment of tetrachlorethane as a dope solvent, so that we have no reason to expect that toxic jaundice will appear among the dopers in our factories. It is quite possible, however, that there may be more or less serious poisoning from benzol and from methyl alcohol, and it may prove that the other solvents used in nitrate and acetate dopes are not as harmless as we now think them. It is only prudent to assume that such danger is present and to provide carefully for the removal of fumes from doping rooms. The British requirements for artificial ventilation and for the medical supervision of dopers—requirements framed when tetrachlorethane was the solvent used—have remained in force now that the safer dopes have been substituted.

10—American airplane works are at present in process of building or remodeling. In many instances artificial ventilation is being installed; in others only natural ventilation is provided. There is little reason to expect serious poisoning among the users of dopes in these factories, but there will be opportunity for the slow, chronic effects of long-continued exposure to large quantities of amyl acetate and smaller quantities of benzol, wood alcohol, amyl alcohol, etc., among dopers, and this should be prevented by good exhaust ventilation.

Doping should be strictly confined to one building. No other work should be carried on in the room. Dopers should be taught to avoid fumes by starting their work at the end nearest the exhaust vent and working back from there, for in this way the fumes will be continually drawn away from the air they breathe. Medical supervision, with periodic examination of the dopers, is very desirable, since these poisons are comparatively unfamiliar and much valuable information as to their effects on industrial workers could be gained by the foregoing methods.

11—In any factory where tetrachlorethane dopes are used the dopers should be protected not only by a good system of down-draft exhaust ventilation, but by shortening the hours of work, by alternation of doping with outdoor work, and by providing periodic medical examination, with authorization to the physician to suspend from work those who show premonitory symptoms of poisoning.

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solvent, or mixtures of acetone and such substance as benzol, amyl acetate, fusel oil and alcohol.

The second case, less markedly jaundiced, had the following history: After one week's work with tetrachlorethane dope he was attacked with dizziness and severe nausea. Symptoms simulating alcoholic intoxication lasted 24 hr. Two weeks later while at work he was overcome for a period of 2 hr. with an attack of vertigo and sleepiness. After 3 weeks more he had a similar attack and again showed symptoms resembling acute alcoholism for about 3 hr. He had highly colored urine at all times. Physical examination showed a slight jaundice. The dope in this instance contained tetrachlorethane.

In studying these cases, it is hard to determine which is the dope solvent responsible for the various symptoms. As we have seen, the characteristic effects of tetrachlorethane are gastrointestinal disturbances and jaundice. Nervous symptoms may also occur. The characteristic effects of solvents used with nitrate of cellulose are found chiefly in the nervous system. Benzol especially may cause a rapidly developing condition resembling alcoholic intoxication. The odor of amyl acetate is nauseating to some men, and both fusel oil and methyl alcohol fumes may cause vomiting, headache, dizziness.

No evidence of serious illness was discovered among these New York workmen, and no case of typical toxic jaundice, such as is described by British and German authors.

Dr. Hamilton's experience, covering three factories in which dopes with tetrachlorethane as the solvent were being used at the moment and in which about 15 dopers were employed, did not reveal any instance of toxic jaundice. The histories related did not even indicate an early stage of this disease; rather the symptoms were those of temporary intoxication and were referable to the central nervous system. Dr. Hamilton also interviewed men who had formerly used tetrachlorethane dope, though at the time they were working with the nitrate. They described cases of poisoning in their own experience or among fellow workmen, but these two were nervous in character, never jaundice with gastric trouble.

In view of the comparative newness of tetrachlorethane in industry it may be of value to describe the symptoms experienced by these dopers who had used it, even if the type of illness from which they suffered was light. Drowsiness, especially in hot weather, was more often mentioned than any other one symptom, and it was most troublesome in the early morning, passing away as the day went on. It was also worse after a holiday, the man having to go again through the process of accustoming himself to the fumes. One doper said that he was always drowsy for a while on starting work, then it passed away, but when he quit and went out into the open air the drowsiness would come over him again. Other men said they would fall asleep as soon as they reached home.

Several men told of having been made faint by the fumes so that they could work no longer that day, but always in these cases there had been some unusual circumstance that had encouraged absorption of the fumes. The room was closed and airless, or the weather very hot and humid. One man had lain down on the floor to paint the under surface of a wing, and thus breathed in the fumes which because of their heaviness always tend to fall to the floor. In another instance described doping was being done in a greenhouse and the men

(*Continued on page* 511)

British Instruction to Avoid Dope Poisoning

THE experience with airplane dope in British factories has resulted in a series of recommendations for the control of doping processes. While these recommendations were framed to protect users of tetrachlorethane dopes, they are still used in airplane works where the use of such dopes has ceased and safer dopes substituted. The following are extracts from Form 356 issued by the factory inspection department of the British Home Office, Februry, 1916:

DOPE POISONING

1—Continued incidence of poisoning in aeroplane factories has led to the addition of the main symptom caused by tetrachlorethane—toxic jaundice—to the diseases which, if contracted in a factory, must be notified to the factory department. The occupier is required to report every such case to the district inspector and to the certifying surgeon, and the medical practitioner in attendance has also to report it to the chief inspector.

2—Not every symptom set up by tetrachlorethane, it should be observed, is reportable. The requirement is limited to the serious sign of jaundice, and in view of its unmistakable character the difficulty of compliance should be small.

3—The size of the aeroplane wings unfortunately makes it impracticable to remove the vapor completely, at the point of origin, by local exhaust which would carry it off without allowing any to pass into the air of the room. Reliance, therefore, in minimizing the noxious effect, has to be placed on dilution of the air so as to keep down the tetrachlorethane and other vapors to a nontoxic proportion. The standard needed for securing this is 30 changes of the air of the doping room per hour. Where this standard has been secured and maintained for all processes in which tetrachlorethane in dope may be used, illness, if not altogether prevented, has ceased to cause serious anxiety. On the other hand, where it has fallen short of 20 changes, toxic jaundice has not failed eventually to show itself, except in the few factories where use of dope has been so intermittent as never to have exposed the workers to a toxic dose.

4—The means of ventilation must be mechanical, preferably by volume or propeller fans with free discharge to the open air. Owing to the high specific gravity of the vapor, the fans should be fixed at the floor level, or below this level where space allows the construction of large ducts under the floor. Air inlets, of the hopper type, the total area of which should be not less than three times the discharge area of the fans, should be provided at the side of the room opposite the fans at a height of about 10 ft. above the floor level. Except, however, where the fresh air is supplied by a satisfactory plenum system, or direct from the erecting shop over a partition of sufficient height, screening the doping room from the rest of the shop, such air inlets may be unnecessary.

5—Owing to varying conditions of construction in different factories, it is impossible to standardize methods of ventilation for doping rooms, but in new works, or extension of existing plants, plans of proposed ventilating arrangements should be submitted to the inspector for dangerous trades, home office, before the work is put in hand.

6—At the commencement of the war, several cases occurred among persons employed in fabric making, erecting fittings, etc., before exhaust ventilation and separation of the process of doping from others was recognized as indispensable. These two conditions have now been secured for doping the wings, but recent experience has shown that insufficient attention has been paid in some factories to the necessity of exhaust ventilation in all processes in which tetrachlorethane dope is constantly used. This applies especially to taping—now sometimes found carried on in the general erecting shop without any precautions—to which operation the three last fatal cases have been mainly due. Notwithstanding the comparatively small amount of dope used the close application required brings the face right into the fumes. And it is the same with the fuselage and other components—struts and landing gear. One attack was traced to the doping on one occasion of especially large wings in the general erecting shop because (it was alleged) the doping room proper could not accommodate them. There was a tendency in some premises before the great development of the industry was fully realized to make the doping room too small. This should be avoided in future construction, but the risk involved by such a procedure as that described makes it incumbent on the occupier to improvise for any exceptional occasion a special exhaust system.

7—Pending the introduction of an efficient substitute for tetrachlorethane, it is most important that occupiers should (in addition to provision and maintenance of a high standard of exhaust ventilation) consider and apply as far as they can the following further suggestions for safeguarding the health of the workers, which are the outcome of experience gained in various works:

(a)—*Exclusion of other work from the doping room.*—The need for this has already been pointed out.

(b)—*Alternation of employment.*—Considerable periods of overtime or long spells in doping or taping have been noted as having preceded some of the fatal attacks. Obviously, as poisoning is a matter of dosage, and the effect of tetrachlorethane is cumulative, the object aimed at by ventilation is defeated if hours of workers are prolonged beyond that for which the ventilation has been designed. In factories where alternation of employment has been arranged, e.g., two days doping and two in other work, or one week in and one week

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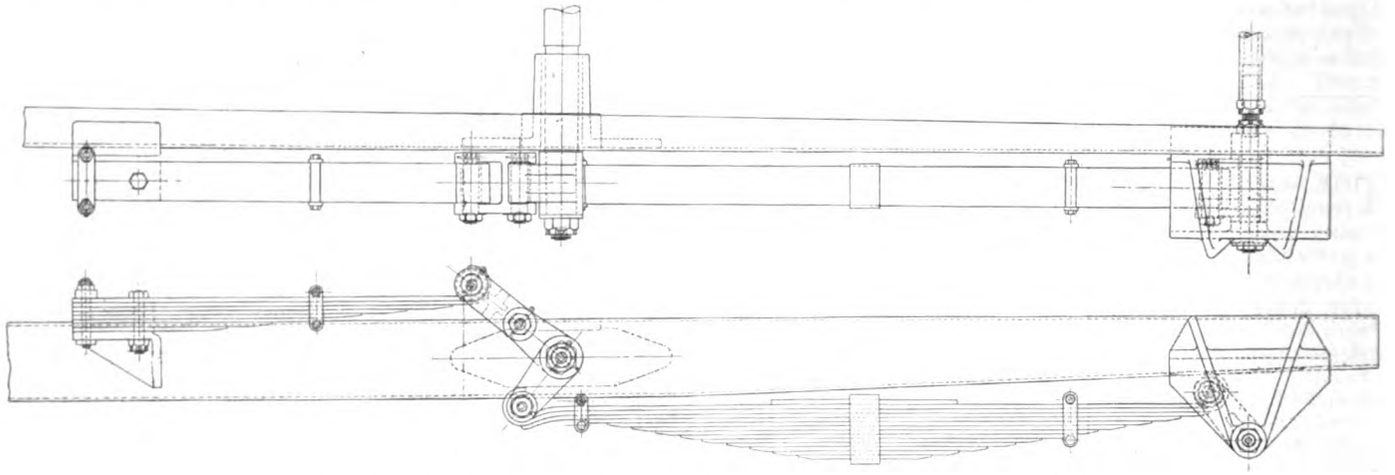
Trott Spring Suspension Absorbs Horizontal Shocks

Introduces Shock Springs Which Take Up Longitudinal Movements of Flexibly Mounted Axles

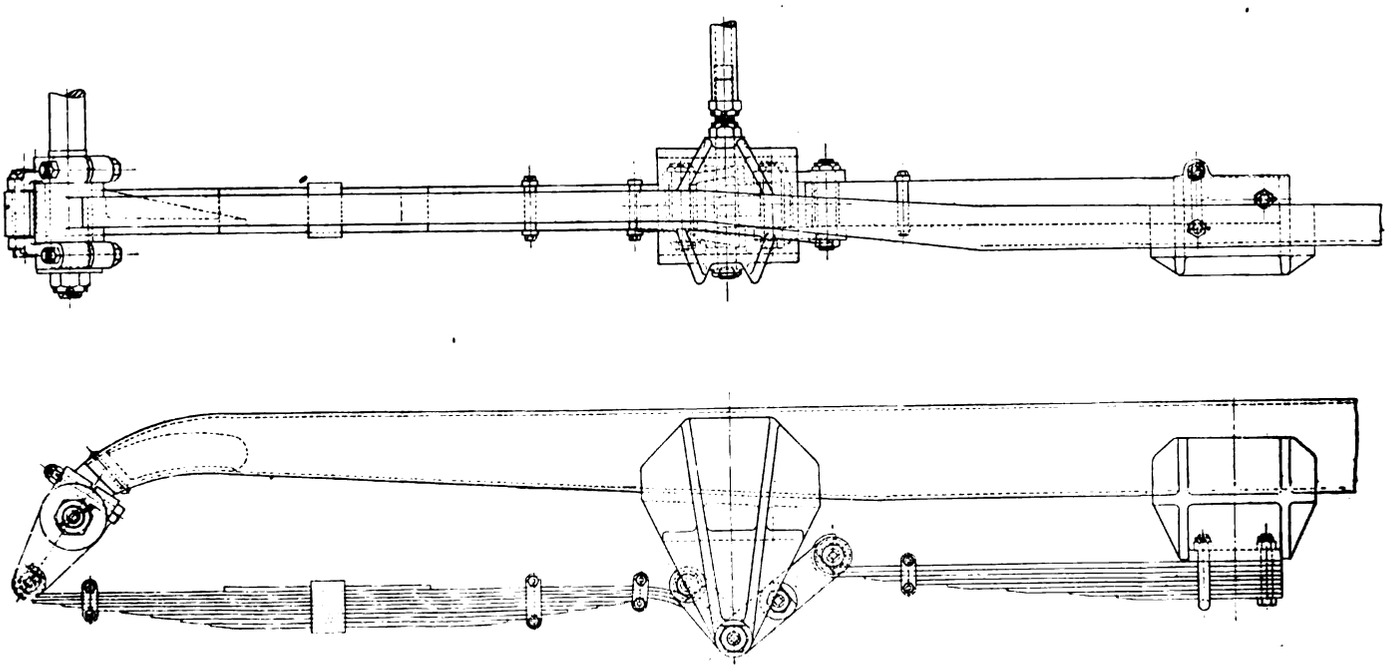
THE Trott Automobile Co. of Detroit has assembled an experimental set of its chassis springs and is sending a car equipped with them over the road from Detroit to Washington, by way of Cleveland, Akron, Pittsburgh and Baltimore. The car, which is a rebuilt White truck, will then proceed down the Atlantic Coast and through the Gulf States to Texas, where the spring suspension will be tested by the government.

The chief object which the designer of the Trott spring suspension had in view was to provide means for absorbing the horizontal component of the shock stresses on the wheels. It is estimated that a 7-in. ditch or shell hole will give a 36-in. wheel a shock with a horizontal component equal to 80 per cent of the total. It is stated that with the conventional spring suspension no attempt is made to cushion the horizontal shocks, although these may do the greatest amount of damage to the truck parts. The ordinary springs do take care of the vertical part of the shock, but it is claimed by the Trott company that nothing is done to cushion the horizontal component, although the entire weight of the truck and load enters into it.

As will be seen from the accompanying drawings, an additional quarter-elliptic spring is inserted, acting as a shock member. This spring is intended to absorb the horizontal components of the shock stresses on the rear wheels. The manner in which this is done may be clearly understood



Drawing showing layout of rear spring suspension by the Trott method



Plan and side view of Trott suspension as applied to front spring

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from a study of the drawings herewith. The rear axle member and the spring attached to it are capable of moving backward and forward in a direction parallel with the road. The axle and load springs are so mounted in connection with the shock springs that horizontal movements are against the action of the shock spring. When the truck is standing on a level road the shock springs may be disconnected and the axle will have no tendency to move either backward or forward. The axle, however, may be easily moved in either direction, and when such a movement takes place there will be no tendency for the frame to rise or fall. This is due to the method of pivoting both ends of the rear springs.

Thus, as far as vertical springing is concerned, there is no change in principle or construction to speak of. The shock springs normally are practically unloaded, being just under sufficient tension to give them the correct set. They are designed to operate under both large and small shocks. The shock spring becomes stronger the further back the axle is moved horizontally, so that heavy loads are compensated for by this spring. When the axle is moved back several inches as a result of horizontal shock the shock spring is said to be virtually twenty times as strong as when the axle is moving back 1 in. Thus the desired flexibility over small obstructions and the desired strength against heavy blows are both secured.

The constructon is simple, the rear end of the vertical load spring being shackled and the front end being connected with a bell crank lever. When the rear wheels strike an obstruction tending to move back the rear axle the bell crank is pulled back with the spring and axle, and it in turn depresses the quarter-elliptic shock spring, which absorbs the horizontal stress. At the front axle the same principle of construction is used as in the rear. The front axle connections do not interfere with the cross steering as used on commercial vehicles. The rear axle horizontal movement is taken care of by a longer slip universal joint on the rear axle.

By careful construction of brake centers it is also possible to get satisfactory brake action through a very low-priced linkage. In order to hold the axles horizontal regardless of their movement, cross shafts are employed which hold the springs on both sides of the truck in alignment, so that deflection of the springs on both sides is equal. Thus, when one wheel strikes an inequality the shock spring on the other side also does its part in relieving the blow. This eliminates one-sided strains on the chassis frame.

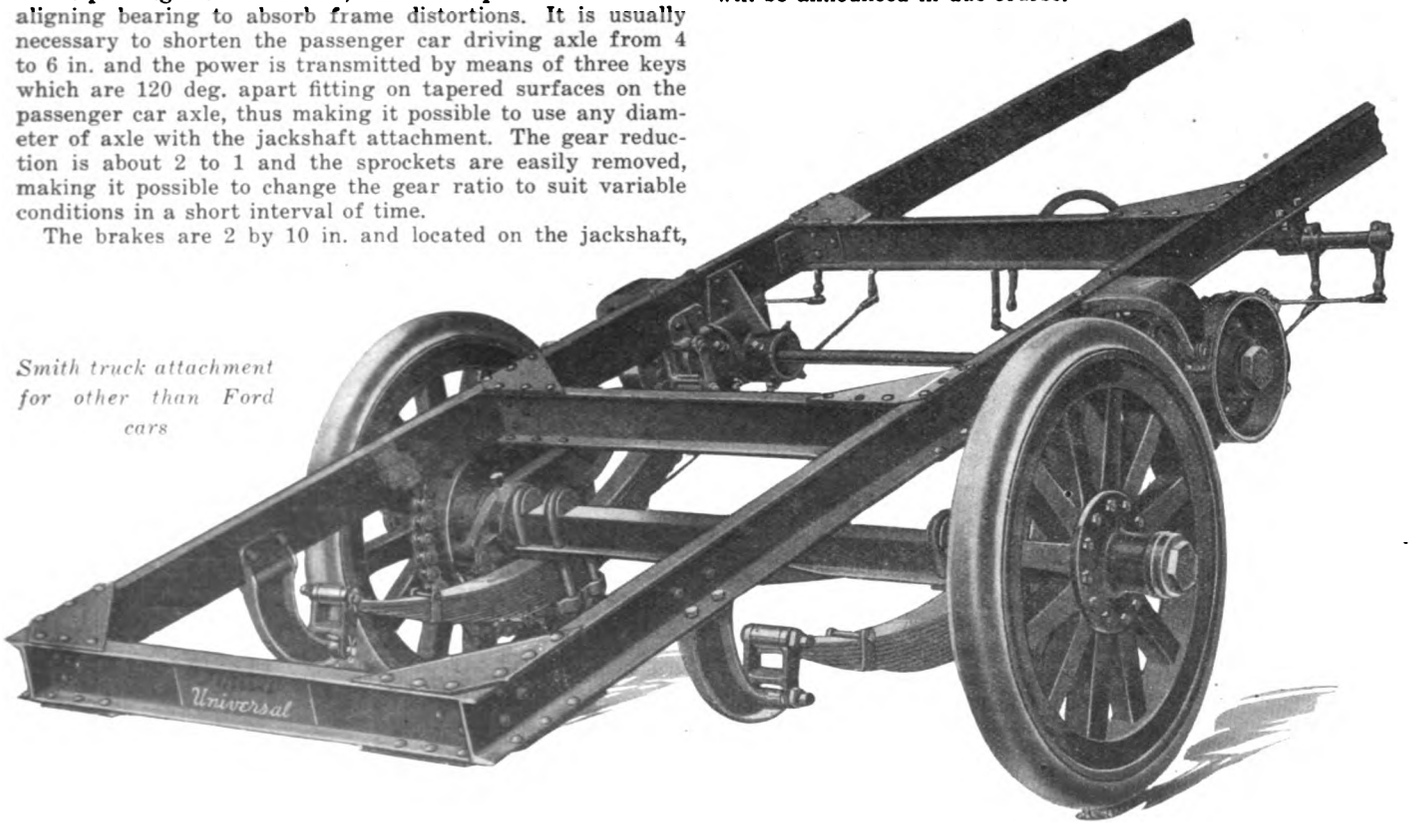
Truck Attachments for Other Than Ford Cars

THE Smith Motor Truck Corp. has brought out a universal Smith Form-A-Truck attachment of 1 and 2 tons capacity which is adaptable to practically every make of chassis except the Ford, for which a standard attachment is made. The 1-ton attachment is recommended for all chassis having engines of less than 260 cu. in. capacity and the 2-ton for all of those having engines larger than this.

The frame is made from 4-in. channel steel, reinforced by a cross member with heavy gusset plates. It is 13 ft. 6 in. long and when attached increases the wheelbase of the car 25 in. This length also provides a loading space of from 9 to 12 ft. back of the seat, depending upon the style of body and the design of car used.

The drive is through adjustable radius rods and not through the springs, which are slung under the dead rear axle. The jackshaft hanger is attached to the frame and to the housing of the passenger car rear axle, which incorporates in it a self aligning bearing to absorb frame distortions. It is usually necessary to shorten the passenger car driving axle from 4 to 6 in. and the power is transmitted by means of three keys which are 120 deg. apart fitting on tapered surfaces on the passenger car axle, thus making it possible to use any diameter of axle with the jackshaft attachment. The gear reduction is about 2 to 1 and the sprockets are easily removed, making it possible to change the gear ratio to suit variable conditions in a short interval of time.

The brakes are 2 by 10 in. and located on the jackshaft, giving ample braking power. The entire attachment is designed so that it can be mounted on a passenger car chassis without any mechanical difficulty. The 1-ton attachment sells for $400 and the 2-ton for $500 f.o.b. Chicago.



Smith truck attachment for other than Ford cars

Encouraging Use of Coal Gas

DURING the past year, since gasoline has become unavoidable for private cars in England, considerable use has been made of coal gas for motor vehicles of all kinds, from omnibuses to motorcycles. To encourage the development of this use the Automobile Association Executive Committee is now offering a prize of £1000 for the best invention which will enable coal gas to be used with advantage as a propellant of motor cars and motorcycles. A small subcommittee has been formed to prepare the conditions, which will be announced in due course.

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Early Difficulties with Detachable Heads Now Overcome

Proper Water Distribution and Tight Gaskets Are Chief Requirements—Plugs Must Be Kept Cool

By J. Edward Schipper

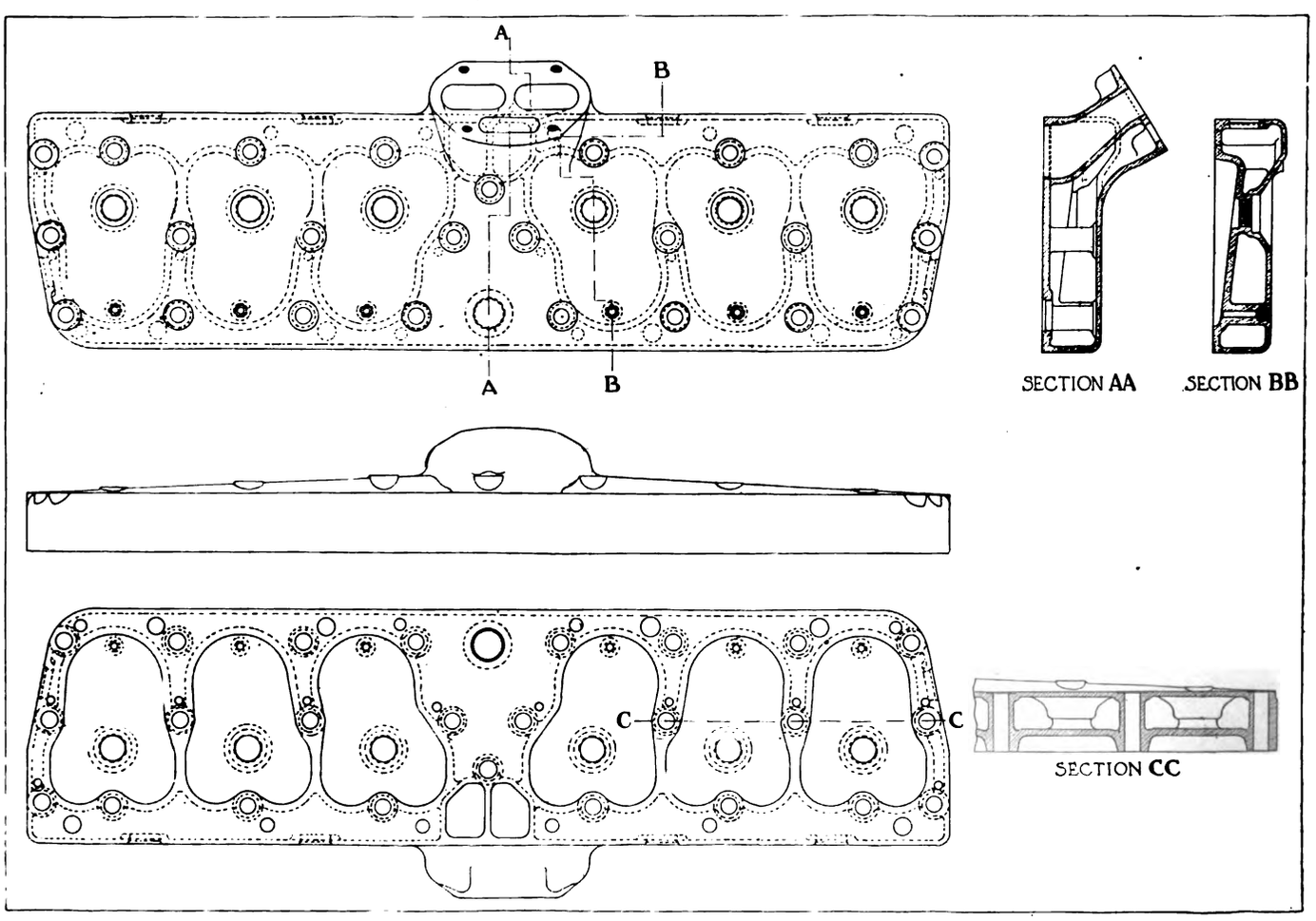
EARLY difficulties with the detachable head have been eliminated to such an extent that there is no indication of any check in the marked tendency toward this construction. Some interesting problems have had to be solved in this connection, and some of the sectional drawings given herewith show the solutions arrived at.

The water around the plugs should be given primary consideration. When this is done the detachable head engine becomes one of the best types that can be designed as far as spark plug life is concerned. The reason for this is, of course, that the water can be brought much closer to the plug than it can be where the spark plugs are screwed into the valve covers.

Many manufacturers on first taking up the detachable head design had the idea that large water passages were necessary between the cylinder and the head. It has been found, however, that the water circulation works out very well with smaller openings, provided they are properly distributed. The objection to large water passages is that they make it quite difficult to prevent water leakage into the cylinder.

Another point is that steam pockets have to be avoided, to which end the water outlet must be located at the highest point of the head. There is an advantage in having the water outlet near the valves, as at this point the water is hottest, and this tends to keep down the formation of steam above the cylinders.

On the Hercules design a different spark plug location has been decided upon from that shown in the drawing. The spark plug is no longer located in the water jacketed head, but is in the port over the intake valve.



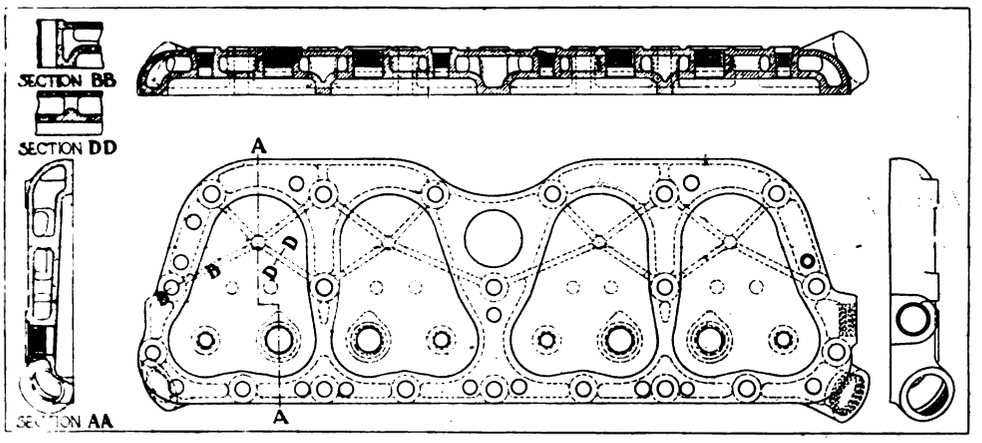
Detachable head employed on the Packard Twin-Six engine, showing water passages

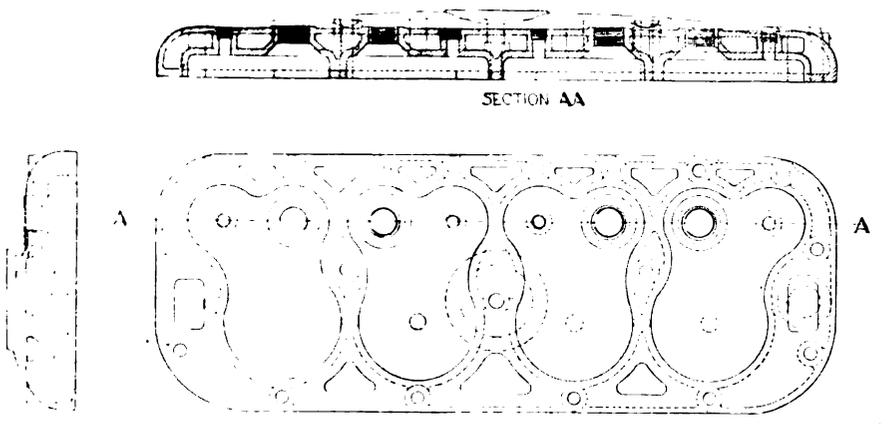
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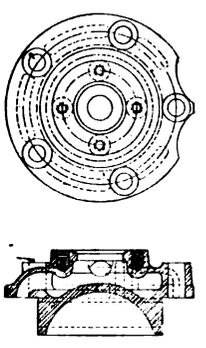
Right—Detail drawing of the detachable head on the Cadillac eight-cylinder engine

Below, right—The Hercules Motor Mfg. Co. employs an independent head for each cylinder

Below, left—Detachable head casting employed by the Wisconsin company showing location of spark plugs and studs, together with water jacket







It is the opinion of the Hercules company that the plugs should be in the head, with the water circulating all the way around the boss into which the stem of the spark plug screws. This idea will be incorporated in the new Hercules design.

The early difficulties with detachable heads were by no means all in connection with the cooling system. One of the points which had to be cleared up was the proper method of installing studs. If there was insufficient metal around the studs the head would often be thrown out of shape, with the result that the gaskets would leak or other trouble result. In case the studs were placed too near the valves, the valve seats would become distorted by the tension on them, with the result that it was difficult to keep the valves tight. By careful watching the water space stud location and the amount of metal around the studs so as to insure that the stresses contingent upon tightening the studs will be properly distributed, a successful detachable head design is secured. Furthermore, an advantage accrues from the close approach to the ideal or hemispherical form of combustion chamber. This means that the wall area, as compared with combustion chamber volume, is a minimum, which tends toward increased thermal efficiency by reducing jacket losses.

From a manufacturing standpoint, a well designed detachable head offers an attractive proposition. In the first place, it results in an open-ended cylinder which is far easier to handle than a closed type, besides being easier to cast. It is also possible to machine the combustion chambers all over and to secure greater accuracy in combustion chamber volume.

Fluxes for Melting Aluminum Scrap

THE fluxes commonly used in melting aluminum scrap, says the *Brass World*, are fluorspar, cryolite, and salt. An excellent way of utilizing such material when a part of the scrap is small and not clean is first to melt a bath of aluminum, using solid material, and to allow it to reach a temperature of approximately 850 deg. C., then add the sweepings, etc., in such quantity that the bath will absorb them without losing its liquidity. The bath is then reheated and more scrap charged, the process of charging and reheating being alternated until the crucible is as full of metal as desired. The metal will most likely be pasty, and a small piece of fused zinc chloride is added and the bath well stirred. The resulting action will free the mixed oxides, and the metal will assume its natural fluidity. The crucible should be immediately emptied of aluminum before any reaction can occur between the metallic aluminum and the heated oxide on the one hand and the oxygen and nitrogen of the atmosphere on the other, as such reaction will consume metallic aluminum and greatly reduce the percentage recovered.

—

IT is said to be the intention of the British Air Board to stimulate output of aircraft engines by reducing the number of standard types to not more than four. At the same time care will be taken that the march of improvement will not be unduly obstructed by overemphasis of the importance of output rate. The Royal Aircraft factory is to be devoted exclusively to experimental work, but such work is not to be confined to this one establishment, as it is considered all important that several totally independent centers of thought should be at work on the improvement of aircraft.

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FROM the Engineering Experiment Station, University of Illinois, copies have been received of two bulletins issued by the Station and covering experimental work done by it. One is entitled "Tests of Oxy-acetylene Welded Joints in Steel Plates" and the other "The Collapse of Short, Thin Tubes."

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The Most Economical Size of Tractor*

An Analysis of Costs of Power Plowing with Tractors of Different Sizes, Taking Account of Labor Cost, Cost of Fuel and Repairs, Depreciation and Interest on Investment

By E. Goldberger
Efficiency Engineer, Packard Motor Car Co., formerly Assistant Chief Engineer, Holt Mfg. Co.

A COUPLE of years ago a study of the cost of plowing with tractors would not have been of any practical value, since the conclusions, even though they might have been drawn in the most logical way, would have been based upon theoretical assumptions, hence the conclusions too would have been theoretical.

During the last few years the line of tractors has been extended, till now we have on the market tractors of practically any size between 10 to 130 hp. From their performance and prices and from the requirements on the farm and the manufacturing problems—all known factors—it is possible not only to draw correct conclusions regarding present conditions, but also to anticipate future developments, which, from a business standpoint, are more important.

Many students of this problem will undoubtedly say conditions on the farms are so different as to the quality of soil, size of farm, kind of crop and hundreds of other things that, considering everything that enters into the problem, a general and intelligent solution of it is precluded, while without taking everything into consideration the solution cannot be correct. That is as it appeared to me a couple of years ago, but I have changed my mind in the meantime.

One way of attacking the problem is by a "national referendum" *i.e.*, by asking every tractor owner the size of tractor and farm he has, perhaps also the size of tractor he thinks would suit him better, and draw the conclusion according to the law of averages. The Department of Agriculture has published in book form the results of such an investigation directed by A. P. Yerkes, and it is of interest to note that although following different methods, the results of the survey agree with the conclusions which follow the thought of this study.

In the following, I shall consider three sizes of tractor that would be built along exactly the same standards of quality, design and workmanship:

A—Capable of pulling two 14-in. plows, 6 in. deep, in average soil, at a speed of 2½ m.p.h. This would require about 9 hp. on the drawbar.

B—Same quality tractor, of double size, pulling four 14-in. plows, 6 in. deep in the same soil, 2½ m.p.h. speed. Drawbar of 18 hp.

C—Twice as strong as B, pulling eight 14-in. plows, 6 in. deep in the same soil. Drawbar 26 hp.

Price

Since there is to-day no doubt in the mind of anybody familiar with the tractor problems that really successful tractors are and have to be built according to the standards of quality adopted by the truck manufacturers and not those of the country blacksmiths, I shall estimate the prices as follows:

Tractor A, $600; tractor B, $1,500; tractor C, $3,600. The price for tractor A if the design, material and workmanship be first class, cannot be reached unless quantity-production methods are adopted. For 100 per cent increase in size, the price increases 150 per cent in the above estimates, since I make the preliminary assumption that with the size of the tractor increasing, the demand might decrease and the manufacturing methods to be adopted become more expensive.

I shall not consider the cost of plows and other equipment, since for a comparative study of the cost of plowing with different sizes of tractors it matters very little.

A two- and a four-bottom tractor and plow can easily be operated by one man, while for an eight-bottom tractor two men are necessary, not for lifting and lowering the bottoms, which can be done automatically, but for cleaning and unclogging the plows, which would mean stopping the machine often if it were expected to be done by the man steering the tractor.

The expense for operator would therefore come to 30 cents per hour for the two- and four-plow outfit and 60 cents for the eight-plow outfit.

Experience has shown that the fuel consumption of gaso-

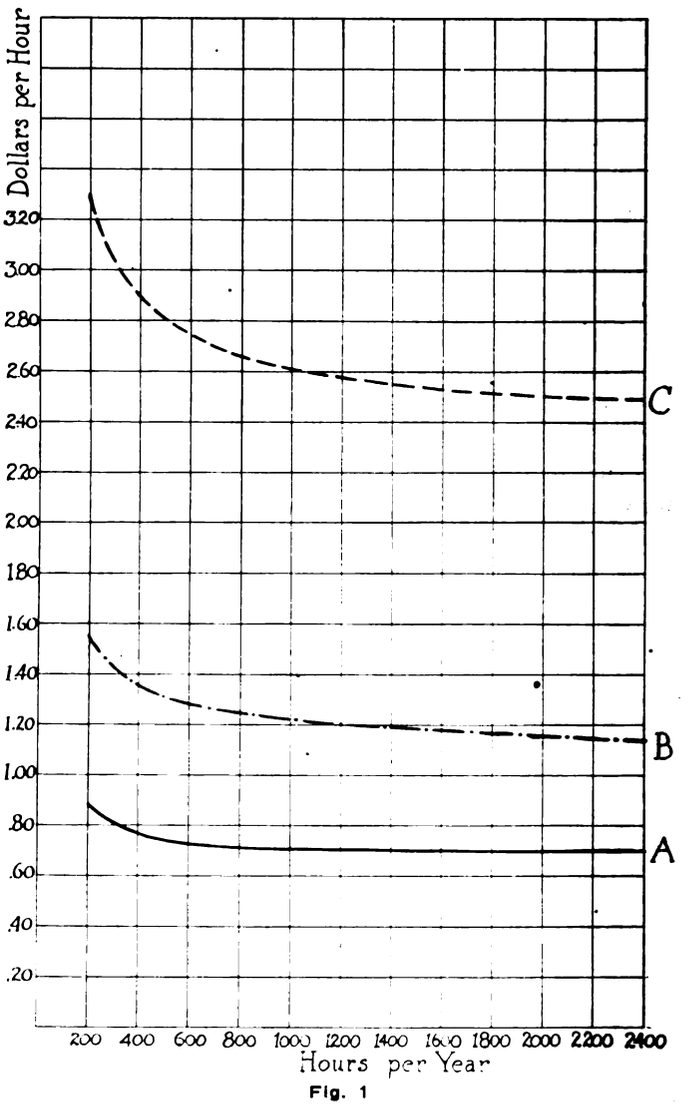


Fig. 1

*Presented to the Mid-West Section of the S. A. E. at its meeting at Chicago on Feb. 21.

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line tractors per hp.-hour changes little or not at all with the size of motor, provided all are built according to the same standards and are run at the same percentage of load. In our case the cost for fuel (and oil, etc.) should be for tractor A, 25 cents per hour; tractor B, 50 cents per hour, and for tractor C, $1 per hour.

Depreciation

One often hears the statement that a tractor will last 5 or 6 years. Such a statement is fundamentally wrong. There are two reasons why a tractor, or any machine in general, depreciates; first, wear and tear of the machine, a factor which is altogether independent of its age, the only thing affecting it being the actual working hours; and, second, obsolescence, which on the contrary, depends upon the age of the machine and not upon the working hours. The last factor is more important than the first in automobiles or any products subject to change of style, but, with utility products, it has little importance, unless a new invention changes fundamentally the existing conditions. Yet, even among automobiles, the Ford car, model T, has not become obsolete after 10 years of use, and I know of American tractor manufacturers who have not improved their tractors materially since 1911-12 and are now selling more tractors of the same type in a month than they made all told up to 1915, while some of the machines they sold in 1912 are still going strong. Therefore, it is appropriate to base the allowance for depreciation upon the total actual working hours of a tractor, provided it be of progressive design, and not upon total life. This should apply satisfactorily to horses or any draft animals whose average life is nearly constant whether they work or not. It is a conservative estimate to say that tractors of modern design of any size have a useful life of about 4500 hours of plowing, which would give a tractor, plowing 10 hr. a day, a life of 5 years. Should the tractor plow only 45 days per year its life would figure out at 10 years, provided no other work is done. This estimate is safe since 90 per cent of its value has already been figured in the item for wear and tear, and part of the remaining 20 per cent can easily be recovered from the sale of its high-grade material as junk.

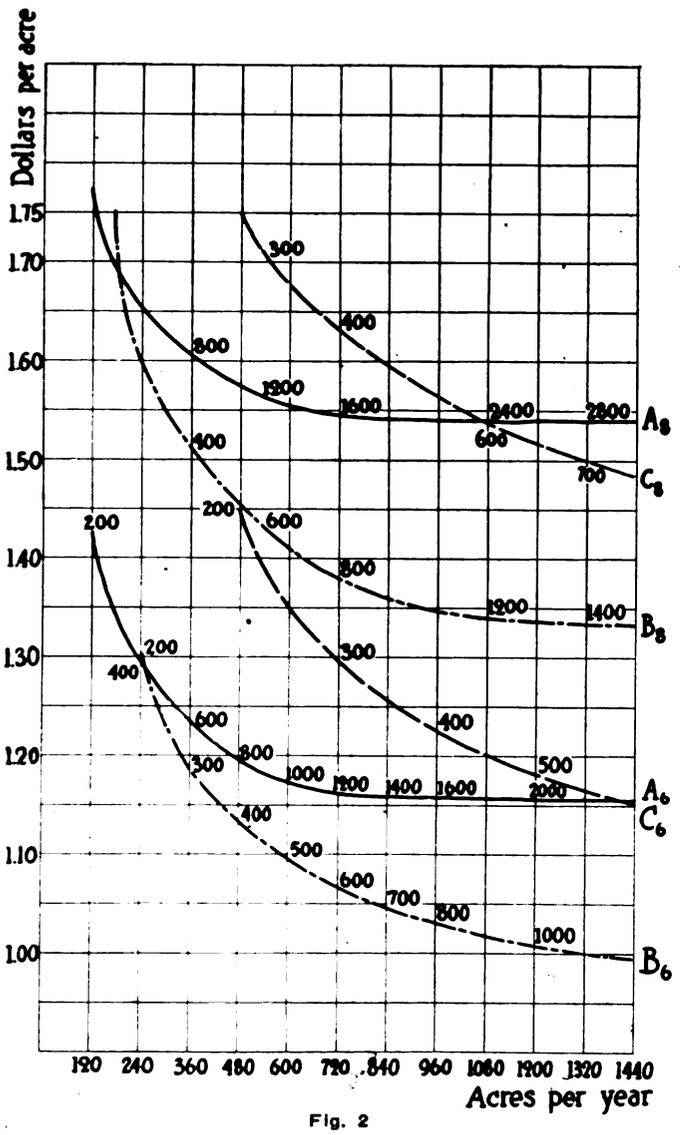


Fig. 2

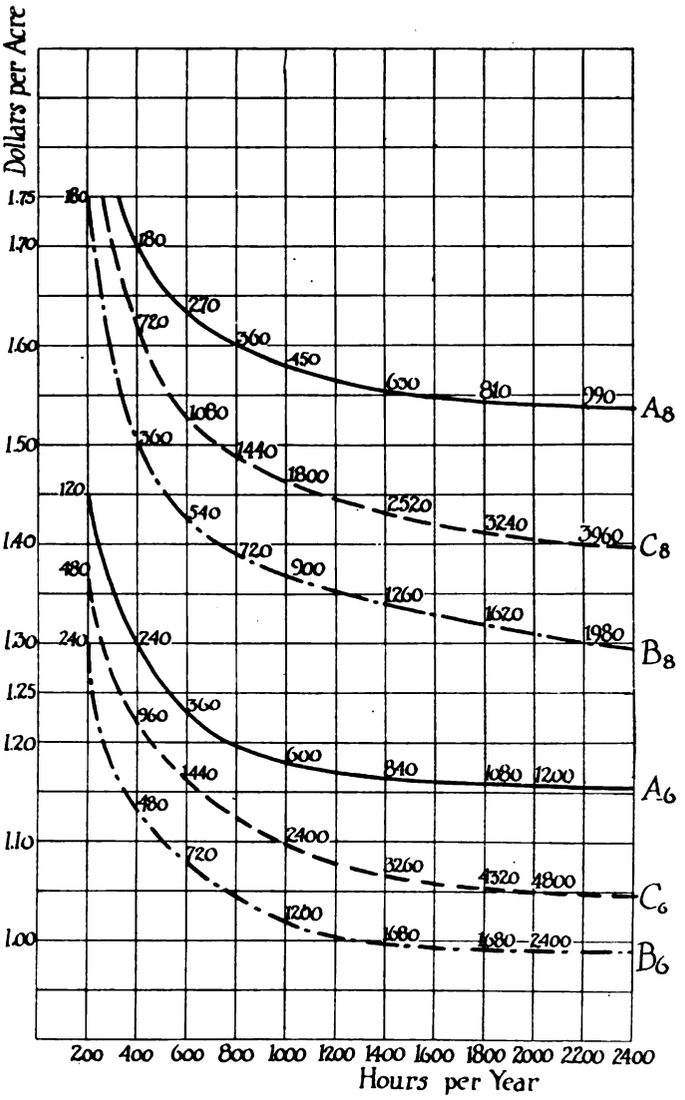


Fig. 3

The amount of depreciation per plowing-hour figures out to

$$\frac{600}{4500} = \$0.13 \text{ for tractor A.}$$

$$\frac{1500}{4500} = \$0.33 \text{ for tractor B.}$$

$$\frac{3600}{4500} = \$0.80 \text{ for tractor C.}$$

Repairs and Interest

These two factors are considered together and estimated at 6 per cent per year on the initial price of the tractor. Since the value of the tractor decreases constantly, the interest on it also decreases. Suppose the life of the tracor to be 6 years, then the interest during the first year will be 6 per cent on the price paid; the following year it will be 6 per cent on the actual value of the tractor, or 5 per cent on the initial price, and so on. The allowance for interest and repairs being 6 per cent per year on the initial price, it results that no repair allowance is made for the first year, 1 per cent of the initial value for the second year, 2 per cent for the third year and so on, an estimate which conforms to conditions encountered with tractors of modern design.

Suppose we calculate every one of these items for each of

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the three sizes of tractors chosen, for different numbers of plowing hours per year. Graph 1 is based on these figures, the horizontal scale representing the number of plowing hours per year and the vertical scale, the cost of plowing per hour. Curves A, B and C correspond to the machines mentioned.

Graph 1 does not give directly the comparative costs of plowing with the different sizes of tractors, but is used for making graphs 2 and 3. Graph 3 gives the cost in dollars per acre, varying with the hours of plowing. Tractors A, B, and C are supposed to pull 2, 4 and 8 bottoms, 14 in. wide and 6 in. deep, at a speed of 2.5 m.p.h. It is assumed that the tractors will plow only 85 per cent of the time they are in the field, 15 per cent being allowed for turning the headlands, oiling, trouble, etc. The area actually plowed per hour then figures out to 0.6, 1.2 and 2.4 acres respectively. The small figures along the curves give the number of acres per year the respective tractor will plow.

With graph 2 as a basis, graph 3 has been drawn, and this gives the information we are after. We read the area to be plowed in a year on the horizontal axis, follow the vertical through this point, until it intersects with the curve representing the A, B, or C tractor, and then pass horizontally to the left where we read on the vertical axis the cost of plowing per acre. The figures along the curves represent the number of hours the tractor will have to work in order to perform the work expected. Recalling that A, B and C represent tractors plowing 8 in. deep, let us now consider the significance of graph 3.

If we have to plow less than 250 acres per year and not deeper than 6 in., the tractor with 9db-hp. plows the cheapest, while for anything above this amount of plowing the 4-plow tractor with about 18 db-hp. is cheapest in the end. Even for farms so large that one 4-plow tractor is too small, it pays better to have two 4-plow tractors than one 8-plow tractor. The advantage of having two smaller units instead of one large one, due to the flexibility and reduced chance of complete tie-ups, due to breakdown, etc., is not considered at all in the chart.

The chart shows much more than this. It shows how much cheaper the plowing comes if there be much of it, or, in other words, how expensive it is to be poor. There are, however, two ways enabling the small farmer to meet the competition of the big one, without having to buy his neighbor's land. They consist in plowing deeper and in plowing early and quick. To enable him to do this he will decide on a 4-plow tractor rather than on the smaller size. In fact, we find from the upper curves that represent the cost for plowing 8 in. deep that for over 180 acres of plowing per year the 4-plow tractor is the cheapest. While for 240 acres of plowing per year the 4-plow tractor figures only a little cheaper in dollars and cents, it has the advantage that it performs the work in about 30 days instead of 60, as is necessary with the smaller one.

Now, there are two ways of making a tractor intended to pull 4 bottoms, 6 in. deep, plow 8 in. deep. The first is to hitch to it 3 plow bottoms instead of 4; and the second to plow with 4 bottoms, but at lower speed, about 1.9 m.p.h., instead of 2.5 m.p.h. Every tractor should have the two speeds mentioned. The areas plowed per hour by the two methods and the costs are nearly the same. One great advantage of the first method is that we have a low-speed gear in reserve for hard spots on the land, or grades. On the other hand, with a 2-plow tractor, intended for 6 in. deep plowing, we have no other choice—if extra expense for specially narrow bottoms is to be avoided—than to run the plows 8 in. deep on low speed all the time.

Manufacturers have too long likened tractor manufacturing problems to truck problems. There are good reasons for building 4 or 5 sizes of trucks in the same plant. A 5-ton load sometimes cannot be handled by either one or two 3-ton trucks and it is not economical to run a 3-ton truck with a 1-ton load; but in plowing the load can be easily adapted to the full power of the tractor.

It is important to note that the above conclusion has been reached although the preliminary assumption was made that the 2-plow tractor would probably be the most popular type, and therefore the cheapest to manufacture. But since we have reached the conclusion that the 4-plow outfit is the most economical it is reasonable to conclude that, owing to its production in large quantities, its cost per horsepower will not be 25 per cent higher than that of the 2-plow outfit, as assumed at the start of this analysis, but perhaps even lower.

Scenes from the Flying Fields in France

THE photographs show views from the training headquarters of the American air forces in France. In the upper picture is seen a Nieuport monoplane, said to be one of the fastest scouting machines in existence, which has been loaned by the French Government to the American air service. In the lower view are shown the provisions for refilling the tanks of the flying machines.

These photographs are copyrighted by the Committee on Public Information.



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The Benz 230-Hp. Aircraft Engine

Part III

Weights of Component Parts—General Data and Dimensions — Analyses of Materials of Construction — Test Results of the Engine

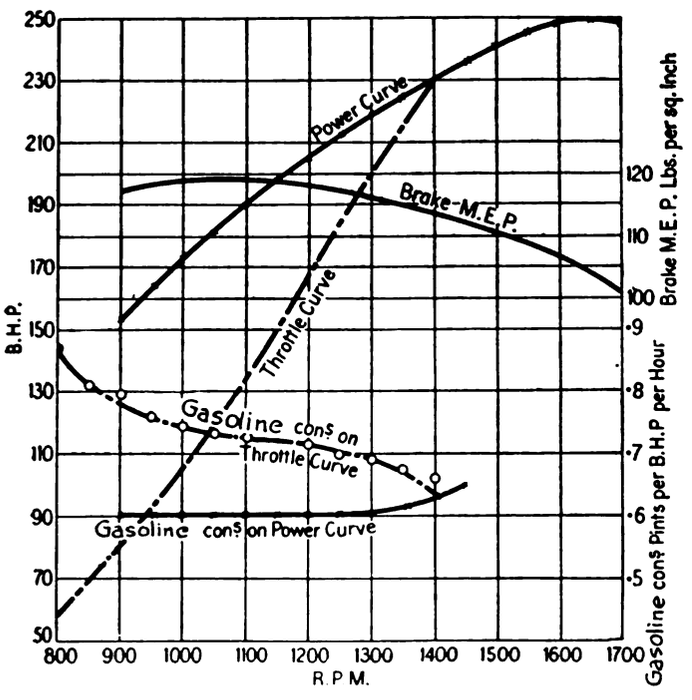
THE following data relating to the 230-hp. Benz engine were obtained from a test carried out at the Royal Aircraft Factory, and the power, throttle and consumption curves as shown resulted.

The engine, which was coupled to a Heenan and Froude water dynamometer, was run up to 1700 r.p.m., the peak of the power curve occurring at 1650 r.p.m., at which 250 hp. was developed. The maximum brake m.e.p. reached 119 lb. per sq. in. at 1100 r.p.m. The test was of one hour's duration.

R.P.M.	1400
B.H.P.	229
Gasoline consumption	150 pints
Oil consumption	4.5 pints
Water inlet temperature (average)	62° C.
Water outlet temperature (average)	71° C.
Oil temperature (maximum)	50° C. steady
Oil pressure (minimum)	28 lb. sq. in. steady

The following is a list of weights of various parts of the engine:

	Lb.
Cylinders, complete, including supports for rocker levers (six at 44.25 lb. each)	265.5
Pistons, complete, with rings and piston pins (six at 7.62 lb. each)	45.72
Connecting rods, complete (six at 7.13 lb. each)	42.78
Valves and springs, complete (twenty-four at 1.14 lb. each)	27.36
Tappets, push rods, and rocker levers (twelve sets at 3.2 lb. each)	38.4
Induction pipes, complete (two at 2.625 lb. each)	5.25
Carbureters, complete (two at 6.54 lb. each)	13.08
Crank chamber, top half	103.25
Crank chamber, bottom half (including cylinder studs and oil pump shaft)	110.25
Crankshaft, complete	109.25
Propeller boss, complete	19.32
Camshafts, complete, with bearing, less gear wheels (two at 8.25 lb. each)	16.5
Magnetos, complete (two at 10.75 lb. each)	21.5
Ignition wiring, complete (two at 2.12 lb. each)	4.24
Water pump, complete	8.75
Oil pump, complete	2.89
Fuel pump, complete	6.75
Exhaust manifold	15
Miscellaneous parts	7.53
Total weight of complete engine	863.32

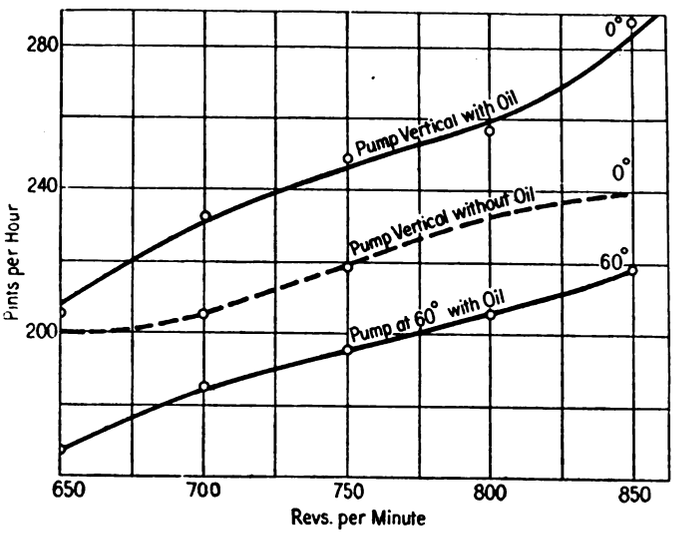


Characteristic curves of engine

General Data and Summary

The following general data and summary are furnished by the naval and military authorities:

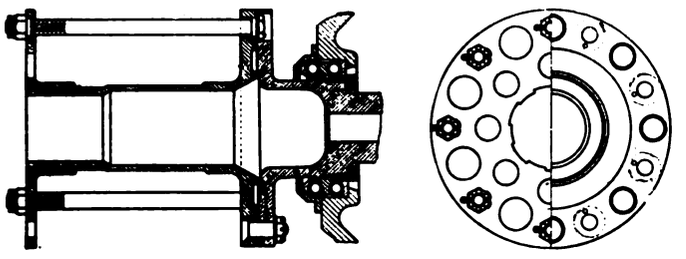
Number and arrangement of cylinders.	Six vertical
Bore	145 mm. (5.71 in.)
Stroke	190 mm. (7.48 in.)
Stroke/bore ratio	1.31-1
Stroke volume of one cylinder	3137.476 cu. cm. (191.386 cu. in.)
Total stroke volume of engine	18824.856 cu. cm. (1148.316 cu. in.)
Area of one piston	165.13 sq. cm. (25.59 sq. in.)



Results of tests of fuel pump

Total piston area of engine	990.78 sq. cm. (153.57 sq. in.)
Clearance volume of one cylinder	796 cu. cm. (48.66 cu. in.)
Compression ratio	4.91-1
Normal B.H.P. and speed	230 B.H.P. at 1400 r.p.m.
Piston speed	1744 ft. per min.
Brake mean effective pressure	113 lb. per sq. in. at 1400 r.p.m.; 119 lb. per sq. in. at 1100 r.p.m.
Cu. in. of stroke volume per B.H.P.	4.99
Sq. in. of piston area per B.H.P.	.667
H.P. per cu. ft of stroke volume	346.3 h.p.
H.P. per sq. ft. of piston area	215.9 h.p.
Direction of rotation of crank	R.H.T.
Direction of rotation of propeller	R.H.T.
Normal speed of propeller	Engine speed
Lubrication system	Forced to main bearings from reservoir in sump.
Brand of oil	50 per cent Vacuum Heavy and 50 per cent Sternof
Oil pressure	28 lb. normal, 50 lb. max.
Oil temperature	50° C., max.
Oil consumption per hour	4.5 pints
Oil consumption per B.H.P. hour	.02 pint
Specific gravity of oil	.9
Type of carbureter	Two Benz each feeding three cylinders (two-jet)
Mixture control	Automatic
Fuel consumption per hour	150 pints

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Propeller hub construction

Fuel consumption per B.H.P. hour	.65 pint
Specific gravity of fuel	.720
Type of magneto	Two Bosch Z.H.6
Firing sequence of engine	Prop.: 1, 5, 3, 6, 2, 4
Numbering of cylinders	Prop.: 1, 2, 3, 4, 5, 6
Speed of magneto	Two-thirds engine speed
Direction of rotation of magneto, facing driving end of armature	Anti-clockwise
Magneto timing	30° E. 18 mm. on stroke
Inlet valve opens. Deg. on crank	10° E.
Inlet valve closes. Deg. on crank	55° L.
Maximum lift of inlet valve = h	11.8 mm. (.465 in.)
Diameter of inlet valve = d (smallest diameter)	Two of 52 mm.
Area of inlet valve ports = $\pi \times d \times h$	19.27 sq. cm. each
Mean gas velocity through inlet valve	124 ft. per sec.
Clearance of inlet tappet	.009 in.
Exhaust valve opens. Deg. on crank	60° E.
Exhaust valve closes. Deg. on crank	20° L.
Maximum lift of exhaust valve = h	11.25 mm. (.443 in.)
Diameter of exhaust valve ports = d (smallest diameter)	Two of 52 mm. diameter
Area of exhaust valve ports = $\pi \times d \times h$	18.37 sq. cm. each = 2.84 sq. in.
Clearance of exhaust tappet	.015 in.
Direction of rotation of revolution counter-drive, facing driving shaft on engine	Anti-clockwise
Speed of revolution counter-drive	½ E.S.
Weight of engine, complete with propeller hub, less water, fuel, and oil, and exhaust manifold	848.32 lb.
Weight per B.H.P., ditto	3.68 lb.
Weight of exhaust manifold	15 lb.
Weight of oil carried in engine	18 lb.
Jacket capacity of one cylinder	1873 c.c.
Weight of water carried in engine	30.9 lb.
Weight of radiators, less water	136 lb.
Weight of fuel per hour	135 lb.
Weight of oil per hour	5.06 lb.
Total weight of fuel and oil per hour	140.06 lb.
Gross weight of engine in running order, less fuel and oil. Cooling system at .65 lb. per B.H.P.	996 lb.
Weight per B.H.P., ditto	4.33 lb.
Gross weight of engine in running order, with fuel and oil for six hours. Tankage reckoned at 10 per cent weight of fuel and oil	1920.89 lb.
Weight per B.H.P. with fuel and oil for six hours	8.35 lb.

Analysis shows the chemical composition of the various parts to be as appended below. The analysis of gear wheel and camshaft were made on drillings taken from the cores, as these were case-hardened parts:

ANALYSIS OF MATERIAL

	Carbon %	Silicon %	Sulphur %	Phosphorus %	Manganese %	Nickel %	Chromium %
Water jacket	0.07	0.03	0.046	.0027	0.35	Nil	0.02
Crankshaft	0.13	0.31	0.026	.0014	0.48	3.21	0.87
Connecting rod	0.15	0.21	0.027	.0026	0.37	4.02	1.21
Gear wheel	0.23	0.25	0.014	.0027	0.53	3.58	0.81
Camshaft	0.14	0.23	0.029	.0026	0.95	4.68	1.48
Inlet valve	0.26	0.28	0.012	.0020	0.40	5.36	1.06
Valve spring	0.40	0.02	0.033	.0085	0.55	Nil	0.01

	Graphitic Carbon %	Combined Carbon %	Silicon %	Sulphur %	Phosphorus %	Manganese %
Cylinder	1.90	0.77	1.68	0.122	0.176	0.48
Piston	1.85	0.50	1.46	0.130	0.210	0.77

	Graphitic Silicon %	Combined Silicon %	Iron %	Tin	Copper %	Zinc %	Lead	Aluminium %
Crank case	0.18	0.89	0.93	Trace	6.20	9.59	Trace	82.21 by diff.

	Antimony %	Tin %	Copper %	Lead %
Bearing metal	11.95	78.57	8.10	0.90

Mechanical tests gave the following results:

	Yield Point, Tons Per Sq. In.	Ultimate Stress, Tons Per Sq. In.	Elongation %	Reduction of Area %	Impact Ft.-lb.
Crankshaft	55.2	62.5	21.3	59.75	26
Cylinder	....	8.36	Nil	Nil	..
Connecting rod	41.9	48.1	14.0	....	..
Crank case		8.91	....	....	..



Female operatives in the plant of the Briggs-Stratton Co., Milwaukee

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New S. A. E. Aircraft Standards

Fourth and Last Installment

S.A.E. Aeronautic Engine Testing Form

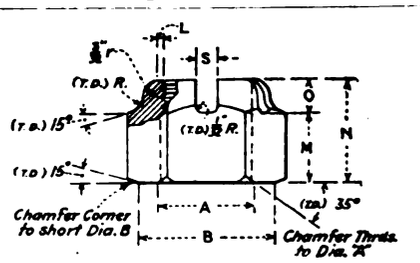
Specification Sheet Outline

Name and Model..... Date of Test.....
Manufacturer .....
(All dimensions to be given in inches.)

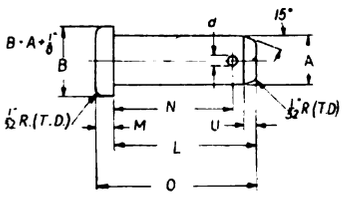
(1) General Type..... Cycle.....
(2) No. of Cycle..... Bore..... Stroke.....
Piston Displ. per Cyl.....cu. in. Total.....cu. in.
(3) Compression Vol. (V_c).....cu. in.
Total Vol. of Cyl. (V).....cu. in.

$$\text{Compression Ratio} = \frac{\text{Comp. Vol.}}{\text{Total Vol.}} = \frac{V_c}{V} \text{ Compression}$$

Pressure .....lb. At .....r.p.m.
(4) Type of Cyl..... Matl.....
(5) Type of Valves..... Location.....
(6) Cooling System..... Type of Pump.....
Capacity.....lb. per min. at.....Eng. r.p.m.
Weight of Water in Cyl. Jackets.....
Water Space bet. Jacket and Cyl. Top.... Bottom....
(7) Piston, Type..... Matl.....
Wgt. without Pin and Rings... With Pin and Rings...
Distance from center of Pin to top of Piston.....
Length, over all.... Clearance Main Body.... Top....
Length Piston Clearance at Head.....
Length relieved portion at Center if any.....
(8) Piston Rings, No. per Piston.... Type.... Width....
(9) Connecting-rod Type..... Matl.....
Length, c. to c..... Weight, Upper end.....
Lower end..... Total.....
No. Bolts in lower end..... Dia. Bolts.....
Matl..... Weight complete with Bearing.....



Clevis Pins



Edges of *d* chamfered not to exceed 0.01 in. T. D. indicates tooling dimension.

A	Limits of A	B	M	L—N	U	d Drill No.	Cotter Pin
⅛	0.123 0.121	¼	3/64	3/32	3/64	50	1/16
5/32	0.154 0.152	9/32	3/64	3/32	3/64	50	1/16
3/16	0.185 0.183	5/16	3/64	3/32	3/64	48	1/16
7/32	0.216 0.214	11/32	3/64	3/32	3/64	48	1/16
¼	0.248 0.246	⅜	1/16	7/64	1/16	48	1/16
9/32	0.279 0.277	13/32	1/16	7/64	1/16	48	1/16
5/16	0.310 0.308	7/16	1/16	9/64	1/16	36	3/32
⅜	0.373 0.371	½	1/16	9/64	5/64	36	3/32
7/16	0.435 0.433	9/16	3/32	9/64	5/64	36	3/32
½	0.496 0.493	⅝	3/32	9/64	5/64	36	3/32

Dimensions in inches.

Clamps and Fittings for Rubber Hose

S. A. E. Recommended Aeronautic Practice

In order to comply with present practice and utilize existing hose connections, the list of sizes shown on S. A. E. data sheet 37, Vol. I, was recommended for aeronautic practice.

CASTLE HEXAGON NUTS

S. A. E. Recommended Aeronautic Practice

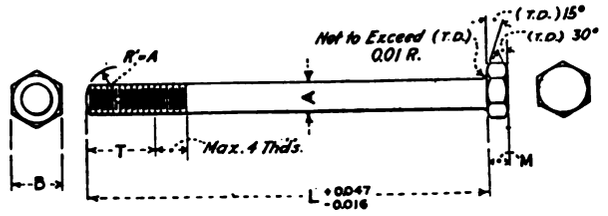
Size A and Threads per Inch	B	N	S	O	M	L	R
.164 (No. 8)—32	.375 (3/8)	.234 (15/64)	.078 (5/64)	.078 (5/64)	.156 (5/32)	.016 (1/64)	.094 (3/32)
.190 (No. 10)—32	.375 (3/8)	.250 (¼)	.078 (5/64)	.078 (5/64)	.172 (11/64)	.031 (1/32)	.094 (3/32)
.216 (No. 12)—32	.438 (7/16)	.265 (17/64)	.078 (5/64)	.094 (3/32)	.172 (11/64)	.031 (1/32)	.094 (3/32)
.250 (¼)—28	.438 (7/16)	.281 (9/32)	.078 (5/64)	.094 (3/32)	.188 (3/16)	.031 (1/32)	.094 (3/32)
.313 (5/16)—24	.500 (½)	.328 (21/64)	.078 (5/64)	.094 (3/32)	.234 (15/64)	.031 (1/32)	.094 (3/32)
.375 (⅜)—24	.563 (9/16)	.406 (13/32)	.125 (⅛)	.125 (⅛)	.281 (9/32)	.031 (1/32)	.094 (3/32)
.438 (7/16)—20	.688 (11/16)	.453 (29/64)	.125 (⅛)	.125 (⅛)	.328 (21/64)	.047 (3/64)	.125 (⅛)
.500 (½)—20	.750 (¾)	.562 (9/16)	.125 (⅛)	.187 (3/16)	.375 (⅜)	.047 (3/64)	.125 (⅛)
.563 (9/16)—18	.875 (⅞)	.609 (39/64)	.156 (5/32)	.187 (3/16)	.422 (27/64)	.047 (3/64)	.156 (5/32)
.625 (⅝)—18	.938 (15/16)	.718 (23/32)	.156 (5/32)	.250 (¼)	.469 (15/32)	.047 (3/64)	.156 (5/32)

A = Size of Bolt. B = Also Size of Hexagon. All Threads U. S. Form. T.D. = Tooling Dimensions. O = Also Depth of Slot. Dimensions in Inches.

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Plain Hexagon-Head Bolts

S. A. E. Recommended Aeronautic Practice



$$M = \frac{A}{2} + \frac{1''}{32}$$

Bolts, Size A, Threads per Inch	*Limits A	B	M
.164 (No. 8)—32	0.164 0.160	.313 (5/16)	.125 (1/8)
.190 (No. 10)—32	0.190 0.186	.375 (3/8)	.125 (1/8)
.216 (No. 12)—32	0.216 0.212	.375 (3/8)	.125 (1/8)
.2500 (1/4")—28	0.250 0.246	.438 (7/16)	.156 (5/32)
.3125 (5/16")—24	0.313 0.309	.500 (1/2)	.188 (3/16)
.3750 (3/8")—24	0.375 0.371	.563 (9/16)	.219 (7/32)
.4375 (7/16")—20	0.438 0.434	.688 (11/16)	.250 (1/4)
.5000 (1/2")—20	0.500 0.496	.750 (3/4)	.281 (9/32)
.5625 (9/16")—18	0.563 0.558	.875 (7/8)	.313 (5/16)
.6250 (5/8")—18	0.625 0.620	.938 (15/16)	.344 (11/32)

When body length L =	1/2"	5/8"	3/4"	7/8"	1"	Over 1"
Length of thread T =	3/8"	7/16"	1/2"	1/2"	1/2"	3/4"

All threads U. S. Form. Dimensions in inches. T. D.=Tooling Dimensions
*Finished size, including plating or rust preventing treatment when used. Bureau of Standards recommend .001" as thickness of plating for rust prevention.

(10) Piston Pin Bearings, dia..... Length..... Matl.....
Location..... Method of fastening Pin in Rod or Piston..... Weight of Pin.....
(11) Connecting-rod Bearing, dia.... Length.... Matl....
Type..... Weight..... Method of Adjustment.....
Method of Holding Bearing in Rod.....
(12) Crankshaft, Type..... Weight.....
No. of Bearings... Dia. Main... Length of Front...
Length Intermediate..... Length Rear.....
Method of Adjusting Bearings.....
No. of Bolts each Bearing..... How held in Case.....
Dia. Hole in Main Bearings..... In Crank Pins.....
Dia. Hole in Crank Pins.... Dia. Hole Main Bearings...
Cheek Thickness next to Propeller End.....
Cheek Thickness of Balance of Crank.....
Dia. of Shaft through Radial Bearing.....
No. of Radial Bearings.... No. of Thrust Bearings....
Type of Thurst Bearing..... If Direct, what Type.....
Propeller Mounting.... Length of Taper.... Dia.....
Method of Holding Propeller Hub.....
No. of Hubs... If Geared, how is Gear held to Shaft...
If Taper, give Length..... Dia.....
Is Radial used in addition to Plain Bearing.....
(13) Camshaft Bearings, No..... Dias.....
Material..... Lengths.....
(14) Type of Cams..... Type of Valve-Lifters.....
(15) Inlet Valves, No. per Cyl.....o.d..... Port Dia.....
Lift..... Seat Angle.....deg.
(16) Exhaust Valves, No. per Cyl....o.d..... Port Dia.....
Lift..... Seat Angle.....deg.
(17) Weight of Valve Reciprocating Parts, Inlet.....lb.
Exhaust.....lb.
(18) Valve-Spring Tension, Inlet open.....lb. Closed.....lb.
Exhaust open.....lb. Closed.....lb.
(19) Valve-Timing, Inlet opens.....deg. Top Center
Closes.....deg. after Lower Center
Exhaust opens.....deg. before Lower Center
Closes.....deg. Top Center
(20) Geared Drive, Pitch.... No. Teeth Crankshaft Gear....
No. Teeth Propeller Gear..... Width of Face.....
Type Gear..... Matl.....
(21) Propeller Shaft, Type Thrust Bearing.....
No..... Radial Bearing, Front..... Rear.....
Type of Propeller Hub Mounting..... No. of Hub.....

Carburetion

(22) Carbureter, Name and Model.....
(23) Specification (size of Nozzles, etc.).....
(24) How Heated .....
(25) General Principles of Operation.....
(26) Description of Intake Pipe.....

Ignition

(27) Name and Type of System.....
(28) Type of Distributor..... Firing Order.....
(29) Type of Breaker.....
Maximum Spark Advance.....deg. Retard.....deg.
(30) Spark Plugs, Name and Type... How many... Size...

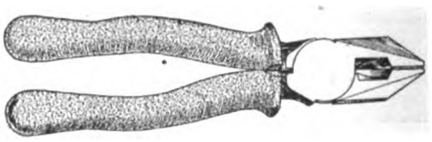
Lubrication

(32) Type and Description.....
Pressure used .....
(33) Main Bearing Hub.....
(34) Crank Pin .....
(35) Cylinder .....
(36) How is Oil Cooled.....
(37) Capacity of Oil Container.....
(38) What Type Pump.....
(39) Oil used .....

—

Rimco Rubber Insulated Pliers

ELECTRICIANS working on high tension distributing circuits always make use of pliers with insulated handles. This same tool is also useful in ignition work. The Rubber Insulated Metals Corp. of Plainfield, N. J., has developed a



Pliers with rubber-covered handles

new type of insulated handle plier in which the rubber covering, instead of being hard, is semi-soft. The result is that the insulation will not crack or break when the tool is dropped on a hard surface. In order to obviate breakage of the rubber covering, in some instances rubber tubes have been slipped over metal handles, but in the tool here illustrated the rubber compound is united to the metal by what is known as the Elchemco process, which is said to effect a permanent bond. These pliers, before being shipped, are subjected to a test under 10,000-volt electrical pressure.

Owing to the rubber covering of the handles the pliers are more pleasant to work with in cold weather than pliers with bare metal handles.

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Automobile Conditions in South Africa

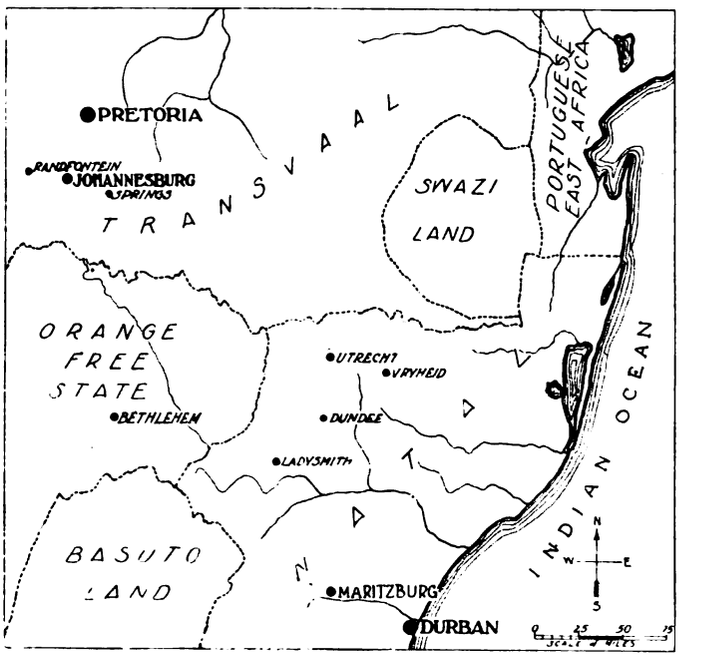
Transvaal's Mining Industry Furnishes the Chief Market in That Province—High Cost of Fuel a Hindrance to Sales — Natal a Prosperous Agricultural Country and Farmers Buying Cars

JOHANNESBURG, SOUTH AFRICA, Nov. 7.—The sale of automobiles in Johannesburg and this district is almost entirely dependent on the mining industry. The principal classes of buyers are business and professional men. This is largely due to there being little manufacturing of any description carried on in the Transvaal, which in turn is due to the absence of any source of production of raw material and also to the high cost of labor.

Conditions here are about as they have been under war conditions, excepting that during the past few months there has been an acute shortage of gasoline, and the price to-day is $4.08 per Imperial gallon. It is hoped that these conditions will soon improve, as there are several large consignments of gasoline due here. There are three suppliers of gasoline for this territory, namely, the Vacuum Oil Co. of South Africa, which is an offshoot of the Standard Oil Co.; the Texas Oil Co., and the British-American Oil Co.

Johannesburg has no definite selling season for automobiles, the sales being generally distributed more or less freely the year round, and while the sale of cars is to business and professional men, these are so largely dependent on the mining industry that sales generally respond to mining conditions.

The farming community purchases generally from August to December, this being the time they are paid for their crops, and it is during these months that the dealers endeavor to stimulate sales and introduce new models. C. Whitehead, general manager of the Johannesburg Motor Mart, reports that the used-car problem is one of the greatest troubles in that section, and that

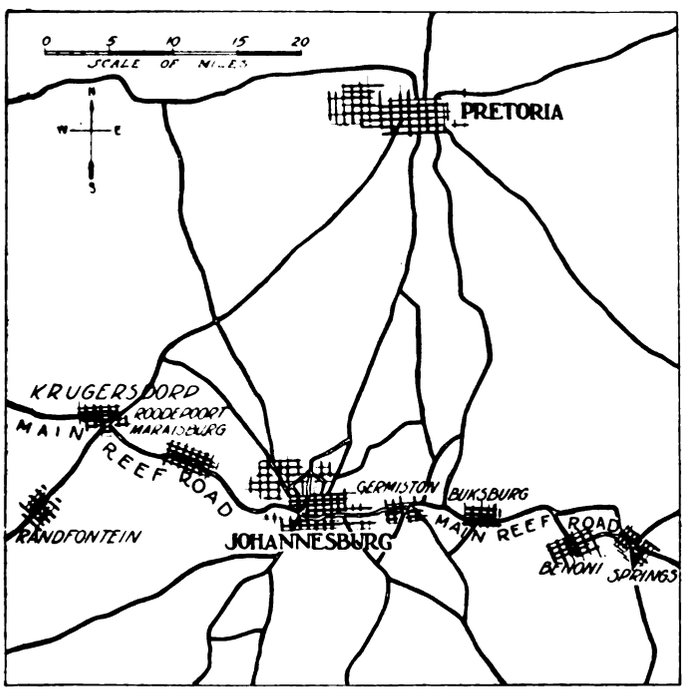


Map of Natal and parts of adjoining provinces

one of the principal difficulties in connection with it is the ridiculous values given by dealers handling comparatively unknown makes of cars in order to introduce them. In the original sales of these cars the dealers will give any discount asked for.

The sale of automobiles in the Transvaal and in the vicinity of Johannesburg is not stimulated by good roads and touring through the country for pleasure as known in America and Europe scarcely exists. The road mostly used around Johannesburg is known as the Main Reef Road, which couples up the principal mines of Witwatersrand and is 60 miles in length. It extends as far as Springs to the east and Randfontein on the west. The surface is good and is generally well maintained. The gradients are not exceptionally heavy, so that an average four-cylinder American car, such as Studebaker or Buick, is able to make the round trip on high gear. Officials of the mining companies and merchants transacting business with the various mines are great users of this road. Perhaps the greatest inconvenience in motoring in the mining district is the high winds which prevail here, and which carry the dust from the mine sand dumps so that the road is frequently bathed in this dust.

The most popular road for motorists is that between

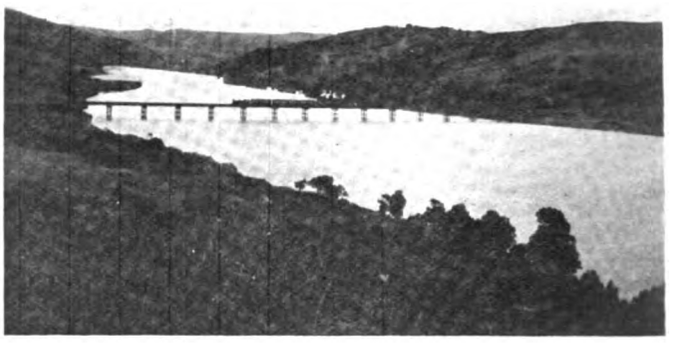


Main road system of the Transvaal

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A view in West Street, Durban



Attractive scenery along the Umkomaas River, Natal

Johannesburg and Pretoria, 37 miles. This road is well maintained and has no heavy grades.

The longest touring trip that can be considered a popular one is from Johannesburg to Durban, which is the popular health resort for Johannesburg people. It is a 400-mile trip, and the road is good as country roads in the Transvaal go, but recently it has been badly washed away by the heavy rains. The worst feature of the road is the number of gates dividing off the various farms. There are sixty of these in the first hundred miles out of Johannesburg, and opening and closing these cut down the pleasure of the trip.

There are any number of other roads radiating from Johannesburg to outlying towns, but these do not compare with those mentioned so far as popularity is concerned. In the outside districts of the Transvaal the success or failure of crops affects the sale of automobiles very materially. Fruit farming is a small industry, but during the past few years rapid strides have been made in the growing of citrus fruits which will eventually be reflected in the increased purchasing power of the Transvaal.

DURBAN, NATAL, SOUTH AFRICA, Nov. 8—Durban is the summer resort for all citizens in Johannesburg and many other parts of the Transvaal. Durban is 400 miles by automobile from Johannesburg. It is the business center of the Province of Natal. Before the coming together of the several South African provinces into the Union of South Africa, Maritzburg was the capital of Natal, but Durban now holds the business center. Durban is one of South Africa's principal ports for the export of wool and corn, and a big bid has been made for these industries opening up in British South Africa. The value of Durban as an automobile center has increased. Ten years ago Durban was the chief port for Natal shipping, but little else. At that time it started developing and has continued to gain so that now it is counted as one of the five or six real business centers of South Africa.



Town gardens, Durban

The Durban of to-day differs from the Durban of 10 years ago about the same as the 1918 automobile model differs from the 1908 model. The city is really one of mushroom growth, and is no longer merely a calling place for vessels but the most popular summer resort in South Africa. The city is exceptionally well laid out, is particularly clean at all times, and merits the name of Dainty Durban, which has been generally bestowed upon it.

As a resort city it is one of the most attractive centers for the motorist, and to-day there are between 5000 and 6000 automobiles in the city. There are but few cars in the district adjoining Durban.

The Province of Natal differs very considerably from other provinces in the Union inasmuch as one finds that a comparatively small area such as is not or cannot be turned to good account in agriculture. Most of the sugar plantations are in Natal, and this province, generally spoken of as the Garden of South Africa, is the most thickly populated province. In Natal one meets the British farmer more often than in any other province of South Africa. Already the farmer is a good buyer of motor cars. The car best suited for these farmers is one reasonably light, must have a good clearance, must be substantially built, and should sell at a reasonable price.

The conditions at Maritzburg are almost diametrically opposite to those of Durban. You find very few cars in Maritzburg, but a great many in the district adjoining it.

Impurities in Malleable Castings

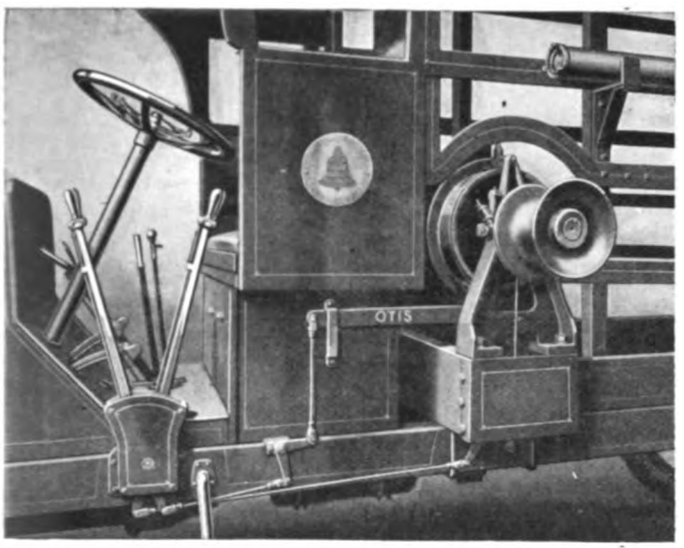
FROM the point of view of analyses, malleable castings contain more silicon and sulphur but less manganese than steel, and while in steel it is considered advisable to keep the phosphorus under 0.06 per cent, the phosphorus of malleable castings can safely be a maximum of 0.25 per cent. In malleable castings the carbon can be considerably reduced by annealing, but the silicon, sulphur, phosphorus and manganese remain practically constant. Under these conditions, says E. Adamson, in a paper read before the Staffordshire Iron and Steel Institute, only certain particular classes of pig iron are suitable for malleable castings, while for steel—broadly speaking—any pig iron can be used, according to process.

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Otis Power Winch for Motor Trucks

Serviceable for Hoisting Loads, Erecting Poles, Drawing Cable Through Conduits and for Various Other Uses

FOR use in handling the loads of heavy trucks the Otis Elevator Co., New York, has developed a power winch which can be fitted to the truck. It consists of a winding drum which rotates freely on a drum shaft, a worm and gear reduction inclosed in a cast-iron gear case, a clutch-operating device and a brake. This power winch has proven of particular service to electric light and power companies



Otis winch on truck, showing the operating levers

for hauling reels, pulling electric light wire through conduits, etc. Telephone companies use the winch for raising poles, and moving concerns use it for hoisting pianos and other heavy articles. The winch is also a very handy piece of apparatus on the trucks of contractors.

The worm gear is made of bronze and the worm is cut from a solid forging. To the outer end of the worm shaft is fitted a ball thrust bearing, designed to take up the end thrust in both directions. Worm and gear are inclosed in a cast-iron case which is provided with hand holes, sight holes and clean-out pockets, so that the worm and gear surfaces may be readily inspected without removing the entire upper case. The outer drum shaft bearing of the gear case is equipped with marine thrust grooves, which are utilized to keep the worm gear and worm in proper alignment.

The winding drum, which is 8 in. in diameter, has a face of 12 in. and flanges 18 in. in diameter, is capable of carrying about 650 ft. of ½-in. steel rope. The drum is fitted with brass bushings and rotates freely on the drum shaft in either direction. For lubrication the oil chamber in the drum is occasionally filled with heavy machine oil.

Secured to the outer ends of the drum is the brake wheel and flange of electric steel. The brake is of the double-acting external type and is lined with multibestos. It is of sufficient power to safely hold the greatest load that can be handled by the winch. The clutch mechanism consists of a semi-steel three-point jaw clutch which is drawn into engagement with corresponding jaws integral with the drum by means of a conveniently located lever.

Nigger Head for Hoisting or Hauling

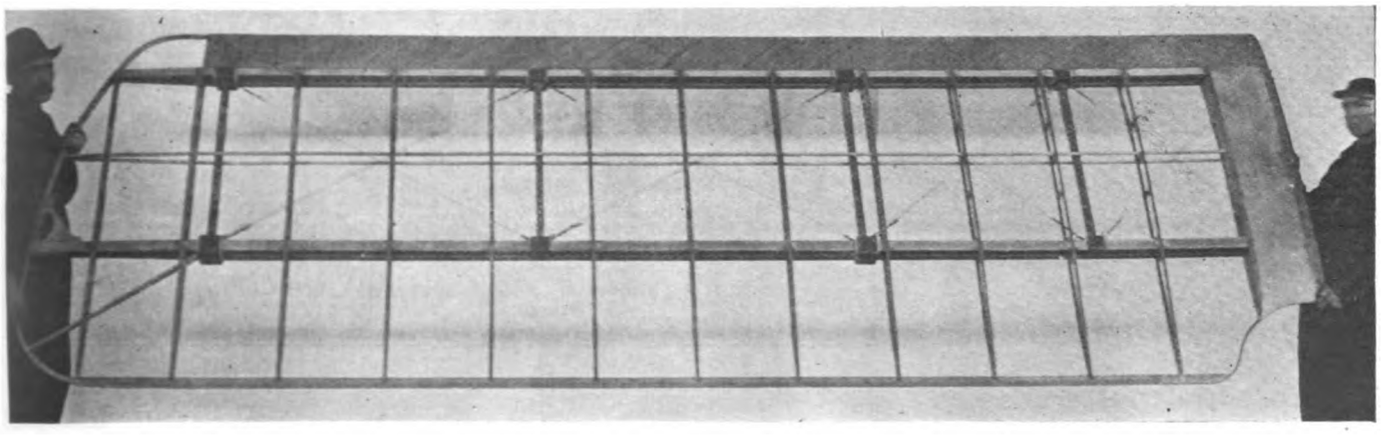
In addition to the winding drum, a nigger head is furnished as standard equipment on either end of the drum shaft. If desired, the company furnishes nigger heads on both ends of the drum shaft at a slight additional cost. The nigger heads provide a convenient means of hoisting or hauling with manila ropes when it is not desired to use the drum with steel ropes.

For operating the Otis winch, power from the truck engine is used, which is transmitted to the winch by means of a sprocket and chain or by a universal joint connection between the worm shaft of the winch and the power take-off shaft of the transmission or main drive shaft. The winch is designed to be mounted directly behind the driver's seat and is so arranged that connections can readily be made from the clutch operating device and brake lever to the hand levers located convenient to the driver's seat. Thus the truck operator has direct control over the operation of the winch without leaving his seat.

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Airplane Wing Construction

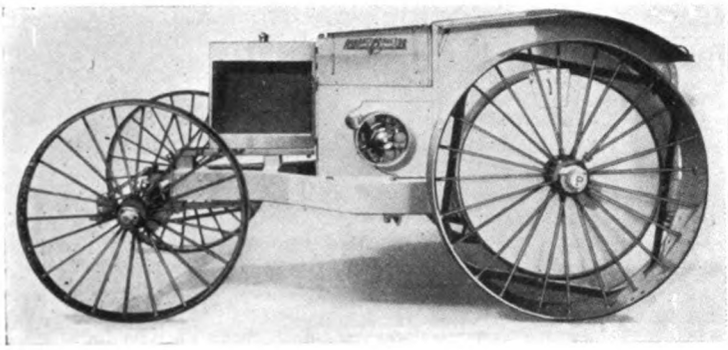
THE accompanying photograph shows a wing designed by the engineering force of the Lawson Aircraft Corp., Green Bay, Wis., for the new MT-2 Lawson machine, which is to be used for advanced training and reconnaissance work over the trenches. It is constructed entirely of wood, except for the metal fittings which connect the internal compression struts to the spars. The wing tip is bent from one piece of second growth white ash, and the internal wing fittings are pressed from one piece of steel, with projecting prongs to take the cross struts, thus making these members into sockets.



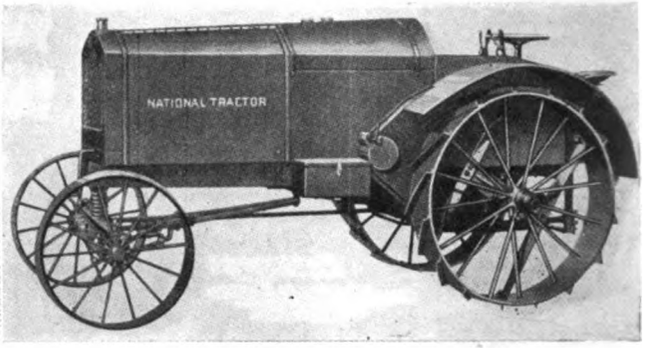
Skeleton of Lawson airplane wing

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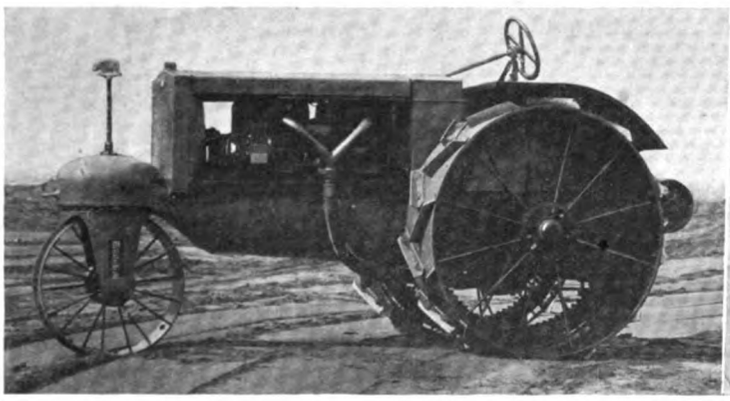
Some Modern Tractor Types



The new Parrett



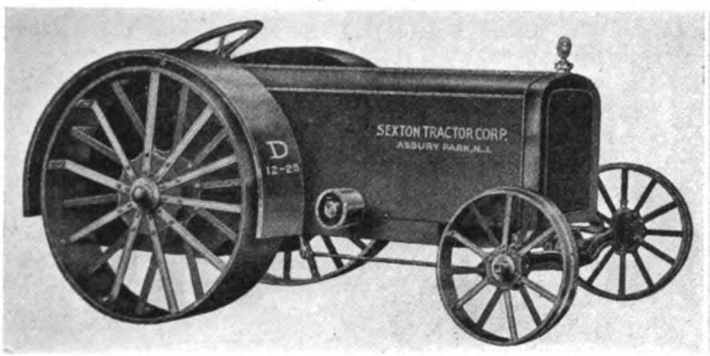
The National



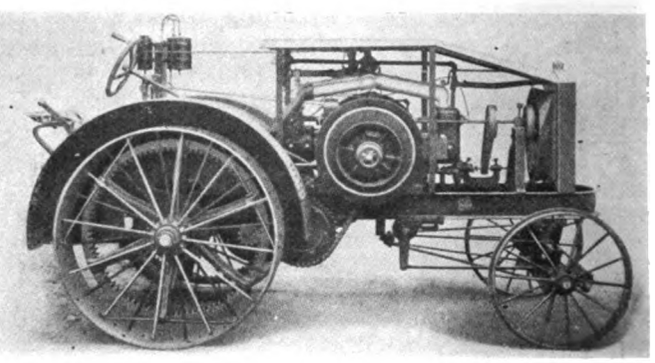
The Wallis



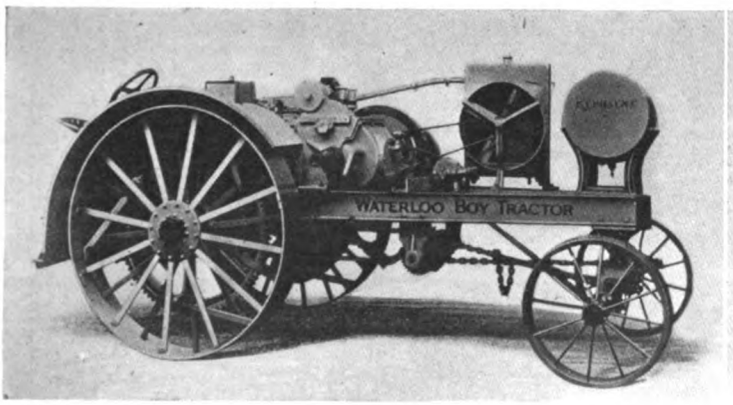
The R. & P. with T. & P. wheels



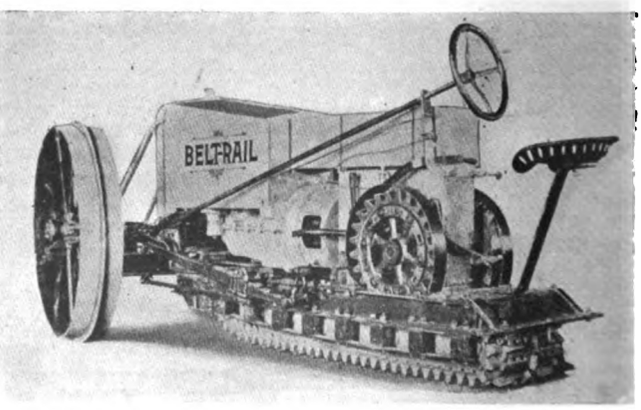
The Sexton



The Leader



The Waterloo Boy



The Belt-Rail

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Dope Poisoning

(*Continued from page* 495)

worked in a narrow aisle with wings stacked close on either side, drying or in course of doping, and the sun beat on the glass roof and walls.

The nervous symptoms were sometimes fairly severe, resulting in loss of consciousness, with temporary respiratory failure. Two men were doping wings in a room that had no artificial ventilation, and one of them was taken with dizziness and faintness and fell to the floor. The other, stooping to help him, upset the pail of dope, spilling some of it on the clothes of the prostrate man. Both had to be carried out into the open air, but the second man revived fairly quickly; the first was unconscious for a short time and had an alarming respiratory failure, so that artificial respiration had to be resorted to and his dope-soaked clothing removed before he revived. However, by the time the doctor arrived he was breathing again, and neither man experienced any lasting result, though both felt weak for several days.

Nausea and headache are likely to follow one of these attacks of dizziness and faintness, but symptoms of abdominal disturbance of any seriousness were apparently not present.

Constipation was complained of only occasionally. Two men spoke of an increased craving for food at the same time that they were losing weight. Men who use tetrachlorethane dope for many weeks or months are said by fellow workmen to have a dull, dopey look in the eyes.

The men using acetone-amyl acetate-benzol-methylalcohol dopes did not complain nearly so often of dizziness, drowsiness, or attacks of faintness as did the tetrachlorethane men.

Some of the men using amyl-acetate dopes complained of headache during the first hours of work, of cold hands and feet, of itching eyelids, watery eyes, feeling of dryness in the throat, and that vague sensation of drowsiness, slight nausea, and weariness, which they describe under the term dopey.

There seems to be a general impression among the men who use tetrachlorethane dopes that they are less harmful than the dopes containing amyl acetate. The disagreeable odor of the latter and its irritating effect on the eyelids and on the throat are experienced at once, while tetrachlorethane, with its less overpowering odor, has no immediate effect, and seems to the workmen comparatively harmless. This opinion is shared by some physicians also, but it is quite wrong. Amyl acetate, though disagreeable, is not at all a dangerous poison, while tetrachlorethane is a slow, insidious poison to the cells of the liver and kidneys. Nevertheless, it is not at all unusual to hear a foreman say that he tried at first to use an amyl acetate dope, but had to give it up and take one with tetrachlorethane as a solvent, because his men could not stand the banana oil.

It must be remembered that the effect of these volatile solvents on workers in American airplane factories has not really been tried out. They have been exposed to fumes only at intervals and for short periods. Fifty-three dopers were asked as to the number of weeks or months they had been employed and all but five had worked less than a year. Seventeen had been doping for less than one month, 12 from one to three months, and 11 from three to six months, leaving only 13 who had worked over six months.

This is one reason why there has been no serious poisoning from volatile dope solvents in this country up to the present time. Another reason is found in the fact that much of the doping has been done in the open air, or under a shed with open sides, and so the fumes from the solvents were rarely heavy. Naturally since our entrance into the war these conditions have changed, and we have no reason to think that we shall escape the experience of the British and Germans with toxic jaundice if we continue to use tetrachlorethane dopes and do not adopt vigorous methods for the protection of dopers from fumes, for from now on there will be many men at work doping throughout their full shift, and they will be in rooms filled with dope-covered fabric, nor are the other solvents free from dangers. Indeed their poisons may prove to be greater than we now think.

British Instruction to Avoid Dope Poisoning

(*Continued from page* 495)

out, improvement in health has resulted. And when such an arrangement is adopted occasional necessary overtime might, it is suggested, be undertaken by those on the out turn rather than by those who have already worked a full day in doping.

In addition to the alternation referred to, in one factory the women engaged in doping are made to spend half an hour morning and afternoon in the open air, so that no spell of work in contact with the fumes lasts longer than two hours.

(c)—*Periodic medical examination.*—A fortnightly medical examination has served a useful purpose, both in reassuring the workers and also in enabling those showing premonitory symptoms to be suspended or transferred to other work. The objective signs, however, which the surgeon has to guide him are few, and he can be materially assisted by information from the foreman or matron as to the state of health of the workers in the intervals between his examinations. After each visit the surgeon should state in writing the names of those (if any) whom he considers should be—

(a)—Suspended as definitely suffering from dope poisoning necessitating absence from work until they are quite well, or

(b)—Transferred temporarily to other work as a precautionary measure on account of equivocal signs.

8—Medical supervision on these lines has been adopted on their own initiative or on suggestion from the factory department in several aeroplane works, and the same course should be pursued in all where doping is continuous. It is important that it should be carried out by a medical practitioner who is familiar with the nature of the work and the symptoms to which it may give rise, preferably by the certifying surgeon, as he is in touch with the department and is thus kept informed of the latest observations on the subject. A health register and instructions as to the conduct of the examination will be sent by the medical inspector to the medical man whom you appoint for the purpose as soon as notice of his name is received here.

9—A worker suffering from effects of dope should be excluded from all contact with it until he is quite well, a medical certificate to that effect being obtained. Instances are known in which premature resumption led to recurrence of symptoms in an aggravated form.

10—*Instruction to workers.*—Certain apparently small points have been noticed which have a bearing on liability to attack. Some instruction to new workers as to how they can best avoid inhalation of fumes without interfering with work is called for, especially bearing in mind the youthfulness of some of them.

(a)—Doping should be commenced at the end of the wing nearest to the exhaust fans and should proceed backward from that point.

(b)—In some factories the wings, as soon as the doped surface is "tacky," are carried to a drying room or closed chamber (separately ventilated), thus diminishing largely risk from inhalation of fumes. Where no such arrangement exists, the wings should be placed to dry in a position between the workers and the exhaust draft, but not so as to obstruct the fans.

(c)—After doping, the safest position for the worker is that nearest to the fresh air inlets, but frequently men and women are seen standing close to the exhaust, and therefore breathing the air which is most highly charged with the noxious vapor; the reason being that either the flat top of the outlet duct has been found a convenient place to keep dope pots, brushes, etc., or the light is better there than at the far side. Shortsightedness, unless corrected by glasses, should debar from taping if not from doping.

(d)—Work should not be commenced on an empty stomach, and where tetrachlorethane is an ingredient of the dope a worker "must not be allowed to take a meal or to remain during the times allowed to him for meals in any room in which such substance is used." (Factory Act, 1901, S. 75.)

Hence the need for provision of a properly equipped meal room on lines suggested by the health of munition workers' committee is self-evident.

11—Even if, as is hoped, discovery of an efficient substitute enables use of tetrachlorethane to be eliminated from the dope, exhaust ventilation will still be necessary to prevent the effects (fortunately much less noxious) from such solvents and diluents as benzene, acetone, and methylated spirit, which must necessarily continue to be used.

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AUTOMOTIVE INDUSTRIES
The Automobile

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Cars at a Premium

TRANSPORTATION difficulties and the utilization of plant space for war work have resulted in the reduced automobile production which was predicted some time ago. The pendulum has now swung so far over to the other side that it is a matter for careful consideration whether or not the output of the factories this year is going to meet the demand of the country.

When the Ford Motor Co., for instance, curtails its output by 50 per cent it means that 1500 low-priced cars less are turned out every day. This leaves a demand which must be met by other concerns, and even if only two-thirds of this business were to be distributed among other manufacturers it would mean 1000 possible sales of low-priced cars per day. However, with production reduced all over the country from 30 to 40 per cent below what it normally would have been, it is difficult to see how the demand is going to be met.

Present indications are that automobiles are going to be at a premium by July 1. This is true not only of new cars but of used cars as well. Shipments to eastern points have been discontinued by several of the largest producing concerns simply because of freight embargoes. The result of this is that New York dealers are paying express rates for quick deliveries. It is even impossible to secure express equipment as promptly as desired, with the result that, unless cars are driven from the manufacturing points to the eastern market, they cannot be delivered.

The next two months are the most difficult period of the year for drive-aways in the Middle West, where the roads are of the so-called gravel construction. These roads become so soft in the early spring that they are impassable, and manufacturing districts are practically isolated in some instances as far as road traffic is concerned.

With this situation in mind, manufacturers in a position to produce cars at the present time should by all means turn out the maximum possible number to take advantage of the coming market. The material situation is no longer a hindrance to any serious extent, and with the roads cleared for drive-aways there is no doubt that those who are prepared will reap a reward for their foresight in the months of May, June, July and August, as well as during the fall season.

Volumetric Efficiency

WHILE the term volumetric efficiency—which has come to be very much used in internal combustion engine literature, especially since kerosene and distillate have been widely adopted as fuel and preheating of the mixture has become necessary—has a fairly definite meaning, we do not remember ever having seen an exact definition. Efficiency in engineering terminology is generally defined as the proportion or the percentage of results actually obtained to the best results obtainable under ideal conditions.

Now, the most air that can be drawn into a cylinder by the method usually employed is that corresponding to the piston displacement volume at atmospheric pressure and temperature, and it would seem at first sight that this would be the logical basis for determining the volumetric efficiency. However, as the air is drawn into the cylinder, gasoline is mixed with it and vaporized, and this gasoline vapor necessarily occupies some space, so in actual operation it is quite impossible to draw in an amount of air equal to the piston displacement volume at atmospheric pressure and temperature. True, the relative volume of the fuel vapor is very small. With a weight ratio of 16 to 1 between the air and the fuel and a vapor density of the fuel of a little over 3, the volume occupied by the fuel in the gaseous state is only about 2 per cent of the total. Nevertheless, it is desirable that volumetric efficiency should have an absolutely definite meaning and it might be well for the Research Division of the S. A. E. Standards Committee to say whether it should be based on a piston displacement volume of air at atmospheric pressure and temperature or on an amount of air smaller than this to make allowance for the fuel vapor in the air.

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The Liberty Engine

NOW that it has been conclusively demonstrated, and we hope to the satisfaction of all those who opposed the standardization work in this engine, that the Liberty aviation engine is a success far beyond the expectations of the most sanguine, that the War Department and the Aircraft Production Board will not fail to impress the country through a good publicity campaign of what has really been accomplished.

The development of the Liberty engine stands as one of the greatest victories of the war and as one of the great if not the greatest contribution America has made. Ten times more has been accomplished with this engine than is generally known throughout the country, due to the desire to keep the information from those who might misuse it. It would be better to get much of this information to those in our own land who do not know it and would be better war workers if they did, than to work so hard to keep in the dark what has unquestionably been known in Germany for months.

A great good can be accomplished at home by a fuller knowledge of the performance of this engine. As yet not a few of the baseless rumors of troubles with the engine have not been sufficiently stamped out. The enemy within our ranks has been very active and has been too quick to turn a situation into a veritable criticism or knock.

A recent example was that of a news item mentioning that the first Liberty engine had been shipped to a certain aviation field with instructions not to use it for flying but for instruction only, the kickback being the inference that it was not reliable enough for flying.

This was not the case, the aviation field in question asking for one for instruction purposes only. The engine shipped was one of the earliest models and which did not incorporate all of the refinements of the jobs that are now going through production and are being shipped to France and being flown so generally in this country.

Some remarkable cross-country flights have been made and the nation should get this convincing evidence of the prowess of the engine and the plane.

The Kerosene Knock

THE exact reason for the kerosene knock, which has been such a problem to overcome in the burning of kerosene in tractor engines, remains a much mooted question among many tractor engineers. Reducing the compression, adding a percentage of water to the explosive mixture, improved water-jacketing of the cylinder heads and cylinder walls, the valve seats and the spark plugs, have all been tried, and while they bring results they do not strike at the fundamental solution of the problem.

Various explanations of the knock have been made but not sufficient research work has been done in different laboratories to give as complete an analysis of the subject as it warrants. The person furnishing a correct and comprehensive solution of the mystery will perform a peculiarly valuable service that should reduce the too general abuse of kerosene in that it is not being efficiently burned to-day as is gasoline. It is relatively easy to operate a vehicle on kerosene if no regard is given to the consumption per horsepower hour and flexibility, but where economy and flexibility are taken into consideration the problem becomes very much greater.

One research engineer, who has been working actively on this task for several years and who is yet far from the end of his labors, ascribed the kerosene knock to secondary explosions or detonations, some of which take place quite some time after the original explosion and often after the piston is well past the top center. Some of these secondary explosions are very violent, producing high pressures for very short periods. Numerous experiments seem to establish a marked similarity of such explosions with different grades of kerosene, whereas in other fuels such detonations are entirely lacking. These explosions and the resulting knock seem the best evidence that kerosene is not being efficiently handled. The very nature of kerosene makes the problem much more difficult than with other fuels which are more uniform in their constituency.

Tractor Ratings

ONE benefit to be gained from industries getting together and co-operating as compared with keeping apart and needlessly competing is that one may profit by the merits as well as the faults of the other. In this respect there is opportunity for more good coming to each industry by the automobile and the truck and the tractor getting into closer contact. Each has suffered or is suffering from similar abuses.

First the automobile was overrated in horsepower and speed and damage was done. Some firms seriously injured themselves by such tactics. Then came the motor truck and the merchandising talent ran rampant in claiming 100 per cent overload, high speeds and lack of attention. Many a good truck prospect was killed by the extravagant claims of the merchandiser. Lastly, we have the farm tractor being overrated by not a few concerns, only to find the maker reaping his own wild oats by the antagonism bred within the farmer and also the doubt that arises in the farmer's mind. Already tractor overrating is exhibiting a boomerang influence and much greater effect will follow if the pernicious policy is continued.

It is unfortunate that some tractor makers practically refuse to co-operate on some standard method of rating. Each firm thus refusing is only fogging the issue with the farmer, and while such makers may picture some individual advantage it has happened in the past that those gross offenders have always had to bear their proportion of the punishment.

It will prove a great advantage to the entire tractor industry not to befog the issue but to get together and make tractor sales easier for all. Co-operation will accomplish much more than misleading competition.

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Latest News of the

Agreement With War Industries Board

Favorable Arrangements for 1918 Production—Suitable Coal Agreement

NEW YORK CITY, March 7—An agreement has been reached between the National Automobile Chamber of Commerce, through its Fuel Committee and the War Industries Board, with regard to passenger car production, which is a very favorable one as relating to the automobile industry, and has every indication that the War Industries Board is giving the most careful consideration to all industries.

The agreement is good evidence of the fact that official Washington recognizes how essential it is to maintain all industries whether so-called direct war industries, that is, those manufacturing guns, shells, clothing and everything needed in the war zone, and also what has been designated as non-war industries, namely, those in which the products are not so entirely utilized in the war zone.

According to the agreement the automobile manufacturers are asked to reduce their 1918 output approximately 30 per cent as compared with what their plans for 1918 production were on July 1, 1917. Supposing at that time a firm committed itself to parts and materials for 100,000 automobiles, such a firm, under the new agreement, would produce 70,000 machines by July 31, 1918.

Such an agreement is very favorable to the automobile industry in that the majority of cases it will not mean any different program of production than what the different factories have been pursuing for many months. In other words, the majority of factories have been manufacturing at a lower pace than 70 per cent of their commitments for last July, and as such the present agreement does not have any effect. There are other companies which may have been manufacturing but 50 per cent of their commitments, and such will, under the agreement, be permitted to increase from now until next July in proportion as they have dropped behind the 70 per cent mark from last July up to the present time.

The agreement should have a very stabilizing effect on the industry in that there is now a definite understanding with the government, and such agreement means a recognition on the part of the government of the essential work of the automobile industry in war times. It was very questionable if such a favorable agreement could have been accomplished last November when the chrome steel crisis arose, and it is very questionable if anything so favorable could have been arrived at in January when the coal crisis was on. The industry certainly can congratulate the War Industries Board on the broad view it takes of industry in general and the necessity of properly looking into the national functions of an industry, such as the automobile industry, before determining upon any policy of curtailment with regard to it. It is almost a certainty that if a curtailment had been arrived at in November or January, it would have been much more severe than the present one.

The present curtailment can scarcely be looked upon in the sense of the word, as there will only be two or three firms at the outside that may have to reduce present production.

Undoubtedly the right of appeal by any manufacturer to the War Industries Board is covered in the agreement, as there is nothing to indicate that the War Industries Board has not the fullest appreciation of the national and world necessity of the automobile as a conserver of man power in these war days.

The present agreement, besides being with the War Industries Board, which covers the question of materials for automobiles, and also takes consideration of transportation, etc., further is an agreement with the Fuel Administration and insures the manufacturer coal. This is a very considerable factor in the case.

—

Liberty Engine Production

WASHINGTON, March 5—The Liberty airplane motors will soon be turned out at the rate of 300 per day from 5 specially designated automobile and airplane factories. The Ford Motor Co. will produce 100 a day, Packard Motor Co., Marmon Co., Lincoln Motors Co. and the General Motors Corp. 50 a day. The present program calls for 22,000 planes to cost about $2,0000,000,000. The greatest production is expected to be attained early this summer. At this time manufacturing energies are concentrated to the high power battle planes of the 12-cylinder type, which are developing 1 hp. to every 2 lbs. weight, 450 hp. to approximately 900 lbs. weight.

—

$450,000,000 More for Aircraft

WASHINGTON, March 6—The War Department yesterday asked Congress for an additional appropriation of $450,000,000 for aircraft. Of this amount, $200,000,000 is needed to make up a deficiency in the $640,000,000 aviation fund provided last year, and the remainder will be used for new aircraft supplies and equipment.

N.A.C.C. Withdraws from Automobile Committee

Hugh Chalmers, Its Representative, Resigns—Lee Also Has Withdrawn

NEW YORK CITY, March 6—The Automobile Industries Committee, so far as the National Automobile Chamber of Commerce, Inc., is concerned, has ceased to be a representative of the chamber, and Hugh Chalmers, the N. A. C. C. representative on the committee, has resigned. For some months Mr. Chalmers is going to give his services to the N. A. C. C. in connection with the Washington work, as he is very familiar with Government matters, due to his poisition on the Automobile Industries Committee since its inception last November.

The N. A. C. C. for several months has been maintaining its own Washington office under the direct management of Alfred Reeves, its general manager, and this office will, it is understood, continue to be the point of contact between the Chamber and the Government departments.

The Automobile Industries Committee formed last November consisted of A. W. Copland, representing the Motor & Accessory Manufacturers, Inc.; Hugh Chalmers, representing the N. A. C. C., and J. R. Lee, representing the Ford company. Mr. Lee has withdrawn from the committee, so that there remains but Chairman Copland representing the accessory industry. It is understood that a meeting of the Motor & Accessory Manufacturers will be held soon at which its attitude with regard to the committee will be taken up.

Since its inception the Automobile Industries Committee has accomplished much good. It was appointed at the time of the chrome nickel crisis when shipments of this metal to the automobile industry were being stopped. At that time the Government's attitude towards the industry was that of a non-essential. The committee served as an excellent point of contact not only between the Council of National Defense, but also between Government departments. The attitude of the Government towards the industry has changed from that of considering it a non-essential up to that of considering the passenger car a public utility as it was considered during the coalless days in January. The committee threw itself into the breach at the critical period in November and warded off any precipitate

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Automotive Industries

Plan Strict Policy for Industry

Some Curtailment of Non-War Manufactures — Coal Production Hampered by Transportation

WASHINGTON, March 6—The attitude of the Government toward industry during this year is awaited with interest by all manufacturers. Up to this time we have had many conflicting opinions and conflicting decisions.

Starting the war with hazy ideas for completely abolishing some so-called non-essential industries and seriously curtailing others, most of the officials here have now revised their opinions to a more logical basis.

We can gather some idea of the attitude of the Government toward industry by the President's outline of the increased functions of the War Industries Board and conveyed by him to Bernard M. Baruch this week in a letter requesting Mr. Baruch to accept the chairmanship of the War Industries Board. In addition, in an unofficial letter to Waddill Catchings of the United States Chamber of Commerce, George N. Peek, Industrial Representative of the War Industries Board, has made clear his personal views and those of some of his associates in the Council of National Defense. These are not strictly official views, but might be regarded as quasi-official.

The views of Mr. Peek and President Wilson are particularly important, because Mr. Peek represents the Government in its dealings with the automotive industries. Having just concluded a series of conferences with the fuel committee the President's views show the attitude we may expect from the War Industries Board, Fuel Administration and other Government agencies toward the automotive industries as regards allowances of fuel, steel labor and so forth, for we may be assured that all Government departments will reflect the presidential viewpoint.

"The first consideration of the nation and of all its industries," stated Mr. Peek, "must be to contribute the utmost toward winning the war, and to that end business must when necessary be diverted from its established channels into new channels. Or if absolutely necessary, the flow must, during the war, be entirely stopped in order to provide adequate labor and materials for war needs.

"It does not, however, follow that there will be less business than usual, but rather more unusual business."

With regard to non-essentials, Mr. Peek said that "if the so-called non-essential industries are cut off many of them would be ruined and others permanently crippled.

"War industries and railroads must have at least 100,000 tons more coal per day than they had in 1917 or the flow of war necessities will be dangerously interrupted. This increase must be met by curtailment of the so-called non-essential production and by economy at every furnace door, both household and industrial.

"The demands for 1918 to carry out the program for production of necessities for the war, in addition to the normal business, would greatly exceed any possible production and distribution of fuel, so there is but one remedy which is to limit the production of non-war industries sufficiently to provide for:

"(1) War needs direct and indirect.

"(2) Necessities for public welfare and domestic consumption.

"In accomplishing the desired end it should be our effort to divert the energies of non-war industries as far as possible to the production of essentials for war so that each industrial center may use existing facilities with its labor living at home, happy and contented.

"In the re-adjustment process it is inevitable that the normal business of some industries must be interfered with in order that production of war and public necessities be kept at the maximum. It may be that some plants because of lack of power, shortage of labor, raw materials or transportation may have to suspend entirely. These sacrifices must be endured in the interest of our first object, which is to win the war."

The statement also points out that on account of transportation conditions the United States probably will mine little if any more coal in 1918 than in 1917.

In his letter to Mr. Baruch, President Wilson outlines the vastly increased powers of the War Industries Board as follows:

(1) The creation of new facilities and disclosing, if necessary, the opening up of new or additional sources of supply.

(2) The conversion of existing facilities, where necessary, to new uses.

(3) The studious conservation of resources and facilities by scientific, commercial and industrial economics.

(4) Advice to the several purchasing agencies of the government with regard to the prices to be paid.

(5) The determination, wherever necessary, of priorities of production and of delivery and of the proportions of any given article to be made immediately accessible to the several purchasing agencies when the

(*Continued on page* 519)

W.T.B. May Change Export Plans

Regulations Between Maker and Distributor on War Tax Will Probably Be Altered

WASHINGTON, D. C., March 5.—The War Trade Board has been asked to modify its present plan of export regarding automobile parts. Under the existing scheme separate blanks must be used for every different kind of metal exported. This naturally would necessitate unreasonable labor for parts exporters. It is expected the War Trade Board will view this matter sanely and modify its regulations.

The Internal Revenue Department has also had attention called to unreasonable regulations. At the present time when an automobile maker ships a chassis to a dealer he pays 3 per cent tax on it, and the tax ends there. However, when an automobile maker like Cadillac ships a chassis to its agency in New York, although entirely separate from the parent company, the tax is demanded not only on the chassis but also on the body which the agency places on the chassis. The dealer is not asked to pay this tax. The agency is asked to pay it, and this creates unfair competition, as it forces the Cadillac agency, for example, in New York City to pay more than the Cadillac dealer in another nearby city. It is anticipated the Internal Revenue Department will rectify this present difficulty.

Return Load Gains

The matter of return loads on trucks used for rural express purposes is becoming very important, and it is receiving much consideration. The Fuel Administration and the United States Chamber of Commerce have both testified this past week in publicity to the growing importance of the use of motor trucks for transportation and freight and of the use of the return loads plan.

—

Pennsylvania Buys Tractors

WASHINGTON, March 7—The State Safety and Defense Commission of Pennsylvania yesterday appropriated $50,000 to purchase 25 farm tractors to be rented to farmers by the State Department of Agriculture at as low rates as possible. Lieutenant-Governor McClain is chairman of a committee to make the purchases. There will be more tractors purchased after further appropriations are made in the near future.

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Trucks End Railroad Congestion

Freight Situation in Hartford Relieved by Co-operation of Mayor and Truck Owners

WASHINGTON, March 4—The Fuel Administration has notified all of its various state divisions of a plan by which Mayor Frank A. Hagerty, Hartford, Conn., took advantage of the recent fuel shut-down order to use motor trucks for improving the freight and fuel situation.

When the fuel order was issued Mayor Hagerty got in touch with the heads of several large industrial plants and proposed that they use as many of their men and trucks for the handling of freight as possible during the idle days. A general invitation was issued to the manufacturers and merchants of Hartford for a meeting the following morning, together with a request that all manufacturers having vehicles suitable for moving freight should volunteer their use, together with men to operate them.

Large Manufacturers Respond

The large manufacturers and merchants responded almost to a man, and at the meeting an executive committee was formed to manage the work. A central office was obtained in one of the banks, telephones installed and comprehensive plans for the work immediately laid out.

Actual work began the following morning. The railroad officials had reported that the congested condition of the railroads had been brought about largely by the fact that consignees had been waiting to have their cars placed on their own private sidings, and that freight was coming in too quickly to permit this. It was therefore decided by the committee that cars would be handled as quickly as possible, and placed on public as well as private sidings. Under the circumstances consignees were not to insist that the cars be placed on private sidings, but to take them wherever they were placed by the railroad.

Handle Own Goods First

The committee also decided that each concern furnishing trucks should devote its attention first to handling its own cars, and, after these were emptied, permit the truck to move other freights irrespective of the consignee. This meant that some freight would be trucked without cost to particular consignees, but the work done was so important that this question was subsidiary.

The railroad made a special effort to place full carloads of freight where they could be reached by trucks. As a result of 2 days' work the 300 freight cars which had been congesting the local tracks were unloaded.

The committee was ready to renew the work on the following Monday, and on each Monday since, but the campaign of the first 2 days was so successful that this was not necessary. The committee is still organized and closely in touch with the local freight situation, so that it may step in at any moment to relieve congestion.

—

Little Relief from Lifting of Embargoes

DETROIT, March 1—The lifting of practically all Michigan and Ohio embargoes has relieved the tight freight situation but slightly. Manufacturers as well as railroads hold that this congestion was caused by the recent most unusual weather conditions, the worst the railroads ever had to fight, and that as long as a car shortage exists there will be no relief for shippers. The government is using so many cars in the transportation of grain, munitions and other necessities of war that only a small percentage of railroad equipment is available for individual shipping requirements. Most of the cars released by the lifting of embargoes went into government use. The Ford Motor Co. reports, however, that this new condition has given it an opportunity to divert to the East and South some of the traffic that was formerly, of necessity, going West, thus making it possible to equalize the distribution of automobiles.

—

Canada Removes Import Duty on Tractors

WASHINGTON, March 4—The Canadian Government has issued an order providing for the free admission of farm tractors until Feb. 7, 1919. The order reads as follows:

"Remission and refund of duty is hereby authorized in respect of traction engines costing not more than $1,400 in the country of production, designed to be moved by steam or other motive power for farm purposes, and parts thereof for repairs; and traction attachments designed and imported to be combined with automobiles in Canada for use as traction engines for farm purposes and parts thereof for repairs."

The duties thereby remitted amount to 27½ per cent ad valorem in the case of imports in the United States, it being assumed that the exemption applies to both the customs release and the war surtax.

—

Gear Manufacturers to Convene

NEW YORK, March 4—Gear Standardization will be the principal subject of discussion at the second annual convention of the American Gear Manufacturers' Assn. to be held at the Green Brier Hotel, White Sulphur Springs, W. Va., on April 18, 19 and 20. The convention will begin with meetings of committees on Thursday morning, April 18. The first session will open at 1:30 with addresses by President F. W. Sinram and a representative of the United States Chamber of Commerce, of which the association has just become a member. The banquet of the association will be held Friday evening.

Plan Rural Express Service

Highway Transport Committee to Establish Routes from Farms to Cities

WASHINGTON, March 4—Considering the shortage of foodstuffs, the greatest problem of the near future, the Highway Transport Committee, headed by Roy Chapin, has worked out a plan for rural express services from farms to cities wherever practical. The committee has made a special study of the conditions in Maryland and the area around Washington, and is arranging for rural express to provide transportation of food for the new 100,000 inhabitants of the Capital.

National Survey Carried On

A national survey has been carried on in co-operation with the Department of Agriculture and the Food Administration. Questionnaires have been sent to farmers and to operators of rural express systems in Maryland and near by and some have resulted in important replies. A blueprint hanging in the office of Roy Chapin shows the complete chart of the service in Maryland, displaying the motor truck routes from Washington to Germantown, Latonville, Redland and Ashton, an aggregate of 93 miles. Seven trucks are used, making a total daily mileage of 286 miles. Out of Baltimore there are 14 such routes, aggregating 1192 miles daily. The good roads of Maryland are one of the factors that stimulated the service there. Maryland has 1500 miles of good roads, of which 300 miles are used for rural express.

The questionnaires sent out resulted in urgent requests by farmers for better roads. Many said they would go out of business if they did not have better roads to help them get their produce to market. The replies also showed that the trucks not only haul the goods to market but help bring other merchandise back to the farmers from the city merchants. As an example of the work done, one man operating rural service brings 400 gallons of milk and cream daily to Washington. Recently he also hauled 827 bushels of wheat to Rockville, Md. He hauled 200 barrels of corn from the field to Washington in 7 days, and his hauls include eggs, poultry, fruit, potatoes and calves, and on his return trip he takes coal and other merchandise back from the city to the farmer.

One farmer near Baltimore reported that in addition to his regular route service the operator in his district also handled for him 100 live hogs, 200 live sheep and 800 bushels of wheat, and brought back to the farm 190 tons of fertilizer, 80 tons of lime, 65 tons of building sand and 70 tons of coal.

One reply showing the importance of the rural express system was from a farmer who said that "without the truck it would take a man and a pair of horses

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2 days to make the trip to Washington and back, which is now made in 3 hours with the truck."

Another reply was to the effect that "I favor the rural express system because labor is scarce and the people in this neighborhood would have to go out of the dairy business without the rural express service, as the railroad station is 5 miles away over a dirt road and the train is due there at 7 a.m."

Chapin, discussing the situation, reported: "Mr. Hoover refers to corn and potatoes rotting because they cannot be moved. Tours through Maryland show exactly that condition because farmers cannot get their produce to railroad stations for shipment."

The Maryland rural express systems are regulated by the public service commission. The State Highway Commissioner of Maryland and the State Highway Commissioner of Virginia are preparing maps and routes showing how Washington can be served as Baltimore is.

—

Motor Parcels Post Route in Ohio

COLUMBUS, OHIO, March 2—The first Ohio motor parcels post route has been established by the post office department between Columbus and Zanesville, via Reynoldsburg, Etna, Hebron, Brownsville and Hopewell. This is a distance of about 60 miles. A 2-ton truck, capable of maintaining a speed of 25 miles an hour is being used, and additional trucks will be installed as the volume of business increases.

—

Shipping Maxwells to Lyons Fair

DETROIT, March 4—The Maxwell Motor Sales Corp. received half of the total shipping space allotted for the use of automobiles being shipped to the Third Annual Fair at Lyons, France. In the shipment were 2 truck chassis, 2 touring chassis, 1 town car chassis, 1 sedan, 1 roadster, 1 all-weather top, 5 touring cars with right hand drive and a Chalmers touring car. The freight charges will be as great as the total cost of the cars in this country. The cars will be admitted free of duty unless they remain in France.

—

Interurban Shipments Not Popular

DETROIT, March 4—The few automobile manufacturers who are sending their cars over the Interurban lines are doing so only where it is absolutely necessary. Great difficulty is experienced in the loading of them due to the fact that the electric cars are of the side door type which makes it difficult for the automobiles to enter.

The Buick company does not ship more than 6 cars a week via the electric route. Reo averages 15 carloads a week, and has been using this mode of shipping for 30 days. This form of transportation permits only short hauls; when the terminal is reached the car must either be transferred to another line or proceed on its own power.

G. M. Earnings Are $26,285,951

Equals 34.2 Per Cent on Common—Increase in Profits Since Reorganization

DETROIT, March 6—The report of the General Motors Corp. which succeeded the General Motors Co. on Aug. 1, 1917, shows that the General Motors properties earned undivided profits of $26,285,951 during 1917, after charging off $6,901,889 for war taxes and extraordinary expenditures. This is equal to 34.2 per cent on the $76,873,300 common stock outstanding on Dec. 31.

The undivided profits in the 5 months from Aug. 1 to Dec. 31, amounted to $13,792,983 as against $12,492,968 in the first 7 months of the year. The former covers the operations of the General Motors Corp. and the latter those of the General Motors Co.

The balance sheet as of Dec. 31, shows current assets of $80,275,577, against current liabilities of but $15,524,044, giving a net working capital of $64,751,533. Cash on hand at the end of the year totaled $18,865,645.

Surplus on the common stock amounts to $26,285.951 as against $23,731,952 at the date of reorganization.

Comparison of results for the 1917 calendar year with those of the fiscal years ended July 31, 1917, 1916 and 1915 follows:

	Dec., 1917	July, 1917	July, 1916	July, 1915
Net profits of dep ...	$34,634,854	$29,132,542	$29,146,107	$14.926,322
War taxes & ext. exp...	6,901,889	4,053,315	.....	.....
Balance ..	$27,732,965	$25,079,226	$29,146,107	$14,926,322
G. Mo. prop..	27 389,737	24,780,916	28,789,560	14,457,803
Pfd. divs. ..	1,103,785	1.048,964	1,048,964	1,048.964
Sur. for com..	*26,285,952	$23,731,952	$27,740,596	$13,408.839

*Equal to 34.2% on $76,873,300 common stock outstanding.

The balance sheet of the General Motors Corp. as of Dec. 31, 1917, compares as follows with that of the General Motors Co. as of July 31, 1917, 1916 and 1915:

ASSETS

	Dec., 1917	July, 1916	July, 1915
Fixed assets of dep	$38,657,835	$18,366,404	$15,819,851
Patents, agreem., etc....	274,100	355,800	413,500
Misc. invest.....	2,030,273	358,428	367,184
Cash.....	18,865,645	22,436,574	14,526,124
Marketable securities...	1,255,000	286,000	1,001,000
Receivables...	13,595,538	5,629,633	3,944,680
Inventories.....	46,559,394	25,100,349	14,049,298
Deferred expenses	854,434	389,630	533,585
Goodwill.....	11,697,503	7,934,198	7,934,198
Total...	$133,789,724	$80,897,019	$58,589,423

LIABILITIES

Preferred stock.....	$19,676,800	$14,985,200	$14,985 200
Common stock.....	76,873,300	16,511,783	16,506,783
6% notes.....	.....	.....	2,328,000
Subsid. stk. and surp....	1,399 583	1,228,458	982,423
Accounts payable.....	10,665,717	7,264,443	1,380,907
Taxes, payrolls, etc	4,858,326	2,690,832	1 270 302
Pfd. div. due.....	196,768	262,241	262,241
Res. for taxes.....	6,939,018	.....	.....
Res. for contingencies...	1,671,818	958,464	888,406
Surplus.....	11,508,392	36,995,597	19,985,159
Total.....	$133,789,724	$80,897,019	$58,589,423

—

Westinghouse Earnings About 19 Per Cent

PITTSBURGH, March 2—The Westinghouse Electric & Mfg. Co., in its current fiscal year, which ends March 31, 1918, will show aggregate sales of about $90,000,000 or about the same as the 1917 amount. Final surplus of the stock will be less than that of last year, due to war taxes and other factors. Surplus for dividends, after deduction of taxes, will probably amount to between $13,000,000 and $14,000,000, as compared with $18,079,889 last year. This is equivalent to 19 per cent on the total $74,812,650 capital stock outstanding against 24.17 per cent a year ago.

Unfilled orders on the books amount to $130,000,000, exclusive of the machine gun contract which will be filled at the plants of the New England Westinghouse Co. About 60 per cent. of this work is for the Government.

—

4616 Dodge Chassis in Army

DETROIT, March 2—Dodge Brothers report that they have 4616 chassis in government service, distributed among the Signal Corps and the Ordnance and Quartermaster Departments. Those in the Signal Corps are constructed with special truck bodies for carrying telephone and telegraph apparatus and laying lines of communication systems. The Quartermaster Department has 4 Dodge chassis fitted with a 2-ton Smith Universal Form-A-Truck attachment, and can be used with either creeper-type or 2-wheel rear drive. So far only four of these trucks have been constructed, and it is expected that these will be driven overland to Detroit shortly.

—

Peerless Cars Shipped by Trucks

CLEVELAND, March 4—The Peerless Motor Car Co. sent a shipment of passenger cars from the factory to Baltimore, last week, loaded on Peerless trucks. The cost was approximately the same as freight rates, and the time consumed in delivery was less than that required for express shipment. The cars were crated, mounted on the truck body, and arrived at their destination in perfect condition. Other shipments will be handled in the same manner, and it is planned to start 20 cars immediately for New York and Philadelphia.

—

Signal Corps Needs 10,000 Machinists

WASHINGTON, March 4—The Signal Corps of the War Department has issued a call for 10,000 machinists, mechanics, chauffeurs and other skilled workers. Men registered in the draft may be inducted into this service by applying to the local draft board. Men not registered may enlist at any recruiting station.

—

Ford Assembling Branches on Part Time

MILWAUKEE, March 5—Operation of the assembling plant of the Ford Motor Co. here was greatly reduced on March 1 because of the difficulty in keeping the factory supplied with materials and parts from the main works in Detroit. It is stated that 19 of the 38 branch plants have been placed on a temporary part-time schedule.

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Headlamp Tests for Glare

Illuminating Engineers and S. A. E. Obtain Data on Maximum Necessary Light

NEW YORK, March 6—In order to obtain accurate data which might be the basis for reasonable uniform legislation covering automobile headlamps, the Lighting Division of the Standards Committee of the Society of Automotive Engineers and the Committee on Automobile Headlights of the Illuminating Engineering Society held a series of tests last night. These tests had as their object to obtain reliable data covering the following questions:

1—What amount of illumination is necessary to reveal a person, vehicle or substantial object at distances 150 and 250 ft. ahead of the driver's seat?

2—What is the maximum amount of light which may be allowed to reach the driver's eye from an oncoming car without producing intolerable and unsafe conditions of glare?

For the tests, a special apparatus was designed by the Society of Automotive Engineers consisting of two pairs of regulation headlamps having commercial bulbs, reflectors and plain front glasses. These were connected in parallel in a series circuit consisting of the lamps, an adjustable resistance and an ammeter.

How Tests Were Conducted

The test, for which between 50 and 60 observers volunteered, consisted of adjusting one pair of headlamps, by means of the rheostat, until the observer was just able to pick up the object, which was a man walking across the road at 150 ft. The test was repeated for 250 ft.

The lamps representing an oncoming car, 100 ft. distant, were then turned on, and with the lamps corresponding to those on the observer's car as he had last adjusted them to pick up the object at 250 ft., the observer varied the intensity of the lamps on the oncoming car until such brilliancy was obtained as in his opinion was compatible with safe driving. Readings were taken, giving the current draw, as the observer indicated he had picked up the various objects. These will be translated into foot candles at the objects and the averages obtained will serve as the basis of such recommendations as may be made.

Tests Made Jointly

The tests were made jointly by the two engineering bodies, the committee from the Illuminating Engineering Society comprising Dr. C. H. Sharp, chairman; E. C. Crittenden, P. W. Cobb, E. J. Edwards, C. A. P. Halporson, Jr., W. F. Little and W. A. McKay. The Lighting Division of the S. A. E. consists of M. E. McKechnie, chairman, Paul F. Bauder and Wm. T. Jones.

The tests were made on an unlighted stretch of Pelham Parkway, New York City.

Prohibit Private Flying Except Under License

WASHINGTON, March 5—To protect army camps and naval bases from possible attack by enemy airplane, President Wilson to-day issued an order prohibiting private flying of balloons and airplanes except by license of the Joint Army and Navy Board on Aeronautics. Any aircraft disregarding this proclamation, which does not apply to aircraft operated by the United States Army or Navy, will be considered hostile and fired upon.

—

Baruch Starts Conversion

WASHINGTON, March 7.—Bernard M. Baruch, chairman of the reorganized War Industries Board, has started to convert existing facilities where necessary to new uses as suggested by the President. He will co-operate with Dr. Garfield, Fuel Administrator, and has outlined the industries of the country as regards their importance as follows:

1—Manufacturers of food and similar necessities and the machinery necessary for their industry.
2—War materials and the fuel required.
3—Peace and peace time production.
4—Luxuries.

Mr. Baruch has not yet definitely decided upon a list of the so-called luxuries. Dr. Garfield's control over fuel will withhold from the unnecessary industries the supply of coal, thus automatically compelling war production.

—

Another Airplane Mail Route

WASHINGTON, March 7—The Post Office Department has under consideration establishment of an airplane mail route between Washington and Atlanta, Ga., connecting with the several military camps on that route along the lines of the airplane route to be established between New York and Washington.

—

Tire Manufacturers in War Conference

WASHINGTON, March 5—Tire manufacturers were called to Washington to attend a conference to-day with the Motor Transport Section of the Quartermaster Corps. It was decided to use the 40 by 6 dual tires on the standardized trucks in preference to the 40 by 10 single tires. This decision was not reached because of any known inferiority of the single tire but rather because of the definitely known qualities of the 40 by 6 dual tire, it being the policy of the Motor Transport Section not to deal with experiment for the present at least.

—

Army Motor Equipment Cost $54,000,000

WASHINGTON, March 2—The motor vehicle equipment for the 33 divisional camps of the United States army cost $54,000,000 according to figures given out here last week. A large part of this sum is paid for trucks. Each division uses 10 light trucks and 343 3-ton trucks. The cost of building repair shops and heating garages during the cold season amounted to $8,700,000.

Call Salesmanship Congress

Third Annual Session to Be Held in Detroit April 24—To Discuss War Problems

DETROIT, March 5—The World's Salesmanship Congress, third annual session, has been called in Detroit, April 24, 25, 26 and 27. The meeting has been called in advance of the usual dates in order to discuss the war questions at present troubling the nation's business men. The part of salesmanship in winning the war will be a prominent feature of the program. The leading speaker will be Herbert N. Casson of London, England, who is especially delegated by England to address the congress. Other speakers have not as yet been announced, but it is assured that the biggest possible men will be secured to discuss the vital points at issue. The following is a list of topics:

"To Win the War, Can the Nation do Without the Individual Business Man?"
"To Win the War, Must Business Earn to Maintain the Nation's Credit?"
"Must the War Be Waged Entirely on Present Savings, Not Earnings?"
"What Businesses are Non-Essential?"
"Is 'Non-Essential Industry' a Recent and Verbal Invention?"
"What Shall We Do with Business, to Win the War?"
"Is Enough Consideration Being Given to the Difficulty of Starting Up a Business that has been Shut Down?"
"Is Enough Consideration being Given to the Fact that We are Preparing for a Temporary, Not a Permanent War?"
"Are Labor and Materials the Only Things that Can Be of Value in Support of Our Fighting Machine?"
"Are Recent Trade Restrictions Affecting the *Spirit* of the Nation?"
"Are We Sentencing Ourselves to a Seat on the Economic Doorstep of the Universe?"
"Is it Illegal and Unpatriotic for Newspapers to Solicit Advertising and Stimulate Sales at this Time?"
"Will the Restrictions of the Magazine-Zone-Legislation Help Business and Help Win the War?"
"Is So-called American Extravagance a National Commercial Asset or Liability?"
"Does the Collapse of the Railroads Argue the Possibility of National Industrial Paralysis?"
"Is it More Patriotic in War Times to Wear Old Clothes?"
"Are the World Nations Going Hopelessly Bankrupt?"
"Can the Nation Keep on Going Bankrupt Indefinitely and Still Carry On?"
"The Projected War Finance Corporation."
"Economic Destruction vs. Economic Security."
"Artificial Restriction vs. Free Play of Supply and Demand."
"Quantity Out-put of Shells vs. Quantity Out-Put of Motor Cars, Safety Razors and Typewriters."
"Winning By Weight of Metal vs. Winning By Weight of Output."
"The Difference between Adjustment and Curtailment."
"The Citadels of Cash, Credit and Commerce."
"Price Fixing."
"War Ends, but Business Never Does."
"An Ounce of Organized Trade Preservation Now vs. a Pound of Ruthless Trade Warfare Later."
"Either We Must have the Biggest National Scrap-Heap Ever Witnessed, or Else We Must Make the Biggest Efforts Ever Recorded in Industrial Organization."
"Individuals, Not Nations, Do Business."
"Shall We Continue to Build, Repair, Borrow, Lend, Buy, Sell, Venture and Trust?"
"The Economic Weapon the Final Factor in the War."
"Making the World Free Not Only for Democracy, but for Trade."
"How England Is Doing It."
"It Can Be Done."

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The Sale: First Factor of the Selling Process.
The Man: Second Factor of the Selling Process.
The Ship: Third Factor of the Selling Process.
Preparation: First of Preparatory Steps of the Sale.
Prospecting: Second of Preparatory Steps of the Sale.
Approach and Audience: Third of Preparatory Steps of the Sale.
Sizing Up the Buyer: First of the Presentation Steps.
Gaining Attention and Awakening Interest: Second of the Presentation Steps.
Persuading and Creating Desire: First of the Convincing Steps.
Handling Objections: Second of the Convincing Steps.
Securing Decision and Obtaining Signature: First of the Closing Steps.
The Get-Away and Future Orders: Second of the Closing Steps.

—

Plan Strict Policy For Industry

(*Continued from page* 515)

supply of that article is insufficient, either temporarily or permanently.

(6) The making of purchases for the allies.

The chief function of the War Industries Board in the past was to make purchases for the Allies. Hence, these new functions display a considerable broadening of power to include practically complete control of all industries including conservation of existing facilities and resources, creation of new facilities, conversion of existing industries to war work, supervision of purchases not only by the Allies, but also by our various war and navy departments and control of priorities of transportation, of production and of proportions of any articles or materials.

Baruch, at the suggestion of the President, will act "as the general eye of all supply departments in the field of industries." It is expected that the new powers given the board will eliminate competition for supplies between U. S. departments and the Allies, thus centralizing purchasing power.

—

N.A.C.C. Out of Committee

(*Continued from page* 514)

action by way of curtailment that might have been taken at that time.

Since the appointment of the committee 472 different jobs in the way of manufacture of war orders have been placed with the manufacturers of automobiles, trucks and accessories and the committee devoted much of its time to the work of bringing Government departments and the automobile industry together. This work approximates $300,000,000 in Government contracts, this figure not including Ford contracts, which are said to range between $75,000,000 and $100,000,000.

The Automobile Industries Committee did good service for the navy in placing $750,000 worth of contracts for small parts, which otherwise would have been difficult to secure.

—

Changes in King Personnel

DETROIT, March 6—Changes in the personnel of the King Motor Car Co. gave practically a new staff of executives and also a change in the sales policy of the company. Following the resignation of H. C. Bradfield, the office of advertising manager has been abandoned, and hereafter the advertising will be handled by W. B. Nesbitt, New York. Salesmanship advertising details will be handled by Robert Walsh, who is assistant to Wallace Hood.

W. B. Nesbitt has been elected vice-president and will act as personal representative of Artemus Ward, Sr., who is connected financially with the company, and who, it is stated, recently pledged $500,000 additional capital to the company. Part of this has already been paid in.

H. A. Church has resigned as secretary, and H. D. McCullough, formerly of the Aluminum Castings Co., will succeed him.

—

Re-elect Daniel Willard

WASHINGTON, D. C., March 6—Daniel Willard was re-elected chairman of the advisory commission of the Council of National Defense at the annual meeting of the advisory commission yesterday. W. S. Gifford and Grosvenor B. Clarkson continue as director and secretary respectively of the commission as well as director and secretary of the Council of National Defense.

—

Wright-Martin to Make Planes, Too

NEW BRUNSWICK, N. J., March 6—The Wright-Martin Aircraft Corp., which heretofore has confined its activities largely to the production of engines, and at present is producing an order of 3000 Hispano-Suiza engines at the rate of 10 a day, is to take up the production of complete airplanes. It is understood the company is negotiating for 25 machines to be built at its Pacific Coast plant. Five hundred of the 150 hp. engines have been delivered and preparations are being made to get into production on the larger engines. The company has a contract for 3000 Hispano-Suiza engines of 300 hp. The company is to-day moving its executive offices from 60 Broadway, New York, to the New Brunswick plant.

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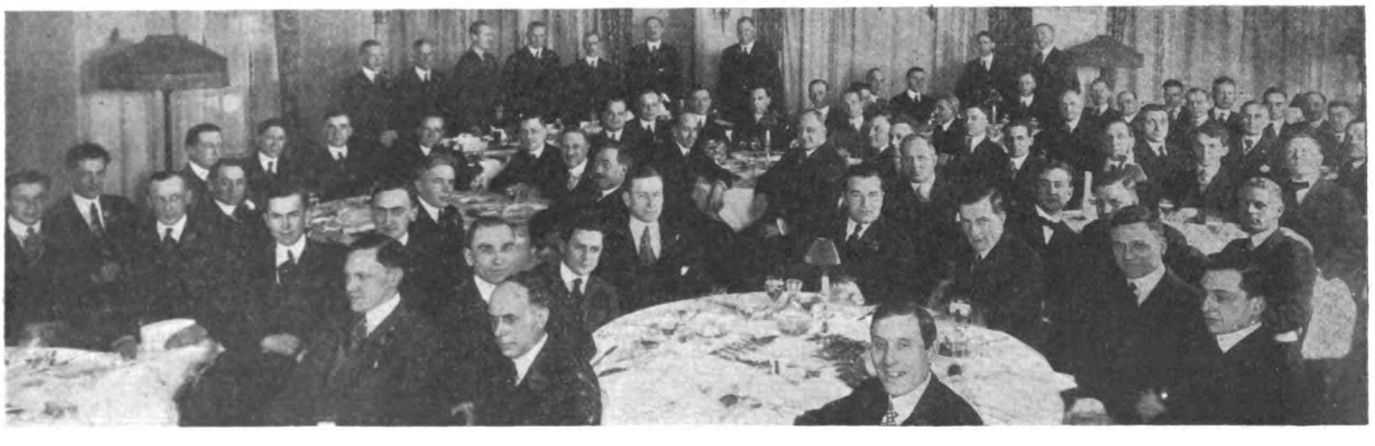
Government Commandeers Platinum

WASHINGTON, March 4—The Government has issued orders through the Council of National Defense for the commandeering, for war purposes, of all crude and unworked platinum in the hands of importers, jobbers and wholesalers. The control will be exercised through the chemical division of the War Industries Board. It is not the intention of the Government to take over and handle directly the present stocks of platinum, but to regulate its shipments by certain conditions. The Secretary of War will fix a price for crude, refined and alloyed platinum, following which notice will be given producers and dealers and blanks issued governing delivery and distribution. The following list indicates in general the order of preference which will be followed in releasing platinum for shipment: No. 1, military needs of the United States Government; No. 2, military needs of Allied governments; No. 3, essential commercial purposes.

—

Standard Parts Holds Sales Convention

CLEVELAND, March 4—The first annual sales convention of the Standard Parts Co. was held in the Hollenden Hotel here Feb. 25, 26 and 27, and was attended by the entire sales organization of the company and many of its executives. The meetings were addressed by President Christian Girl. Director of Sales D. C. Swander was in charge of the gathering. Following the meeting on Monday there was a banquet, and on Wednesday three of the plants of the company were inspected.



First annual convention of sales representatives of the Standard Parts Co., held in Cleveland, Feb. 25 to 27

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Chamber of Commerce Urges Return Loads

Bulletin Sent to All Local Boards Affiliated with It Calling Attention to Plan and Advocating Its Adoption

WASHINGTON, March 2—The Chamber of Commerce of the United States is issuing a bulletin to all of the boards of commerce affiliated with it in the country calling attention to the return load plan of motor truck transportation. The bulletin reads as follows:

"The motor truck is a part of the transportation equipment in every community. Its use more nearly to capacity will help solve local problems.

"More complete use means loads both ways. A motor truck usually carries a good load to its destination, whether the destination is in the same community or in another city. Too often, however, the truck makes the return trip with no load. Every time this occurs there is waste of at least half the capacity of a truck to do work in transportation.

"Owners of trucks do not wish half the earning power of their vehicles to be lost. Manufacturers and merchants with goods piled up and awaiting shipment do not like to see empty trucks pass their doors. Both need a local clearing-house for information about the trucks that are available and the shipments that are ready, i.e., to bring together loads and empty trucks.

"Such a clearing-house the local commercial organization can easily provide. It will not ordinarily entail any special expense. It will promote co-operation in the community. It will render a very real service for which business men will be thoroughly grateful.

"Return-Load Bureau is a convenient name for a clearing-house. The bureau should ascertain the established lines of trucks that run regularly on fixed routes and the part of their capacity that is not being utilized. It should then obtain information from all owners of trucks used for private hauling, getting statements about the capacity of each truck, how far its capacity is used, between what points the capacity is unused, if the unused capacity can be made available for other persons at a reasonable price, etc. Besides gathering this information, the bureau can make known to everyone that whenever a truck is to make a trip without a load the bureau will respond to a telephone inquiry by endeavoring to give the name of a person who wants to send a load over the route in question. Efforts can be made also to have drivers who bring loads by truck from other points telephone to the bureau in order to get return loads.

"At the same time the bureau can enlist the co-operation of business men who may have shipments to make.

"In order that any driver or other person from out of town may quickly ascertain if there is a return load for him, each bureau should be specially listed in the telephone directory.

"With incidental questions the bureau will not usually need to deal. For example, it can leave the compensation that is to be paid to negotiation between the parties.

"In England return-load bureaus have proved of great assistance. They have been most developed in the United States by commercial organizations in Connecticut. Experience has demonstrated that the assistance they can render is very real and important, and that they can be organized advantageously in many communities where they have not as yet been tried."

—

Edmunds & Jones Earns $417,034

DETROIT, March 2—The Edmunds & Jones Corp. earned net profits of $417,034 during 1917, before deduction of war taxes. After the dividends were paid, a surplus of $168,791 remained for the year. The output of lamps from the Detroit plant aggregated 2,798,842 as against 1,897,043 in 1916. The output of the Canadian plant was 338,293. Orders on file in the Detroit plant amount to $800,000. The combined income account of the Edmunds & Jones Corp. and subsidiaries follows:

	1917	1916	Changes
Gross sales profit.	$516,303	$637,278	*$120,975
Other income	112,354	110,545	†1,809
Total income..	$628,657	$747,822	*$119.165
Selling exp., etc..	211,623	185,896	†25,727
Net profit	$417,034	$561,926	*$144,892
War taxes.....	79,908	.....	†79,908
Balance	$337,126	$561.926	*$224,800
Pfd. dividends ...	48,335	51,625	*3,290
Com. dividends..	120,000	120,000	.....
Surplus for year.	$168,791	$390,301	*$221,510

*Decrease. †Increase.

—

Commandeer Spruce for Airplanes

WASHINGTON, March 3—The War Department has given the Aircraft Production Board the authority to commandeer spruce in the northwest wherever it may be found in order to hasten the government aircraft program.

—

Scripps Shipping 1918 Cars

DETROIT, March 1—The Scripps-Booth Corp. has made the first shipment of 1918 cars to Pittsburgh and other eastern points. The shipment consisted of 4 carloads, containing 20 cars. Production for 1918 is expected to reach a total of 12,000.

—

Airplane Program Ahead of Schedule

WASHINGTON, March 2—Thirty representatives of airplane and engine manufacturers called to Washington to report progress on the air program told Secretary of War Baker they were abreast of the program and that some of them were ahead of it. With Secretary Baker they went over the program on training, advance training and combat planes. They were addressed at the meeting by the Secretary; Howard E. Coffin, chairman of the aircraft board; Maj. Gen. Squiers and Col. Deeds, of the aviation section of the Signal Corps. Secretary Daniels and Admiral Benson also congratulated them on their splendid progress.

—

Western Carburetor to Increase Output

ALMA, MICH., March 3—The present output of the Western Carburetor Co. is 30 carburetors a day, but this will be increased to 200, as soon as the working force is completed. At the stockholders' meeting held last week, the following officers were elected: President, Albert Frevert; vice-president, George J. Sandel; secretary, Harley Williams, and treasurer, Charles O. Ward. The directors appointed are Albert Frevert, Harley Williams, George Sandel, C. M. Johnson, Chas. O. Ward, P. M. Smith and J. N. Jay.

—

U. S. Truck Adding to Plant

CINCINNATI, March 4—The United States Motor Truck Co. is building a three-story brick and steel structure as a plant addition. It will be one-half block square and serve as a testing department, paint shop and final assembling shop. Later an addition one and one-half blocks square and three-stories high will be built.

—

Airplane Mail Service April 15

WASHINGTON, March 2—Airplane mail service between Washington and New York is to start April 15. Eight machines will be used and a daily schedule of one trip daily each way maintained. Machines probably will land at Van Cortlandt Park in New York. The time for the flight is estimated at 3 hours. A stop will be made in Philadelphia. Each plane it is estimated will carry 300 lb. of first-class mail.

—

General Electric Subsidiary Buys Abbott Plant

CLEVELAND, March 3—The National Electric Lamp Works of the General Electric Co. has purchased the plant and land of the defunct Abbott corporation on East 152nd Street, and the Nickel Plate tracks for a consideration of about $200,000.

The deal includes a one-story building, 110 x 681 ft., and 5½ acres of land. It is stated that the Abbott plant will be used for a machinery building.

—

Spruce Shortage in Germany

WASHINGTON, March 4—Some German airplanes captured and brought to this country reveal that Germany is running short of spruce and is making its wing beams of thin pieces, some of them less than 1 in. in thickness, put together with glue and nails.

—

To Decrease Airplane Accidents

WASHINGTON, March 3—To eliminate the many accidents at flying fields, the aircraft production board has evolved a system whereby pupils will fly in different directions from the camps to points 10 miles distant, and thus avoid collision.

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Freight Embargoes Modified

Permits Now Obtainable for Motor Car Shipments Part of the Way to New York

DETROIT, March 2—The embargo placed upon the handling of motor cars by the railroads early in January has been so far modified that permits may now be obtained through the Freight Traffic Commission for a limited number of carloads when freight cars are available. The dealers are taking advantage of this privilege and shipping their cars at least part of the way when possible. Permits are frequently granted as far as Newark, N. J., or Poughkeepsie, N. Y., when they cannot be had for the whole distance.

Factories within driving distance of New York, and so placed that they can use the Lincoln Highway or good state roads, are maintaining a regular drive-away service, usually sending cars or trucks in groups of five or six only on account of the limited hotel accommodations. No regular schedule has been possible yet owing to uncertain weather and the far from perfect condition of even the best roads. In some cases no shipments have arrived since December. Four Crow-Elkhart cars were recently driven through from Elkhart, Ind., to New York, via Pittsburgh, in 5 days. Some have not been so fortunate. It is said that the road from Detroit is crowded, and that many stalled cars and wrecks are passed on the way.

Often as many as 15 or 20 Packard cars and trucks are driven through daily. Wherever possible cars are carried on the trucks. When not enough trucks are included in the day's drive cars are driven also. Little or no attempt is made to use the railroads to the eastern seaboard.

Studebaker is now driving all cars east. The last rail shipment left the factory Jan. 1 and has just arrived. Cars are also driven from New York to purchasers in other cities.

Buicks are driven in groups of five, with a captain for each group, at the rate of 20 cars a day. When possible, some are shipped to Buffalo by boat and by rail from there. The New York branch has a storehouse at Port Huron for its own use and to relieve factory congestion. The Reo company has men constantly on the lookout for possible rail shipments, but expects to drive cars overland as soon as the roads improve.

The road from Detroit to Pittsburgh is none too good. The section between Toledo and Norwalk is the worst, being badly rutted and muddy. From Pittsburgh the Lincoln Highway is followed most of the way, but even that is cut up and very hilly part of the way. Between Princeton and Rahway, N. J., it is not being used at present, a detour being made via Perth Amboy.

The route from Detroit via Cleveland and Buffalo is longer, but east of Buffalo the road is good and the large towns along the entire distance are always available in case of trouble. Roads in the Mohawk Valley, however, are apt to be flooded in the spring. Such a condition is reported now.

Michigan Stamping Earns $505,959

DETROIT, March 3—The Michigan Stamping Co. earned $505,959 in 1917. The total sale for the year is $3,419,419. This yielded a percentage of 14.8 per cent profit. As compared with a year ago this is a gain of about 80 per cent when the sales were $1,858,489 with a profit of 13 per cent. The items charged off for depreciation include $42,129 for accounts, $42,306 on the company's old plant, and $32,500 on the new plant. For machinery, fixtures and dies a total of $101,861 is charged.

The balance sheet follows:

Current Assets—		
Cash	$26,584	
Accounts receivable	365,668	
Liberty Bonds	9,350	
Material on hand	701,412	
Prepared expense	14,027	
	$1,117,041	
Investments—		
Building and real estate	$517,079	
Machinery, tools and fixtures	358,265	
Auto trucks and pickup	4,000	
Office furniture	6,598	
Old plant	125,000	
Marketable real estate	232,826	
	$1,243,768	
Total assets		$2,360,809
Liabilities—		
Accounts payable	$134,113	
Bills payable	174,353	
Accrued payroll	7,571	
Deposit on scrap contract	5,000	
Reserve for Federal income and excess profits taxes	150,000	
Steel	178,856	
	$649,893	
Capital stock, com	$1,300,000	
Capital stock, pfd	200,000	
Surplus	210,893	
Total liabilities		$2,360,809

Ohio Assn. Meeting Postponed

CLEVELAND, March 2—The annual meeting of the Ohio State Automobile Assn., which was to be held at Lima during the last week in March, has been postponed until the week of May 3. This action was taken by a referendum vote of the members, in order to permit delegates to make the trip by motor car.

Germany Building New Airplane

WASHINGTON, March 4—Germany is building a new airplane modelled on the Caproni with three separate engines and to carry one thousand pounds of dynamite. It is anticipated that this airplane will be used for bombing purposes over England.

France to Add 10% Car Tax

Horses Reduced 31% in 3 Years — Trucks and Tractors Tax Exempt

By W. F. Bradley

PARIS, Feb. 11—Under the necessity of raising war revenue the French Government is about to apply a tax of 10 per cent of the purchase price of all articles of luxury. Under this heading are included automobiles of more than 12 horsepower or of purchase price of more than $1,200.

Trucks, farm tractors and touring cars necessary for the use of professional men are excluded.

Used cars have to pay the tax if the price exceeds the limit of $1,200.

Motorcycles are elegible for the tax if their purchase price exceeds $300.

French manufacturers are finding fault with the new fiscal arrangement on account of the low horsepower limit. They maintain that this should be raised from 12 to 16. Their most important stand, however, is made against the principle of classifying an automobile as an article of luxury. They maintain that the vast majority of automobiles are used for utility purposes, and while there may be an element of pleasure in the use of an automobile that is only an incidental in the great movement.

It is pointed out that owing to the war the number of animals is being reduced at an alarming rate. Between 1913 and 1916 the number of horses dropped 31 per cent; donkeys and mules, 14 per cent; oxen dropped 30 per cent, and cows 20 per cent. The official figures showing the number of cattle in France on these two dates are as follows:

	1913	1916
Horses (more than 3 years old)	2,550,000	1,682,000
Donkeys and mules	544,000	470,000
Oxen	1,843,000	1,260,000
Cows	7,794,000	6,200,000

In order to meet these losses gasoline tractors and automobiles will have to be used on the land in a measure altogether unknown prior to the war. While it is not proposed to tax this agricultural machinery, it is impossible to put a tax on any one branch of the automobile industry without affecting the whole.

The matter is also being looked upon from a national standpoint, for France possesses, in the hands of private owners, 160,000 automobiles of a capital value of $320,000,000. These 160,000 are made up of 115,000 privately owned touring cars paying direct taxation, 15,000 taxicabs and others paying indirect taxation, and 30,000 commercial vehicles not subject to taxation. Motorcycles are not included in these figures.

Until the outbreak of the war France occupied the position of leading automobile export nation of the world, and her manufacturers are anxious that there shall be no system of taxation which

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shall handicap her in the keen competition which will take place when the war is over. In 1913 the French automobile export business stood at $45,600,000; America came second with $33,000,000; England third with $28,000,000; Germany fourth with $21,600,000, and Italy fifth with $7,200,000.

—

Aluminum Price Fixed at 32 Cents

WASHINGTON, March 4—The price of aluminum has been fixed by presidential proclamation at 32 cents per pound; last month the metal reached its lowest price during the past year, when it touched 36.4 cents, the average for the year being 51.59 cents and the high figure 60.77 cents. The fixing of the price has been made after investigation by the Federal Trade Board as to cost of production, and is the result of an agreement made with the producers. The price is subject to revision June 1. The new price is to cover lots of 50 tons and over of ingots of 98 to 99 per cent grade. The usual stipulations that producers shall maintain production, not reduce wages, sell to the Allies and the public at the same figure and prevent the metal from falling into the hands of speculators are made.

Most of the aluminum produced in the United States comes from Georgia, Alabama, Arkansas and Tennessee, these four states producing 425,359 tons of bauxite, from which the metal is extracted. A limited amount of cryolite ore comes from Greenland and Iceland. Following are production figures:

1916		1917	
Tons	Value	Tons	Value
68,000	$33,900,000	*80,000	$45,882,000

*Approximate.

—

MacMullen Chevrolet Sales Manager

FLINT, MICH., March 4—John S. Collins has resigned as sales manager of the Chevrolet Motor Co. He will be succeeded by B. J. MacMullen, who was sales manager of the Chevrolet Motor Co. of Texas, with headquarters at Fort Worth.

20 Per Cent Drop in Exports

January Amount $2,097,633 Less Than December—More Trucks Shipped

Mos.	Cars	Value	Trucks	Value	Parts
Jan.	4,325	$3,841,871	1,156	$3,328,870	$2,665,278
			1917		
Dec.	6,442	5,375,706	825	1,585,481	4,952,465
Jan.	4,733	3,860,224	1,340	3,515,210	2,194,312

WASHINGTON, March 6—Exports of automobiles, commercial vehicles and parts, not including engines and tires, from the United States, amounted to $9,816,019 in January. This is $2,097,633 or 18 per cent less than the December amount, the record month of the year; but $447,273 or 5 per cent more than the January, 1917, amount.

There was a great reduction in the number and value of passenger cars shipped, practically every foreign country purchasing less than half of its December amount. France received only 19, as compared with 285 in December. Canada's allotment was 692, compared with 1852 in December. New Zealand alone increased its orders, the January number being 221 and the December number only 71.

The cars sent to the United Kingdom are much higher priced than those sent to Canada, the average cost being $3,500 for the former, and $800 for the latter.

There was an increase in the number of trucks exported. The December figure was 825, and in January 1156 were shipped. This gain is due to a shipment of 622 trucks to France. Truck shipments to other countries remained practically the same.

The value of parts, exclusive of engines and tires, exported decreased from $4,952,465 in December to $2,665,278 in January.

—

Reo Completes First Holt Tractor

LANSING, MICH., March 4—The Reo Motor Car Co. has completed the first of the Holt caterpillar tractors for a government order recently received. The order calls for 3000, and the sample tractors just completed have been passed by Lieutenant H. C. Shafer of the Ordnance department, who is in charge of inspection in Lansing.

The Reo company will assemble tractors for the government during the next 60 days on a large production scale. The first 3000 of these to be turned out by the Reo company are but a forerunner of larger contracts to follow. It is planned to motorize the entire ordnance department, and this will keep the motor car factories working on a chain of contracts.

—

B Truck Parts Delivered

WASHINGTON, March 7—Up to this time complete sets of parts for the Class B truck to the number of 210 have been delivered to the fourteen factories engaged in their assembly. It is expected that 1000 complete sets of these parts will be delivered by April 1, following which there will be a steady production with the schedule completed sometime in July.

—

Fisher Body Earns $999,826 in 3 Months

DETROIT, March 4—The Fisher Body Corp. reports earnings and income from all sources of $999,826 for the quarter ending Jan. 31, 1918. After $42,611 is deducted for interest on the floating debt, but before income and excess profits taxes are deducted, a surplus of $957,015 remains.

The consolidated income account for the 9 months from May 1 to Jan. 31, 1918, shows total earnings and income from all sources of $2,809,645. Interest on the floating debt reduces this to $2,697,925.

—

Maxwell Establishes Central Warehouses

DETROIT, March 6—The Maxwell Motor Sales Corp. has established warehouses in Buffalo, Indianapolis, Cincinnati and Chicago, and expects to establish one in Pittsburgh, where the company plans to drive 200 cars each month.

Exports of Automobiles, Trucks and Parts for January and 6 Previous Months

	January				Seven Months Ending January			
	1918		1917		1917		1918	
	No.	Value	No.	Value	No.	Value	No.	Value
Passenger cars	4,325	$3,841,871	4,733	$3,860,224	34,080	$28,702,545	33,531	$25,351,131
Commercial cars	1,156	3,328,870	1,340	3,315,210	8,317	22,635,150	10,113	28,722,972
Parts	.....	2,665,278	.....	2,194,312	.....	19,335,816	.....	14,650,217
	5,481	$9,816,019	6,073	$9,369,746	42,397	$70,673,511	43,644	$69,024,320

BY COUNTRIES, 1917-1918

	Passenger Cars		Trucks		Passenger Cars		Trucks	
France	19	$49,324	622	$2,175,899	677	$756,498	2,010	$7,238,241
Norway	3	10,504	.....	.....	89	94,066	.....	.....
Russia in Europe	4	1,720	2	5,454	492	1,136,400	366	1,480,303
United Kingdom	50	173,475	237	729,920	670	1,400,027	3,994	10,917,148
Canada	692	561,107	81	97,103	6,750	4,959,356	483	622,324
Cuba	318	406,313	.....	.....	2,241	2,090,610	.....	.....
Argentina	84	72,864	.....	.....	2,540	1,775,476	.....	.....
Chile	272	268,094	.....	.....	2,610	2,539,183	.....	.....
British India	4	2,672	.....	.....	32	28,602	.....	.....
Dutch East Indies	47	65,644	.....	.....	1,137	1,160,489	.....	.....
Russia in Asia	.....	.....	.....	.....	5	8,425	.....	.....
Australia	931	685,065	.....	.....	2,978	2,302,204	.....	.....
New Zealand	221	138,138	.....	.....	1,260	970,392	.....	.....
Philippine Islands	135	133,208	.....	.....	762	660,278	.....	.....
British South Africa	231	167,933	.....	.....	1,709	1,334,450	.....	.....
Other Countries	1,314	1,105,810	214	320,494	10,128	7,486,087	1,464	2,377,134

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These warehouses will serve as central stations for certain sections of the country and freight deliveries will be made from them.

The Maxwell drive-away system has been organized on an extensive plan. Last week between 600 and 700 vehicles, mostly loaded trucks, left the factory for Ohio, Illinois, Indiana and a number of eastern points, particularly the southern section of Pennsylvania.

—

Woods Lieut. Colonel in Signal Corps

WASHINGTON, March 5—Arthur Woods, former Police Commissioner of New York City, has been appointed Lieutenant Colonel in the Air Section of the Signal Corps.

—

Ordnance Base to Have Repairshop

WASHINGTON, March 6—The ordnance base costing $25,000,000 which is being erected in France will include a motor vehicle repair plant capable of overhauling 1200 vehicles a month. Four hundred and fifty officers and 16,000 men will be required for the entire base.

—

650 Townsend Tractors in 1918

JANESVILLE, WIS., March 5—The Townsend Mfg. Co., maker of oil tractors and engines, will increase its output to 650 or 700 tractors for 1918. Several plant additions are being erected to increase facilities for production.

Gain in New York Exports

72 Per Cent of Total Shipments of United States Sent Through This Port

NEW YORK, March 6—Exports of automobiles, trucks and parts from this port during January amounted to $7,021,661, or 72 per cent of the total exports from the United States.

The shipments to Canada were made by railroad, not one car being shipped there from the port of New York. Few cars are sent to the Far East from New York, none being shipped to the Philippine Islands, Dutch East Indies or British India, although all received a goodly number from the United States during January.

Australia's cars, on the other hand, came mainly from New York, 851 of the total 931 being sent via this port. Shipments to South America vary. Ninety per cent of the cars sent to Chile went through New York, but half of Argentina's cars were either sent overland or shipped from another port.

There was a slight gain in New York exports over the December amount.

—

Fourteenth Packard Train Starts

DETROIT, March 1—The Packard Motor Car Co. yesterday started eastward its fourteenth army truck train since Dec. 14. This is made up of 30 trucks, some of them loaded with Packard and Dodge parts. In a short time army truck trains will carry capacity loads of steel ranges for the army cooks.

Last week a driveaway of 36 Packard twin sixes and trucks left the factory. Seventeen of the trucks had mounted on them either another truck or a passenger car. The train is expected to complete its run of 780 miles in 12 days. The route will be the same as that traversed by the army trains as far as Gettysburg, where the train will switch to a more northerly course to New York.

—

Cars, Trucks and Tractors at Indianapolis Show

INDIANAPOLIS, March 4—The seventeenth annual show of the Indianapolis Automobile Trade Assn., which closed yesterday, was the most successful exhibit in the history of the organization, and included displays of cars, trucks, tractors and accessories. Dealers say that more prospective buyers attended than in former years. The show was held in the industrial plant of the Diamond Chain & Mfg. Co., and 48,000 sq. ft. were devoted to exhibits.

There were 258 displays, including 38 makes of passenger cars, 20 of trucks and 11 of tractors. The latter appealed chiefly to the numerous rural visitors who attended the show. It is predicted that the demand for tractors will be so heavy that dealers will be unable to supply it.

—

100,000 Men in Flying Section

WASHINGTON, March 5—One hundred thousand aviators and mechanics now form the flying section of the Signal Corps. More than 5000 fliers have been graduated from the ground schools in this country and 5000 are now taking the course. More than 10,000 additional students are awaiting an opportunity to enter the schools.

—

Elgin Assets $1,035,906

CHICAGO, March 2—The balance sheet of the Elgin Motor Car Co. for the fiscal year ending Dec. 31, 1917, shows assets of $1,035,906. The full quota of cars will be built by the company in 1918.

—

Carlton, Bosch Chicago Manager

SPRINGFIELD, March 1—Lee C. Carlton, for the last 17 months manager of the San Francisco branch of the Bosch Magneto Co., is now manager of the Chicago branch, succeeding W. Norman, who has been appointed factory manager at Springfield, Mass.

—

Report Liberty Plane Flies Over Capital

WASHINGTON, March 5—Although it is impossible to secure confirmation from the Aircraft Board or the Signal Corps, there are fairly substantial reports that a Curtiss airplane which flew

Automobile, Truck and Parts Exports from New York for January

Country	Passenger Cars (No.)	Passenger Cars Value	Commercial (No.)	Commercial Value	Parts Value
Argentine	44	$44,895	1	$5,000	$532,513
Australia	831	589,057	...	....	43,300
Barbados	1	800	...	....	3,020
Bolivia	....	....	...	....	190
Brazil	228	144,030	6	2,560	26,539
British East Africa	....	....	...	....	58
British Guiana	3	3,091	...	....	2,079
British Indies	....	....	...	....	15,044
British South Africa	231	167,933	5	6,765	57,214
British West Africa	50	21,951	2	1,276	11,603
British West Indies	8	4,295	1	600	1,007
Canary Islands	2	730	...	....	654
Chile	271	267,031	...	....	6,862
Colombia	13	11,691	...	....	5,489
Costa Rica	....	....	...	....	283
Cuba	139	122,518	21	50,251	54,259
Danish West Indies	3	2,285	...	....	100
Dutch East Indies	....	....	...	....	49
Dutch Guiana	....	....	...	....	127
England	50	173,475	237	729,920	582,401
France	19	49,234	622	2,175,899	293,610
French Guiana	1	331	...	....	177
French West Indies	7	5,744	...	....	2,063
Ecuador	....	....	...	....	620
Guatemala	2	3,412	1	322	1,319
Haiti	19	7,247	...	....	2,474
Honduras	3	2,100	...	....	248
Italy	....	....	6	4,300	12,122
Jamaica	24	16,961	3	1,125	9,337
Japan	31	38,104	...	....	7,019
Mexico	4	4,800	...	....	1,949
Newfoundland	4	3,525	...	....	670
New Zealand	2	4,401	...	....	30,406
Nicaragua	4	2,494	...	....	40
Norway	3	10,504	...	....	332
Panama	16	14,871	1	265	5,211
Paraguay	1	2,500	1	875	49
Peru	66	66,907	...	....	4,627
Port Africa	....	....	...	....	2,637
Portugal	111	131,160	3	6,666	7,602
Russia (Europe)	4	1,720	2	5,454	...
Russia (Asia)	....	....	...	....	198
Salvador	2	3,300	...	....	1,480
Santo Domingo	25	9,985	...	....	753
Siam	....	....	...	....	130
Spain	184	193,561	...	....	27,554
Straits Settlement	....	....	...	....	2,750
Trinidad	9	5,206	1	600	3,339
Uruguay	101	48,994	...	....	10,912
Venezuela	....	....	1	2,500	5,266
Total	2,691	$2,287,283	922	$3,013,204	$1,721,174

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over Washington yesterday was fitted with a new Liberty engine. It is expected that several airplanes equipped with Liberty engines will be stationed at the hangar, near the Washington Navy Yard, and that flights over the city will be frequent.

Newspaper reports that four Liberty airplane engines are being tested in the basement of the Union Depot here are incorrect. The rumors are due to tests of the Liberty motor trucks made in the basement of the Union Depot. It is reported, however, that the Liberty airplane engine has been given thorough tests in an especially constructed room at the Bureau of Standards.

—

Photograph Government Employees

DETROIT, March 4—In accordance with the request of the Government, the heads of all industrial establishments with their employees must be photographed and listed for identification. The work has just been completed at the Ford factory, where every one from Henry Ford down was photographed by the official photographer. Five photographs, it is understood, are to be made of each man. Each man is to be known by a number and when photographed he must carry his number on his chest. Two of the photographs are to be retained by the employer, one by the Government, one by the police and the other serves as an identification card for the man.

—

Parachutes for Dropping Mail

WASHINGTON, March 2—The Post Office Department is considering a scheme for dropping mail from airplanes by parachute in connection with the proposed airplane mail service between New York and Washington.

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U. S. to Have 4 Aviation Departments

WASHINGTON, March 5—The United States has been divided into 4 aviation departments. The eastern department will have headquarters at Governor's Island; the southeastern department headquarters will be at Atlanta; those of the southern department will be at San Antonio, and of the western and central department at Chicago. An aviation officer with rank of brigadier-general will be placed in charge.

—

Cannot Control Price of Patented Articles

WASHINGTON, March 5—The prices of patented articles cannot be controlled by the patentee according to a decision just rendered by the Supreme Court. This interpretation of the patent laws was made by the court in answering questions certified by the lower courts in injunction proceedings restraining the Boston Store, Chicago, from selling records in violation of a contract made with the American Gramophone Co. for less than list prices. The opinion affects retail dealers bound by similar contracts in which the resale price is fixed by the manufacturer.

Earns 49 Per Cent on Common

Kelly-Springfield Shows Profits of $4,323,955 in 1917—30 Per Cent More Than 1916

CLEVELAND, March 6—The Kelly-Springfield Tire Co. earned gross profits of $4,323,955 in 1917, an increase of 30 per cent over 1916. After deduction of preferred dividends but before deduction of war taxes, this amounts to $12.40 a share on the common stock ($25 par). After deducting dividends, interest and reserve for sinking fund and profit sharing, a surplus of $1,453,585 remains. This is 50 per cent more than the surplus of $957,571 on Dec. 31, 1916.

Assets totaled $15,395,835 and current liabilities amounted only to $1,273,701, leaving a net working capital of $14,122,134.

Following is the income account for 1917, as compared with that of 1916:

	1917	1916
Gross profit	$4,323,955	$3,464,459
Operating expenses	1,720,335	1,404,388
Net operating income	$2,603,620	$2,060,071
Other income	45,293	57,243
Net income for year	*$2,648,913	$2,117,314
Preferred dividends	213,078	215,932
Common dividends	785,152	735,316
Interest	.....	10,800
Sinking fund	75,164	85,964
Profit sharing	121,934	111,731
Surplus	$1,453,585	$957,571

*After $213,078 preferred dividends, the balance of net income was equal to $12.40 a share on $4,907,200 common stock ($25 par).

The balance sheet as of Dec. 31, 1917, compares as follows:

ASSETS	1917	1916
Cash	$772,448	$983,512
Notes receivable	195,917	52,732
Accounts receivable	1,552,431	1,850,585
Bond sinking fund	.....	147,851
Inventories	3,760,162	2,218,142
Preferred stock sinking fund	.....	.....
Deferred charges	52,189	22,374
Liberty bonds	272,353	.....
Plant, goodwill, etc.	8,781,776	7,887,357
Treasury stock	.....	.....
Stock purchased	*8,560	.....
Total	$15,395,835	$13,162,552
LIABILITIES		
Preferred stock	$3,509,300	$3,593,300
Second preferred stock	.....	.....
Common stock	4,907,200	4,907,200
Notes payable	600,000	.....
Accounts payable	235,752	187,911
Debt bond sinking fund	.....	270,000
Reserve for taxes, payroll, etc.	78,961	98,328
Preferred dividend payable	52,639	53,899
Interest payable	.....	10,800
Loan pay—Liberty bonds	231,185	.....
Stock and bond redemption fund	75,164	233,815
Miscellaneous liabilities	.....	350,559
Surplus	5,705,633	3,456,740
Total	$15,395,835	$13,162,552

*Represents difference between $484,960 common stock purchased for resale to employees and $476,400 special loan which will be self-liquidating by employees' instalment payments under stock profit-sharing plan.

—

Michigan Copper Earns $60 a Share

DETROIT, March 2—Net earnings of the Michigan Copper & Brass Co. for the year ending Dec. 31, 1917, were $596,819.41, amounting to $60.20 a share. The company has declared a 3 per cent dividend, payable April 1 to stockholders of record March 15.

The following directors were elected at the recent stockholders meeting: David M. Ireland, James T. Whitehead, Hal H. Smith, Alonzo P. Ewing, Bernard G. Koether and W. B. Wallace, all of Detroit; C. S. Mott and Walter P. Chrysler, Flint; Alfred P. Sloan, Jr., New York. The officers were re-elected by the directors.

—

Higrade Motors Ready for Production

HARBOR SPRINGS, MICH., March 4—The Higrade Motors Co. is ready to start production. A preliminary schedule of 25 cars has been arranged and materials are now at hand for these. The materials for another 100 cars are practically all in and indications are that a producton of from 20 to 25 of the light trucks will soon be made weekly. According to present indications this production will start about March 1.

—

Maxwell Changes Coast Distributer

LOS ANGELES, March 3—The Southwest Motors has been appointed southern California Maxwell distributer. The move has occasioned considerable surprise among dealers. Up to the present time Maxwell has been handled by the Lord Motor Car Co., which has had the line for the last 5 years. The Southwest Motors was organized less than a year ago and is occupying part of the building erected for Harold L. Arnold.

—

Federal Reduces Shipping Space

DETROIT, March 4—The Federal Motor Truck Co. has succeeded in knocking down its Class B army truck to such a degree that when it is boxed for overseas shipment it will occupy only half the space it formerly used, thus saving 50 per cent shipping space. This box is of the smallest proportions any manufacturer was able to attain in knocking down a truck of this capacity, and it is believed the Government will accept this as a standard.

—

Warner Trailers for Ammunition Trains

BELOIT, Wis., March 2—The Warner Mfg. Co. has for the past three months been working on a government contract for heavy-duty Warner trailers, to be used in ammunition trains. They are a standard type Warner 4-wheel model, and follow regular specifications except that U. S. Standard pintle-eye is used in place of the Warner ball and socket hitch.

—

Aerial Repair Base in Cleveland

CLEVELAND, March 4—The Government will establish an aerial station here, not as a training station, but as a supply and repair base for government airplanes, which are making test flights. Alva Bradley, chairman of the airplane committee of the Cleveland Chamber of Commerce, is arranging for a site and the erection of hangars and machine shops. He has appointed sub-committees to assist him.

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Summer Business in Argentina Good

Uncertainty of Export Conditions and Movement of Crops Holds Back Sales Slightly

BUENOS AIRES, ARGENTINA, Jan. 30—Business during the summer which is just closing has been very satisfactory, although the number of cars sold by some dealers has not been as great as was expected. The wheat crop is good, but there is much uncertainty surrounding its movement on account of the Argentine attitude towards the Allies. This, together with the uncertainty about export conditions, is holding up what would otherwise be a good selling period throughout the country. It is very possible that the import tax on automobiles will be increased 25 per cent. This will apply to tires, parts and accessories, and will make sales more difficult.

The great loss of horses due to the war is bound to stimulate the sale of motor trucks, but such developments are coming slowly in this country. Road conditions are not favorable for truck use.

The continuous railroad strikes, in which practically all of the railroads of Argentina were concerned, entirely stopped shipments, and automobile sales were very much affected for several months. They are beginning to recover from this setback.

Practically all of the business here is with American cars, although there still are some European machines of such makes as Fiat, Mercedes, etc., which have not been sold, some of them since before the start of the war, and the Fiats since the time Italy entered the war. Nobody cares to buy these cars because they fear they cannot get spare parts for them.

There is a general feeling that the question of the 56-in. tread in Argentina has not yet been solved, due to the feeling that the farmers in the country want the wide treads, but are obliged to buy 56-in. treads. There is a strong feeling that as soon as the war is over some European factories will furnish models with the 62-in. tread.

A few Buenos Aires dealers have been manufacturing bodies for high-priced American cars, the Cadillac being an example. Fehling Bros. have been building bodies in their own shops, due to the high shipping expenses and also shortage of ocean tonnage.

—

Compute Cost of Drive-Aways

WASHINGTON, March 2—Statistics of the cost of drive-aways from Michigan to the Capital have been compiled by dealers here. An Oakland car drive-away from Pontiac requiring 5 days, and covering 600 miles, cost $70. A Hupmobile drive-away from Detroit averaged $85 a car and required 6 days, the increased time and expense being due to weather conditions. Several Federal trucks made the trip from Detroit in 12 days, at a cost of $130 per truck.

—

Drive-Aways for 75 Per Cent of Paige Production

DETROIT, March 4—The Paige-Detroit Motor Car Co. is reorganizing its drive-away system so that 75 per cent of its production can be sent overland. The company is driving away only 20 per cent.

Great Reduction in London Traffic

Only 25 Per Cent of What It Was 3 Years Ago—Motor Industry Quiet

LONDON, ENGLAND, Feb. 6—London traffic to the motorist who has not been here for several years does not exceed 25 per cent of what it was 3 years ago. Despite the fuel difficulties there are many more motor vehicles on the streets than horse vehicles, and only a comparatively small number of vehicles driven by the gas bags.

Here the automobile industry is extremely quiet and there seems to be very little in the way of after the war schemes, although it is certain that there will be some high protective measures in force for several years after peace is signed. Just at the present all of these after the war measures as relating to the automobile industry seem to be entirely shelved, and the whole country is engrossed in the one thought of winning the war. The manufacturers appear to be relying entirely on either the continued prohibition of imports of motor vehicles or a very high tariff.

There is very great interest in the American aviation program, and the Liberty engine is looked forward to being one of the important factors in the war.

—

Regal to Make Shells for Government

DETROIT, March 2—The Regal Motor Car Co. has received a government contract for the manufacture of 300,000 3-in. shells. These will be made at the Jamestown, N. Y., plant.

Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co.	53	55	—2½
*J. I. Case T. M. Co. pfd.	82	86	+1
Chalmers Motor Co. com.	5	8	+ ½
Chalmers Motor Co. pfd.	30	40	..
*Chandler Motor Co.	85	89	—2
Chevrolet Motor Co.	118	120	—9½
*Fisher Body Corp. com.	26	33	+3
*Fisher Body Corp. pfd.	80	87	..
Fisk Rubber Co. com.	50	53	..
Fisk Rubber Co. 1st pfd.	98	103	..
Fisk Rubber Co. 2nd pfd.	70	75	..
Firestone Tire & Rubber Co. com.	96	98	..
Firestone Tire & Rubber Co. pfd.	98	100	— ½
*General Motors Co. com.	116	118	—8½
*General Motors Co. pfd.	83	85	..
*B. F. Goodrich Co. com.	43½	45½	+3
*B. F. Goodrich Co. pfd.	94	100	..
Goodyear Tire & Rubber Co. com.	136	139	—1
Goodyear Tire & Rubber Co. pfd.	99	100	..
Grant Motor Car Corp.	2	3	..
Hupp Motor Car Corp. com.	3	3¼	+ ¾
Hupp Motor Car Corp. pfd.	78	83	+3
International Motor Co. com.	16	19	+2
International Motor Co. 1st pfd.	40	45	..
International Motor Co. 2nd pfd.	16	20	+3
*Kelly-Springfield Tire Co. com.	46	47	—1
*Kelly-Springfield Tire Co. 1st pfd.	77	85	+5
*Lee Rubber & Tire Corp.	15	16	..
*Maxwell Motor Co., Inc., com.	28	29	+ ½
*Maxwell Motor Co., Inc., 1st pfd.	60	63	..
*Maxwell Motor Co., Inc., 2nd pfd.	22	24	—1
Miller Rubber Co. com.	133	137	—3
Miller Rubber Co. pfd.	95	98	..
Packard Motor Car Co. com.	93	98	—6
Packard Motor Car Co. pfd.	92	95	+2
Paige-Detroit Motor Car Co.	19	21	+2
Peerless Truck & Motor Corp.	17½	18½	..
Portage Rubber Co. com.	111	113	—2
Reo Motor Car Co.	17	19	..
*Saxon Motor Car Corp.	9½	10½	— ½
Standard Motor Construction Co.	12	13	..
Standard Parts Co.	65½	69½	+1½
*Stewart-Warner Speed. Corp.	54½	56½	—1½
*Studebaker Corp. com.	47½	48½	—3½
*Studebaker Corp. pfd.	93	96	..
Swinehart Tire & Rubber Co.	..	35	..
United Motors Corp.	25⅜	25½	+3⅛
*U. S. Rubber Co. com.	46½	58½	+1
*U. S. Rubber Co. pfd.	98	103	+1
*White Motor Co.	42½	43½	—1½
*Willys-Overland Co. com.	18	19	— ¼
*Willys-Overland Co. pfd.	80	82	+1

*At close March 2, 1918. Listed N. Y. Stock Exchange.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	Bid	Asked	Net Ch'ge
Auto Body Co.	..	8½	..
Bower Roller Bearing Co.	..	18¾	..
Chevrolet Motor Co.	119	121	—13
Commerce Motor Car Co.	6¾	..	..
Continental Motor Co. com.	5⅝	5⅞	— ⅛
Continental Motor Co. pfd.	..	..	..
Edmunds & Jones com.	..	..	..
Edmunds & Jones pfd.	..	..	..
Ford Motor Co. of Canada	216	229	+4
Hall Lamp Co.	..	..	..
Michigan Stamping Co. com.	13	14¼	— ¼
Motor Products	..	..	..
Packard Motor Car Co. com.	..	100	..
Packard Motor Car Co. pfd.	90¼	..	—2
Paige-Detroit Motor Car Co.	19⅜	20	+ ¼
Prudden Wheel Co.	12	14½	..
Reo Motor Car Co.	17¼	17⅝	—1½

INACTIVE STOCKS

Atlas Drop Forge	..	30	..
Kelsey Wheel Co.	83	90	..
Regal Motor Car Co.	..	26½	..

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Industrial Review of the Week

A Summary of Major Developments in Other Fields

Divergent Interests Among Iron Producers

NEW YORK, March 6—The New York conference of iron and steel manufacturers on March 1, attended by about 75 representatives of the industry, brought out plainly the divergent interests of large and small producers, as affected by Government prices. While the Steel Corporation and some of the larger independent companies would probably accept without complaint a continuance of present prices, smaller producers in several lines, notably plates, show advances in cost on which they contend strongly for higher Government prices after March 31.

The increased costs of some large companies were as much as $6 a ton between Dec. 31 and Jan. 31, and when account is taken of to-day's restricted scale of operations the increase since the first announcement of Government prices late in September is put in some cases as high as $10 a ton.

For the Washington conference with the War Industries Board, which will probably be in the third week of March, various manufacturers are preparing individual statements showing the reduced profits of recent operations and the prospect of a very considerable falling off in 1918 from the results of 1917.

Consumers of iron and steel have thus far taken no steps to have their varied interests represented at Washington. There has been some agitation on behalf of Northern users of Southern pig irons for a reduction in such irons so that they may be had at delivered prices comparing with those of Northern irons.

What is increasingly commented on in the trade is the small volume of buying for uses having no connection with the war. Some forms of finished steel may become quite plentiful.—*Iron Age.*

—

Roads Bad For Drive-Aways

NEW YORK CITY, March 6—It will be nearly a month before all of the main highway between Buffalo and Albany, which is the route over which war trucks are being driven from the Pierce-Arrow factory to seaport, will be free of snow and in ideal condition, according to R. H. Johnston, New York manager of the White Co., who made an investigation trip over the route from New York City to Albany and thence west as far as Little Falls. Due to snow on the road between Albany and Little Falls, 80 miles, it took longer to make this distance than the 150 miles up the east side of the Hudson from New York City to Albany.

Through the Mohawk Valley which stretches westward from Albany the snow is still 6 to 12 inches deep and there are frequent drifts with snow 4 to 6 feet deep. The men driving war trucks through have literally cut channels through these drifts, and if it had not been for their work it would still be impossible to get through with a touring car. The road is filled with deep ruts which constantly weave from side to side of the highway.

Long before Mr. Johnston reached Little Falls, however, he had decided that the driving of cars and trucks over this route for delivery to customers is quite out of the question at this time. Cars and trucks can be brought through but the inevitable damage to the finish of passenger cars and the wear on tires of trucks would be more than the customer would reasonably expect. Possibly, one week from now, or two weeks from now, conditions will be much improved, but the present conditions, as we see them, make advisable some postponement of "drive-aways."

A New Service

¶ Herewith AUTOMOTIVE INDUSTRIES *supplies for the benefit of its readers a general summary of important developments in other fields of business. This is rendered possible by the editorial co-operation of leading industrial publications which are recognized authorities.*

By compressing the general industrial situation into this form we hope to give our readers a clear and comprehensive idea of up-to-the-minute developments which they could otherwise secure only with considerable expenditure of time and effort.

—

Harding Director of Wagner Axle

ANDERSON, IND., March 6—H. P. Harding, formerly president and general manager of the Wagner Axle Company, manufacturers of the Liberty Worm Drive Axle, Anderson, has resigned, and G. D. Yaeger has been elected by the board of directors of the company to the office of general manager, in addition to secretary and treasurer, and has now taken up the added duties of general manager.

—

Changes in Whitman & Barnes Sales Department

AKRON, OHIO, March 6—A. B. Hall, vice-president of the Whitman & Barnes Mfg. Co., will have charge of the company's sales. R. S. Carter, district representative in Pittsburgh, has been promoted to sales manager, and will have direction of the Twist Drill and Reamer sales. H. E. Fisher, formerly with the Pittsburgh Model Engine Co., will succeed Carter as mechanical engineer, with charge of sales in the Pittsburgh district. Paul E. Thomas is sales manager in charge of the department of wrenches and spring cotters.

Country Laying Plans for Next Season's Coal

A sure sign that fuel troubles are almost over for the present is evidenced by the fact that the country as a whole is now laying plans for next season's requirements instead of worrying about immediate needs. Even the situation in New England shows signs of improvement, better weather having enabled the movement of more coal from the southern tidewater ports via all-rail and Long Island Sound. Beyond Portland, however, the ports are still closed by ice. The shortage of vessels also continues to be a deterrent.

Though transportation conditions in general show marked signs of betterment, much of the freight congestion having been cleared away, there are still well-founded complaints of a shortage of empty cars at the mines.

Receipts of anthracite at tidewater are more plentiful; but the demands for this, as well as for any grade of coal, are still strong. Bituminous coal is extremely short. The output in January was the lowest for any month since September, 1914, owing to inadequate car supply and railroad congestions. "Give us more cars, and we'll flood the country with soft coal," say the bitumimous operators.

Prices for the most part are based on contracts entered into before the Federal price regulations went into effect, and there is little, if any, spot coal offered. No new contracts are reported, the trade evidently waiting for the announcement of the new price schedule promised by the Fuel Administration before April 1.

The anticipated elimination of the jobbers' commission has caused much criticism, as it is considered that this branch of the trade performs an important function.

Great care is still necessary in distribution and consumption, as no great reserve stocks of coal exist. Bunkers and bins were scraped bare during the past three months, and coal will neither be cheap nor plentiful this year.—*Coal Age.*

—

Truck Show in Brooklyn

BROOKLYN, N. Y., March 5—The first and only Greater New York show at which trucks were exclusively shown this season opened to-day in the Twenty-third Regiment Armory. Despite war conditions this is a larger show than last year, which was a record breaker. There are 102 chassis on view, representing 32 makers. There are also five styles of Ford adapters and two booths devoted to bodies.

The great majority of the exhibitors are truck dealers in the Metropolitan territory, and most of these are from New York City. Some Brooklyn dealers are represented and there are a few direct factory exhibits.

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Men of the Industry

Changes in Personnel and Position

Bowman General Manager of Acason Motor Truck Co.

DETROIT, March 2—J. F. Bowman has been elected vice-president and general manager of the Acason Motor Truck Co. He was formerly vice-president and sales director of the company, prior to which time he was sales manager for the Federal Motor Truck Co. H. A. Conlon has been promoted from assistant sales manager of the Acason company to sales manager. He was formerly assistant sales manager of the Federal company.

—

P. D. Sampsell has been placed in charge of sales of United States trucks in Indiana, Ohio and West Virginia. His headquarters will be in the Severn Hotel, Indianapolis.

J. C. Schmitz and **Robert H. Scott** have been appointed district representatives of the Dart Motor Truck Co., Waterloo, Iowa. Schmitz will handle sales in Oklahoma and Texas, and Scott those in New York and Pennsylvania.

Millard N. Newton, who has been connected with the advertising department of the White Co., Cleveland, for 5 years, has been appointed advertising manager.

J. Welch has been appointed western sales manager of the Freuhauf Trailer Co., with headquarters in Kansas City. He was formerly associated with the Abbott Corp. and the Inter-State Motor Co.

E. Wooler has abandoned the small car proposition on which he was working, and has returned to the Chandler Motor Car Co., Cleveland.

F. H. Burdette, formerly Pacific Coast manager of the Four Wheel Drive Co., Clintonville, Wis., has joined the sales organization of the Hercules Motor Truck Co., Milwaukee. He will have charge of sales in the Pacific Coast district.

W. K. Frederick has been appointed sales manager of the Gryphon Tire & Rubber Corp., New York.

L. M. Field, salesmanager of the Frank O. Renstrom Co., San Francisco, has been elected vice-president of the company.

J. B. Howell of the sales department of the Bound Brook Oil-less Bearing Co., Bound Brook, N. J., has entered active service in the United States army, and is now training at Camp Dix.

Earl Cooper, who has practically given up racing for the coming year on account of the decision of the American Automobile Assn. to sanction no races during the war, will devote the greater part of his time to an agency for Firestone tires in Sacramento, Cal.

Rodney K. Haines has been appointed sales manager of the Saxon Motor Co. of New York, Saxon distributor.

John Kennedy has been appointed director of social education of the Reo Motor Car Co., Lansing.

Lieutenant Gerald Fitzgerald has been promoted to the rank of major, and is reported to be somewhere in France. He was formerly manager of the Minneapolis branch of the Remy Electric Co. and later sold Marmon and Stewart trucks.

Beckwith Havens, who until recently was foreign representative of the Denby Motor Truck Co., Detroit, is now a lieutenant in the naval aviation service.

William H. Reese has resigned the secretaryship of the Convention and Good Roads Bureau of the Milwaukee Assn. of Commerce. He will become advertising manager of the Sterling Motor Truck Co., Milwaukee.

R. W. Mickam, formerly advertising manager of the Liberty Motor Car Co., and more recently head of the advertising department of the Ford Motor Co. of Canada, has joined the Carl M. Green Co., advertising agency, Chicago.

Walter P. Coghlan, Secretary of the Klaxon Co., Newark, who at the outbreak of the war joined the United States Navy, has been honorably discharged from the service owing to an injury to his back and has resumed his duties as secretary and sales manager of the company.

—

H. Walter Staner Dead

LONDON, Feb. 27—H. Walter Staner, for many years editor of *The Autocar,* died on Sunday last from a complication of diseases which set in after a partial recovery from an attack of pneumonia. He also had editorial charge of the other automobile publications of the firm.

—

Harry R. Radford Dies

DETROIT, March 2—Harry R. Radford, well-known in automobile and club circles, is dead. He was secretary and sales manager for the Motor Car Co., organized in 1904, which company name was later styled Carter Car Co. At the time this corporation was taken over by the General Motors Co. in 1907, he became vice-president and general manager, remaining with that company until 1915. Two years ago he became associated with the Radford Block Co., Oakland distributer.

—

Changes in Velie Organization

MOLINE, ILL., March 3—The Velie Motors Corp. has made several changes in its organization. Charles R. Gardner, formerly manager of the Velie branch at Omaha, has been appointed assistant sales manager, and will be located at the Velie factory. L. H. Hazard, associated with the company for many years, has been appointed superintendent of production to succeed C. B. Rose, who was commissioned a major in the United States army. G. E. Martin will fill Hazard's place as chief engineer. F. D. Soper has been appointed purchasing agent and C. E. Mason traffic manager.

New Companies Formed

Latest additions to ranks of Automotive Industries

Organize Hebb Motors to Make Patriot Trucks

OMAHA, NEB., March 4—The Hebb Motors Co. has been organized in Lincoln to manufacture Patriot trucks of 1½ and 2-ton capacity. A factory is being built in Havelock, a suburb of Lincoln, which will be two stories high and 400 x 200 ft. As soon as the factory building is completed work will begin on a power plant, foundry and office building. It is expected that the company will be in production by fall.

—

Dealers For Concord

CONCORD, N. H., March 4—The Abbott-Downing Truck & Body Corp. has been organized to absorb the Abbott & Downing Co., manufacturer of Concord trucks, and increase the output of Concord trucks and bodies. E. E. Vreeland, who has been associated with the Fulton Motor Truck Co. for the last 2 years, has been elected president and general manager. Until the present Concord trucks were sold exclusively at retail from the factory and Boston branch, but the new company will appoint agencies.

—

Trucks Coming from St. Louis

ST. LOUIS, March 4—The Traffic Motor Truck Corp. has been organized here with $500,000 capital, and is rapidly getting into production a 2-ton truck to sell for $1,095. The company is headed by H. P. Mammen, formerly with the Westcott Motor Car Co. T. C. Brandle is vice-president and Guy Wilson, secretary and treasurer. Officials of the company say that numerous distributers' contracts have been made.

—

Four Aviation Departments

WASHINGTON, D. C., March 5.—The proposal to divide the United States into four aviation departments was declared by the War Department to-day to have no connection with the many recent fatal accidents. The change is based entirely on administrative considerations. The recent accidents will bring no new important changes other than the enlargement of flying fields already announced. It is held that a certain number of deaths must be expected. The training schedule now in force requires each student to fly nine hours with an instructor before he is allowed alone. This compares with the four-hour schedule maintained under the regulations of the allies. American flying machines to-day have had one accident to every 2400 flight hours as against one to 1400 in the flying schools of the allies.

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Day-Elders Company Making New 5-Ton Truck

NEWARK, N. J., March 2—The Day-Elders Motors Corp. has brought out a new 5-ton worm-driven truck, with a chassis capacity, including the body, of 14,000 lb. The wheelbase will be either 150 or 170 in., and the truck is assembled from standard parts, including a Buda 4½ by 6-in. L-head engine, a four-speed Brown-Lipe gearbox, a Savage Arms pressed steel frame 9 in. deep and Sheldon front and rear axles. The springs are 3 in. wide in front, and 48 in. long, and rear springs are 4 in. wide and 60 in. long. The truck has Ross steering gear, and solid front tires, 36 by 5 and rear 40 by 6 dual tires. The engine is fed by gravity to a Zenith hot-air-jacket carbureter.

—

Olympian to Start 1918 Production

PONTIAC, Mich., March 2—The Olympian Motors Co. has orders for 500 of its new model cars, and expects to begin production on this model by March 25. The company shipped its last old model car a few days ago.

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Hays Mfg. Co. Building Addition

IONIA, MICH., March 4—The Hays Mfg. Co., maker of automobile bodies, is building an addition to its plant. This is a two-story building, and will be used for finishing work.

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Baltimore Plant for Kelly-Springfield

BALTIMORE, March 4—The Kelly-Springfield Tire Co. will erect a plant here which will cost $1,000,000. The main structure of the proposed works will be three stories high.

—

Winther Truck Building New Factory

WINTHROP HARBOR, ILL., March 4—The Winther Motor Truck Co. has started work on the erection of a new factory in Kenosha, Wis., to provide facilities for handling a government contract for military trucks. The new plant will be ready by May 15, and the company will move there from its present quarters in Winthrop Harbor.

—

Duplex Truck to Increase Production

LANSING, March 4—The Duplex Truck Co., according to H. M. Lee, president of the company, will increase its production to 300 trucks a month for the remainder of the year.

—

Hawkeye Truck Buys Factory Site

SIOUX CITY, IOWA, March 2—The Hawkeye Truck Co. has purchased a 5-acre tract here for a new factory, and construction work will begin as soon as plans can be drawn. The building will be 75 by 300 ft., and will have the saw-tooth roof style.

—

Jackson Munitions Ready to Start Production

JACKSON, Mich., March 2—The Jackson Munitions Corp., which has practically closed contracts for the old Mutual Motors Co. plant, is planning to start active operations in manufacturing shells by April 1. Two-thirds of the factory will be devoted to this work and between 800 and 1,000 men will be employed.

Production of shells will start within a week at the plant of the Jackson Automobile Co. Other plants that will engage in the manufacture of shells are the Jackson Cushion Spring Works, the Sparks-Withington Co., and the Mott Wheel Works. A committee of real estate men is making a canvass of the housing situation here so that homes may be obtained for the hundreds of men who will be brought to this city. Employment will be given to all available local workmen first.

—

McNaull Shipments by Truck

TOLEDO, Ohio, March 2—Because of the difficulty in getting sufficient freight cars to make shipments to the east, the McNaull Tire Co. has started two motor trucks, loaded with tires, to New York and Paterson, N. J. If the experience is a success it is planned to put other trucks into service to make long haul deliveries.

—

20 F. W. D. Trucks Daily

CLINTONVILLE, WIS., March 2—The Four Wheel Drive Auto Co. is now manufacturing between 20 and 25 complete 3-ton trucks a day. The government has erected barracks near the factory where 200 officers and men of the ordnance department make their headquarters when receiving instructions in the operation and care of the F. W. D. trucks in the established school of the plant. The course lasts 4 weeks for privates and 3 weeks for officers.

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Martin Aircraft Plans Building

CLEVELAND, March 3—Plans for the Glenn L. Martin Aircraft producing building were filed with the city building department. It is reported that a site will be selected shortly and that the building will be rushed to completion.

—

Goodyear Marketing Cord Patch

AKRON, Ohio, March 1—The Goodyear Tire & Rubber Co. is placing on the market a cord patch for repairing inside breaks and injuries in cord tires. The patch is built of several layers of cords, the same construction being used as in cord tires. Edges are tapered to prevent tube chafing and the patch is inserted in the same way as an ordinary blowout patch, the surface in contact with the shoe being skim-coated with a layer of uncured gum.

Current News of Factories

Notes of New Plants—Old Ones Enlarged

Buda Engines Made by Other Companies for U. S.

HARVEY, ILL., March 2—The Buda Co. has licensed the United States government to contract with outside manufacturers for the production of Buda "HU" 4-cylinder 4¼ x 5½ in. engines. This engine has been adopted as a standard for certain government vehicles for the duration of the war, and the output of the Buda company is not sufficient for government requirements. Outside companies manufacturing these engines will be permitted to sell them only to the United States, and not to private organizations.

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Gillette Rubber Increases Output

EAU CLAIRE, WIS., March 4—The Gillette Rubber Co. is increasing its output from 500 tires to 1500 tires a day. Before the close of summer it is hoped to bring the capacity up to 2000 tires a day.

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Kissel Erecting Additions

HARTFORD, WIS., March 5—The Kissel Motor Car Co. has awarded contracts for the erection of two factory additions to provide extra facilities for handling the government contract for military trucks.

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DIVIDENDS DECLARED

INDIANAPOLIS, March 2—The Stutz Motor Car Co. has declared a quarterly dividend of $1.25 a share on common stock, payable April 1, to stockholders of record March 15.

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DETROIT, March 2—The Packard Motor Car Co. has declared the regular quarterly dividend of 1¾ per cent on preferred stock, payable March 15 to stock of record February 28.

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BUFFALO, March 2—The Pierce-Arrow Motor Car Co. has declared the regular quarterly dividend of 2 per cent on preferred stock, payable April 1 to stockholders of record March 15.

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CHICAGO, March 2—The Union Carbide Sales Co. has declared a regular quarterly dividend of 2 per cent, payable April 1 to stock of record March 12.

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AKRON, Ohio, March 2—The Firestone Tire & Rubber Co. has declared the regular quarterly dividend of $1.25 a share, payable March 20 to stock of record March 10.

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NEW YORK, March 4—The Linde Air Products Co. has declared a regular quarterly dividend of 2 per cent on common stock and 1½ per cent on preferred stock, payable March 30 to stockholders of record March 20.

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CHICAGO, March 4—The Stromberg Motor Devices Co. has declared the regular quarterly dividend of 75 cents a share on common stock, payable April 1 to stock of record March 15.

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Uruguay Buying American Cars

European Cars No Longer in the Market—1500 Fords Sold in 1917

MONTEVIDEO, URUGUAY, Jan. 1—The European war continues to keep the European automobile entirely out of the Uruguay market. The summer season, which is just passing, has been a very satisfactory one for the sale of cars here. Ford leads in the number sold and the increase in the use of them is nothing short of amazing, as buyers almost stand in line with cash in hand waiting to get their turn at buying. Over 1500 Fords have been sold this year, and now nearly every other car seen in the country is a Ford. The sale of Studebakers, both four and six-cylinder models, by Coates Bros., has been good, and now these machines are seen all over the Republic. Cadillacs have sold in greater quantities than any other high-priced cars. The Dodge has made strong progress since introduced here 2 years ago. Buicks, Maxwells and Overlands are doing well in this market.

Up to the present the motor truck is scarcely known in Uruguay so far as the country is concerned, although there are goodly numbers of them in Montevideo with its population of 375,000. Labor shortage is what this country is facing at present, and is going to face for several years, and this is going to make a market for the motor truck.

Farm tractors are scarcely more than heard of in Uruguay, although several dealers here believe that if they had an opportunity of visiting a demonstration in U. S. A., which would give them a definite line on tractor performance, that they would be able to make good sales to the farmers of Uruguay. Population is what is needed more than anything else in the farming sections of Uruguay, and the farm tractor should be the one effective means of making up for labor shortage. The shortage of mechanical help is one of the great handicaps to the truck and tractor.

Complaints are heard too frequently in Montevideo concerning extortionate shipping rates which are exacted by exporters in the U. S. A. To quote the exact words of one Montevideo automobile dealer, he says: "You will find cars on the same steamer for which shipping rates are at the rate of 67½ cents per cubic foot, $1.20 per cubic foot, $1.80 per cubic foot and even $2 per cubic foot. I guess the steamer all the way through gets about the same 50 cents per cubic foot rate and the balance goes to the forwarding pirates. It is all right so long as the United States has a literal monopoly because of war conditions, but give us 10 minutes' peace conditions and sooner than buy the Yankee car which we want, and for which we are soaked on the ocean shipment, we will buy the European car we do not want, but on which we get a square deal on ocean shipments. American manufacturers apparently do not realize that this is a detail of importance."

There should not be any difficulty in having this abuse remedied. Could it not be stopped in 10 minutes by the custom's port authorities refusing clearance to any steamer not endorsing on each bill of lading the exact freight collected for the carriage or transportation of that particular parcel of goods? The result would be that the Montevideo dealer would know exactly what shipping rates were paid.

—

Osborne Working for Industrial Peace

WASHINGTON, March 2—Loyall A. Osborne, New York, vice-president of the Westinghouse Electric & Mfg. Co., and chairman of the executive committee of the National Industrial Conference Board, has been appointed by the Secretary of Labor a member of a committee on industrial peace during the war. This committee, which consists of five representatives of employers, five labor leaders and two others, will provide a definite labor program for industrial peace during the war to prevent interruption of production.

—

Optician Shop Trucks for France

WASHINGTON, March 3—Motor trucks will perform a new service in France. Various makes of 5-ton military trucks are being equipped with complete shops to manufacture lenses for spectacles for our soldiers. The trucks will operate within 15 to 50 miles of the front lines and will make glasses for every soldier requiring them. Stocks of optical glass and the parts of spectacles and nose-pieces will be maintained at base depots in large quantities and will be carried on board the trucks in such amounts as can be handled. The trucks will be equipped with cabinets for holding the stock, machines for grinding lenses, producing spherical surfaces, automatic and hand-operated edge-grinding machines, tools, gauges, etc. There will be two drivers and two optical repairmen on each truck.

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Complaints Against Paint Makers

WASHINGTON, March 2—The Federal Trade Commission to-day authorized the issuance of complaints charging thirty-eight paint, varnish, soap and ink concerns with various unfair methods of competition in violation of Section 5 of the Federal Trade Commission Act. This is the largest number of complaints ever acted on at one time. The complaints allege the concerns stifle and suppress competition through lavish entertainment of competitors' employees, secret payment of money to employees of customers who might otherwise buy goods from competing concerns, and in one instance the respondent is charged with the adulteration of competitors' goods. The firms named in the complaints are given the usual 30 days to reply, and have been notified that the commission will hold a hearing on all complaints in question on the morning of April 8 next.

Favor U. S. Tractors in Europe

Italy, Switzerland, New Zealand and South Africa Buying American Products

WASHINGTON, March 5—American tractors are gaining ground abroad, according to reports received by the Department of Commerce from consuls in various cities of Switzerland, Italy, New Zealand and South Africa. Tractor manufacturers are paying more attention to the foreign field, and are eliminating features of mechanism objected to in Europe.

This is especially true in Italy. Several Italian rice cultivators have stated that they did not consider American tractors suitable for the requirements of the uneven Piedmontese land. A well-known American company, after careful study, changed its tractor so as to eliminate the features which had militated against the successful operation of the tractor in Piedmont. At present Italian rice cultivators are appreciative of American products.

As a first step to increased trade in Italy, tractor manufacturers should issue circulars in Italian for distribution among farmers there.

During the war the Swiss peasant has been paying more attention than previously to American agricultural machinery. Trials of American motor plows were recently undertaken by the Zuckerfabrik Aarberg, Aarberg, Switzerland, and by the Landwirtschaftliche Schule Rutti bei Berne, Switzerland. The results favorably impressed the various experts of the agricultural associations.

In South Africa, imports are being curtailed with a view to conserving all available shipping space for necessaries. Nevertheless, American products are easily obtained, and a good foundation for future trade should be established. Medium sized tractors with good power, which can be utilized for traction plowing, operate successfully. The tractor should be easy to operate and as nearly foolproof as possible. Purchasers should be thoroughly instructed in the use of the tractor, and spare parts should be easily obtainable.

Great care should be taken in granting exclusive agency rights. Importing dealers in agricultural machinery and implements are usually the most satisfactory representatives, as they generally have various branches or connections and have an established trade in farming communities.

Reports from New Zealand state that the demand for tractors is not large at present, but that a good market could readily be developed. The district is flat, and most of the grain is grown here. Traction engines from the United States are taxed 10 per cent. In order to obtain a footing, it would be necessary either to open a branch or grant an exclusive agency to some established firm.

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Export Regulations Altered

WASHINGTON, March 2—Following the report of the War Trade Board 2 weeks ago, AUTOMOTIVE INDUSTRIES published a statement to the effect that collectors of customs would accept a shipper's export declarations in lieu of an individual license, for all goods which had not required licenses prior to the President's recent export and import proclamation. This was under the provision that it be shown to the satisfaction of the collectors that the goods were covered either by a bill of lading marked "for export," or a through export bill of lading, provided the bill of lading was dated Feb. 19, 1918, or earlier and provided that the goods were actually exported by March 15th. The War Trade Board assumed when it made this statement that all exporters interested in above described shipments would immediately apply for export licenses and receive them in ample time to be used on or before March 15, 1918.

The War Trade Board now says that there is at present a considerable congestion of freight at various points which will make it impossible for all goods covered by the above ruling to be exported on or before March 15, 1918. To take care of the situation the Board has adopted the following form of procedure to be used in those cases where the goods, which did not need a license prior to the proclamation, are covered by either a bill of lading marked "for export" or a through bill of lading dated February 19, 1918 or earlier.

Any exporter or shipper interested in shipments of this character which are not to be exported by March 15. 1918 should present his export declarations in quadruplicate, under Form Customs Catalog No. 7525, to the nearest branch office of the War Trade Board. This branch office will license the shipments on the export declaration without requiring the shipper or exporter to file a formal application.

These export declarations when licensed will be of use only if the goods are exported by April 15, 1918. If any shipper or exporter has reason to believe his shipment will not be exported by this date, he has several weeks within which to file a formal application and receive a license valid for the usual period.

Shippers should not wait until July 15 to file formal application if shipments cannot be exported before that date. The application should be filed immediately, to fully protect the shipper if the formal license becomes necessary later.

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Tractors Shown at Columbus Show

COLUMBUS, OHIO, March 2—The Ninth Annual Columbus Automobile Show which opened Feb. 27, at Memorial Hall, included farm tractors as well as passenger cars. Because of lack of space, no motor trucks were shown. An unusually large crowd attended the show, on the opening night, and several sales were reported. Passenger cars and tractors were exhibited on the main floor, and accessory dealers and manufacturers had booths in the balcony. The show was held under the auspices of the Columbus Automobile Show Co., a corporation composed of several Columbus dealers.

—

Thayer on Aircraft Board

WASHINGTON, March 2—Harry B. Thayer, New York, has been appointed a member of the Aircraft Production Board by President Wilson.

Need Workers for Ordnance Department

WASHINGTON, March 4—The Ordnance Department of the United States Army has issued a call for civilian workers with a high school education and some shop training. Applicants will receive the necessary training under government instruction, and will receive appointments as soon as this short course of training is finished. Those who have the required technical training will be assigned to ordnance work immediately in the following positions:

Inspectors and assistant inspectors, field artillery ammunition steel.
Inspectors, artillery ammunition, cartridge cases, assembling, loading, forging, primers, detonators, shell and shrapnel machining.
Ballistic inspectors.
Metallurgical chemists and assistants.
Inspectors, powder and explosives.
Inspectors, cannon, forging operations.
Inspectors, gun carriages and parts.
Inspectors, gun fire control instruments.
Assistant inspectors, motor vehicles and artillery wheels.
Engineers and assistant engineers for tests of ordnance materials.
Inspectors, ammunition packing boxes.
Machinists accustomed to work to 1000ths of inch.

Applications should be mailed to C. V. Meserole, special representative of the Ordnance Department, U. S. A., Room 800, 79 Wall Street, New York City.

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Recommend Daylight Saving Bill

WASHINGTON, March 4—The United States Chamber of Commerce, through its committee on daylight saving, recommended the prompt passage by Congress of the Daylight Saving Bill. Fifty-two important reasons were given in the recommendation.

Calendar

ASSOCIATIONS

April 15-19—Little Rock, Ark., United States Good Roads Assn. Sixth Annual Session.
June 5-12—Hot Springs, Va., National Assn. Automobile & Accessory Jobbers.
June 17-19—Dayton, O., Society Automotive Engineers, Annual Midsummer Session.

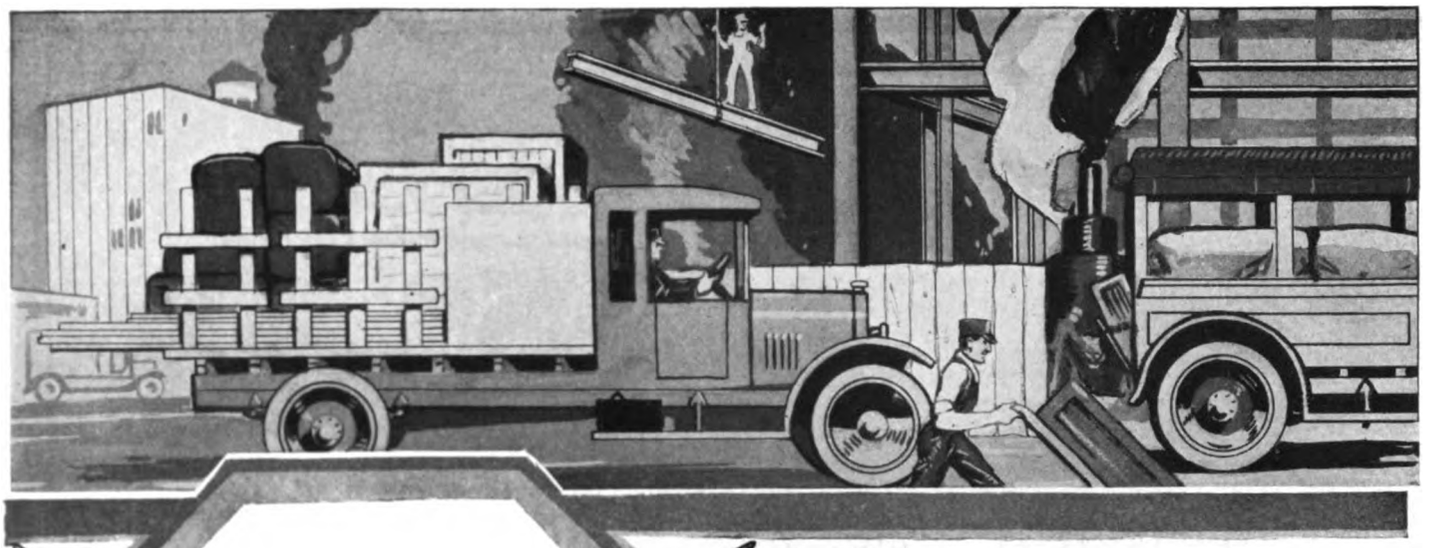
SHOWS

Mar. 1-15—Lyons, France, Third Sample Fair.
Mar. 2-9—Boston, Mass., Boston Auto Dealers' Assn., Mechanics' Bldg. Chester I. Campbell, Mgr.
Mar. 2-9—Pittsburgh, Pa., Automobile Dealers' Assn. of Pittsburgh. Motor Square Garden. John J. Bell, Mgr.
Mar. 4-9—Utica, N. Y., Utica Motor Dealers' Association, Inc., State Armory.
Mar. 6-9—Clinton, Ia., Clinton Automobile Dealers' Assn., Coliseum.
Mar. 6-9 — Watertown, N. Y., Automobile Dealers, Inc., State Armory. Arthur E. Sherwood, Mgr.
Mar. 6-9—Mason City, Iowa, Annual Car and Truck Automobile Dealers' Assn.
Mar. 6-9—St. Joseph, Mo., St. Joseph Automobile Dealers' Assn., Auditorium. John Albus, Mgr.
Mar. 6-9—Little Rock, Ark. First Annual Car and Truck Show. Liberty Hall.
Mar. 6-9—Sioux Falls, S. D., S. D. Automobile Dealers' Assn.
Mar. 11-16—Cedar Rapids, Ia., Cedar Rapids Auto Trade Assn., Auditorium.
Mar. 11-16—St. Louis, Mo. Used Car Show. St. Louis Auto. Manufacturers and Dealers' Assn. Exhibit Bldg.
Mar. 12-15—Fargo, N. D., Gate City Auto. Show Co., Auditorium. J. W. Murphy, Mgr.
Mar. 13-16—Raleigh, N. C., Auditorium. John Kelley, Mgr.
Mar. 13-16—Warren, Pa., Warren Automobile Dealers' Assn., Russell Garage.
Mar. 13-16—Peoria, Ill., Peoria Auto. Accessories Dealers' Assn. W. O. Ireland, Mgr.
Mar. 15-20—Great Falls, Mont., Montana Automobile Distributors' Association, Lexington Garage. A. J. Breiteastein, Mgr.
Mar. 19-23—Vancouver, B. C., Western Canada Automobile Show Assn., Horse Show Bldg. D. A. Hamilton, Mgr.
Mar. 20-22—Houlton, Me., Second Annual, Houlton, Motor Car Dealers' Assn., Bangor St. Exhibition Hall. J. D. Luther, Mgr.
Mar. 20-23 — Holdredge, Neb., Second Annual of Southwest Nebraska.
Mar. 20-23—Greensboro, N. C. First Annual. John Kelly, Mgr.
Mar. 20-23 — Trenton, N. J., Trenton Auto Trade Assn., Second Regiment Armory. John L. Brock, Mgr.
Mar. 25-30—Rochester, N. Y., Tenth Annual. Rochester Auto. Trades Assn., Exposition Park. C. A. Simmons, Mgr.
Mar. 25-30 — Bridgeport, Conn., Fourth Regiment Conn. Home Guard State Armory and Casino. B. B. Steiber, Mgr.
Mar. 27-29—Fort Fairfield, Me., Reed's Garage. R. F. Reed, Mgr.
Mar. 30-April 6—Hartford, Conn., Eleventh Annual, Hartford Automobile Dealers' Assn., Inc. State Armory. B. F. Smith, Mgr.
Mar. 30-Apr. 6 — Atlantic City, N. J., Second Annual. Garden Pier. S. W. Megill, Mgr.
Mar. 30-Apr. 6—Chicago, Ill. Second Annual Chicago Used Show. Chicago Auto. Trade Assn. Coliseum.
Apr. 1-6—York, Pa., York Auto Dealers' Assn. T. F. Feiffer, Mgr.
Apr. 6-8 — Green Bay, Wis., Brown County Automobile Trade Assn.
Apr. 6-13 — Red Bank, N. J., Monmouth County Auto. Dealers' Assn., Armory, E. C. Von Kattengell, Mgr
Apr. 8-13—Reading, Pa., Reading Automobile Trade Assn.
Apr. 9-13—Stockton, Cal., Third Annual San Joaquin Auto Trade Assn. Samuel S. Cohn, Mgr.
Apr. 16-20—Deadwood, S. D. City Auditorium.
Apr. 17-19—Davis, Cal., Tractor Demonstration. University of California.
Apr. 17-20—Calumet, Mich., Upper Peninsular Show, Copper County Automobile Dealers & Garage Owners' Assn., Coliseum.
May 3-7 — Lima, Ohio. Ohio State Automobile Asn.
Sept. 23-28 — Chicago, National Accessory Show for Fords, Coliseum.

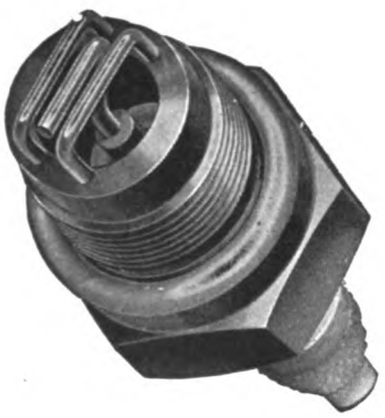
ENGINEERING

American Society of Heating and Ventilating Engineers.
Mining and Metallurgical Society of America.

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BERGIE
National
SPARK PLUGS



The Spark Plug
With the One Inch
Firing Surface

"Best Spark Plug for Trucks We Ever Used"

This is the unanimous opinion of every truck manufacturer, truck operator and truck dealer who has given the National Spark Plug a fair trial.

Try a set on your trucks for 30 days this cold weather. The results—quicker starting, better economy, better "pulls"—will prove a revelation.

Price $1 each. Guaranteed for 365 days. **Truck Users**—Order of your dealer. If he cannot supply you, send us his name and we will see that you are supplied direct. **Truck Dealers and Manufacturers**—Write for unusually interesting offer.

BERGIE NATIONAL SPARK PLUG CO.
ROCKFORD ILL.

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RAYFIELD THERMOSTAT

Here it is at last



A hot motor all the time

Stops your motor troubles

CAR, truck and tractor owners have been awaiting such a device ever since the advent of low-grade fuel—a device that would insure instantaneous, constant and efficient heat in the motor. The Rayfield Thermostat does it. No matter how cold the water in the radiator, and no matter whether the temperature be 30 below zero or 100 above in the shade; your motor will retain an even, efficient heat.

The Rayfield Thermostat is easily installed on a pleasure car, truck or tractor, using any make or type of carburetor. In a short time it will save its cost in fuel, oil and repair bills. It insures perfect combustion and forestalls trouble arising from unconsumed fuel. You have a better performing motor all the time. This new device is simple, durable, and requires no adjustments or attention whatever. Once used it becomes a necessity in summer as well as winter.

The Rayfield Thermostat is made by the makers of the famous Rayfield Carburetor.

Investigate this new device. Ask your dealer. If he can't supply you, write us.

Prompt deliveries on Rayfield Carburetors

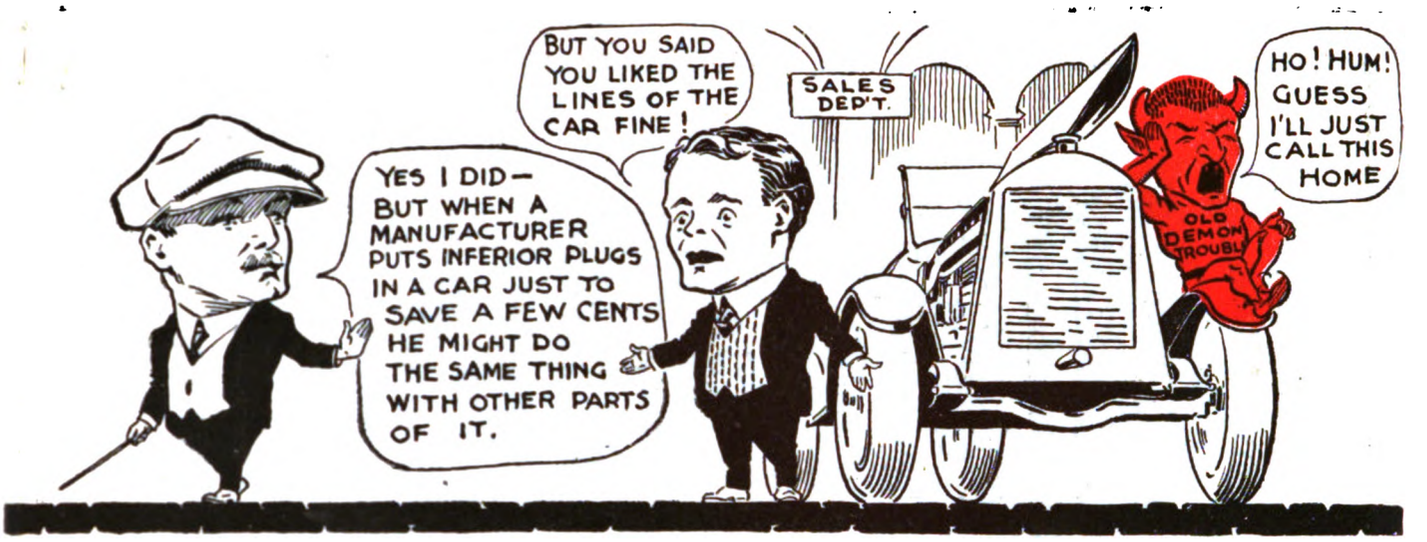
We have heen swamped with orders for Rayfield Carburetors. Often in the past we were unable to supply the demand. Now, however, due to increased production facilities, we can guarantee immediate delivery on all carburetor orders.

Moreover, the Rayfield Carburetor has been brought to a point of greater perfection today than ever heretofore.

Now is the time to have a Rayfield installed on your car.

Findeisen & Kropf Manufacturing Company
2117 Rockwell Street, Chicago

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Confidence is the root of success in business. Don't shake the confidence of your customer by putting in bad Spark Plugs! How does he know the rest of the car is right? This is the principle that makes so many leading manufacturers equip with AC. *They will not take chances!*



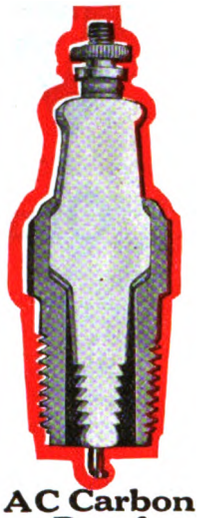
⅞ in. Regular AC Titan

After strenuous tests the manufacturers listed decided on A C. Can *you* afford to disregard their judgment?

Albert Champion means

AC SPARK PLUGS

The Standard Spark Plug of America



AC Carbon Proof
For Fords Overlands and Studebakers

LOOK FOR AC ON THE PORCELAIN
They Are Made For All Types of Motors

Ford, Overland and Studebaker owners, how often must you clean your plugs? This new AC is exactly what its name implies—*Carbon Proof*. Progressive dealers owe it to their trade to advise AC equipment exclusively.

CHAMPION IGNITION COMPANY
SOLE MANUFACTURERS, FLINT, MICHIGAN

These Manufacturers Use AC as Standard Equipment

Cadillac	Buick	Scripps-Booth	Dodge Brothers	Gabriel Trucks	Riker Trucks
Pierce-Arrow	Oakland	Crane-Simplex	McLaughlin (Canada)	Gramm-Bernstein Trucks	Stewart Trucks
Packard	Oldsmobile	Stearns-Knight	Duesenberg Motors	Moreland Trucks	Wisconsin Motors
Marmon	Nash	Saxon	American-La France	Wilcox Trux	La Crosse Tractor
Hudson	Kissel Kar	Stutz	Davis	Sterling Trucks	Advance-Rumely Tractor
Chalmers	Premier	National	Sanford	Republic Trucks	Buffalo Motors
Hupp	White	Stephens	Old Reliable Trucks	Diamond T Trucks	Continental Motors
Chandler	Delco-Light	Jackson	Titan Truck	F-W-D Trucks	Deere Tractors
Haynes	Murray	Apperson	Ford Tractors	G. M. C. Trucks	Northway Motors
Chevrolet	J. I. Case	Anderson	Acme Trucks	Sandow Trucks	Rutenber Motors
Dort	Jordan	Locomobile	Netco Trucks	Signal Trucks	Sterling Motors
Coie	Liberty	Daniels	Federal Trucks	Brockway Trucks	Smith Motor Wheel
Reo	McFarlan	Westcott		Samson Tractor	Van Blerck Motors
Paige	Paterson	Singer		Menominee Trucks	Wallis Tractors
Peerless	Lexington-Howard	Dorris			Waukesha Motors
Pilot					

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WISCONSIN AXLE

WORM DRIVE

Ordered Now May Prevent A Shortage Later

No one knows how long you will be able to get worm drive axles, or how many will be available during the course of 1918.

Right now, WISCONSIN Worm Drive Axles are ready for immediate delivery, in the quantities you want. We have increased our facilities to accommodate you—and a few other truck manufacturers, foresighted and business-wise.

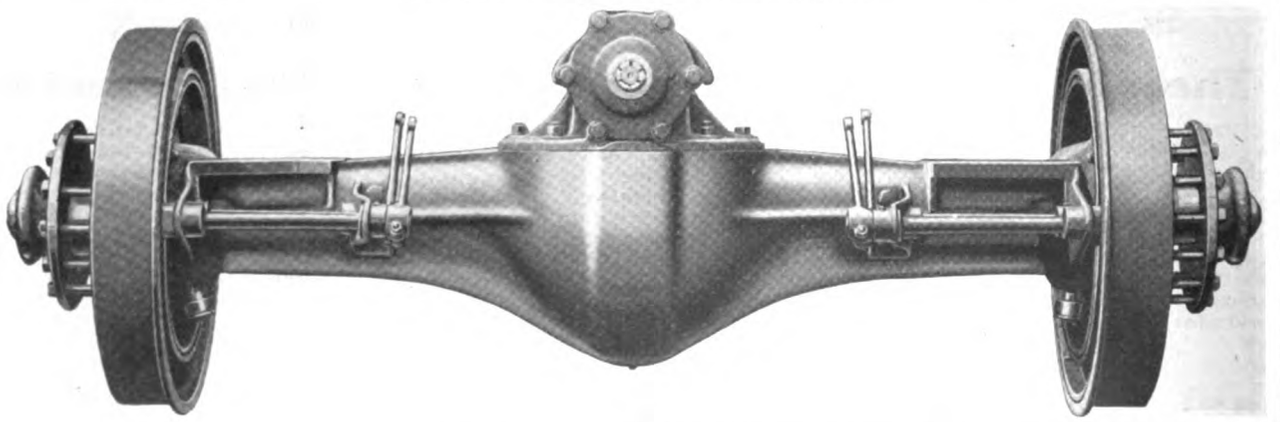
Your order placed while we are in position to deliver is protection against a possible shortage in the future. Delay, in the face of conditions, changing from day to day, may find you curtailing your output later in 1918.

Ten other truck manufacturers are certain of their 1918 supply of Wisconsin Axles. Let us show you what they think of our product and service.

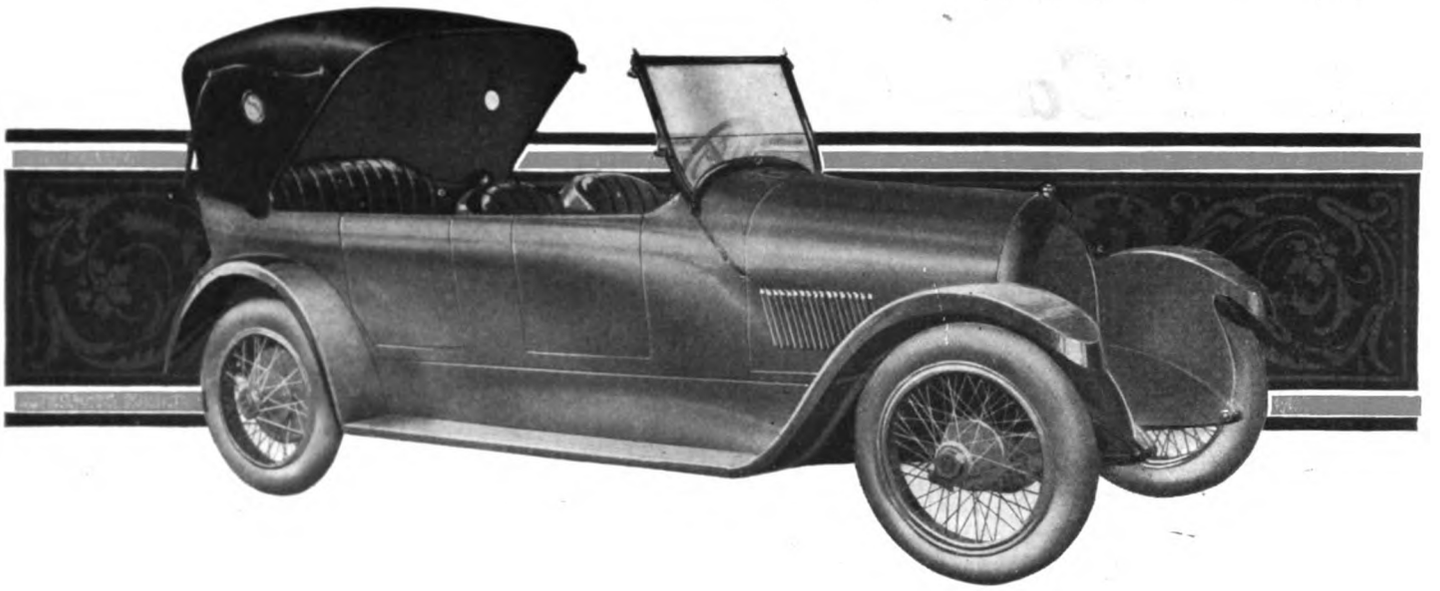
Sales Representative of
E. B. Hayes Machinery Corporation
Oshkosh, Wis.

Engineering & Sales Corporation
122 South Michigan Avenue, Chicago, Ill.

4 Models — 2½, 2, 1½ and 1 ton Capacity.



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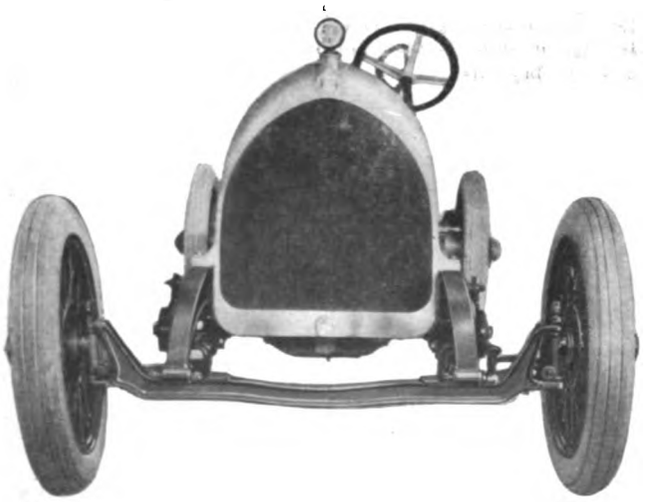


REVERE

A limited number of inventions succeed. They are the inventions of practical theorists—of men who know and know how.

A limited number of motor cars succeed. They are the motor cars that dominate—designed by men who know and know how.

Gil Anderson is a race driver, but he is also a motorist like yourself. He knows the mechanics of motor cars that win, and the requirements of passenger cars that make good.



You would select the Revere—designed by Gil Anderson, Adolph Monsen and Tom Rooney—from a group of many motor cars. It combines the accessibility, so essential in the racer, with refinements and design that make a few passenger cars a notable success.

For a select number of big calibre dealers in the larger population centers, the Revere offers a connection of unusual possibilities.

Write or wire for complete information, as limited output for 1918 makes early alliances essential.

Distinctive Specifications

Duesenberg Racing Type Motor—speed from 4 to 85 miles an hour; 130-in. wheelbase; 4 speeds forward and 1 reverse; Bosch Magneto; Bijur Electric System; Special Revere design Drop Forged Front Axle; Special Revere design Springs; Miller or Stromberg Carburetor; Goodyear Cord Tires. All Standard Body Sizes, Revere Designs.

CAR OWNERS Wire for Catalog

Revere Motor Car Corporation
1638 Monadnock Block CHICAGO
Factory, LOGANSPORT, IND.

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Last Call for 5% Extra Profit

Special Offer Ends March 15th



A Volume for every Section

Price $3.00 per Volume

This is your last opportunity

to make a 5% better profit on this standard piece of merchandise—the Automobile Blue Books

Every car owner who tours knows the Automobile Blue Books. For seventeen years they have been known as the Standard Road Guides of America. That is the reason they are such a popular annual seller and a profitable article to push.

By placing your order before March 15th, helping us to determine how many to print of the various volumes, you can have an additional extra 5% discount on your order. Books will be published May 1st, but your order must be in our hands not later than March 15th.

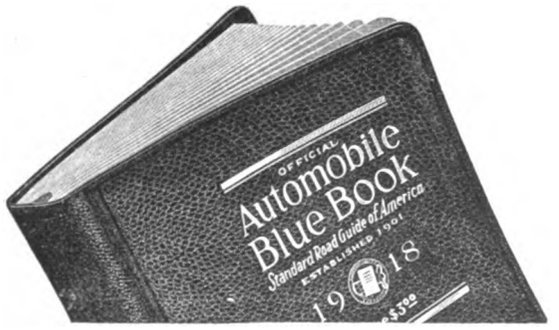
Here is the profit you will make on every copy if you order before March 15th:

$1.00½ on every copy if you order 1 to 6 copies (33⅓%)
$1.10 on every copy if you order 7 to 24 copies (36⅔%)
$1.14¾ on every copy if you order 25 to 49 copies (38¼%)
$1.19½ on every copy if you order 50 to 99 copies (39.8%)
$1.24¼ on every copy if you order 100 to 249 copies (41.4%)
$1.29 on every copy if you order 250 or more copies (43%)

Terms—2% 10 days or 30 days net

This is 5% better than our regular schedule—the schedule at which all orders will be billed that are received after March 15th. If you delay placing your order you will deprive yourself of an extra 5% profit on this standard merchandise that you can have if you act now. This means a difference of from 9 to 10½ cents on every copy.

The above discounts are for books f.o.b. New York, Chicago or San Francisco. Delivery will be made from nearest point. Every order determines its discount. Discount on initial order does not hold good on repeat orders.



Mail your order now to your jobber or direct to

The Automobile Blue Book Publishing Co.

243 West 39th St., New York, N. Y.

900 So. Michigan Ave.
CHICAGO

513 Pacific Bldg.
SAN FRANCISCO

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MARMON 34

The New Series—Stabilized Design

It seems a contradiction, but it is no less a fact, that the new series Marmon 34, while bringing no radical changes—no fundamental innovations—does establish a most noteworthy fundamental in motor car construction — namely, Stabilized Design.

WHEN the Marmon 34 was introduced at the New York Automobile Show two years ago, it differed entirely in principle and design from all other cars.

For one thing, it was 1100 pounds lighter. For another, it eliminated more than 1200 parts. Aluminum was extensively used in the motor and body. The frame, running-boards, and fenders were a rigid unit construction. Great engineering genius has not been able to better it except in the matter of a few mechanical refinements.

So today the distinguishing differences between the New Series Marmon 34 and the old are the slanting windshield and the wider seats and the deeper sides.

As far as men know, the Marmon represents the final type. It has put a stop to the annual metamorphosis of models—it has stabilized not only construction, but the buyer's investment.

NORDYKE & MARMON COMPANY

Established 1851 : Indianapolis

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MARMON 34

Advanced Engineering

A Stabilized Market

TAKE a survey of the automobile field and you will note that certain cars possess certain strong individuality—they represent types.

For example: The car that stands for a very low price. A second that is recognized for a certain type of motor. Or a third that is known for another important idea.

Among these steady sellers looms the Marmon 34—leader of the fine car group, the exponent of stabilized design.

It represents advanced engineering—eleven hundred pounds less weight—minimum unsprung weight—perfect balance, front and rear—twelve hundred and ninety less parts—automatic lubrication—roadability at all speeds—long wheelbase with short turning radius and 50 to 75 percent more miles per gallon of fuel than cars of like size and power.

These and other great distinctions have made the Marmon come to typify the thing men want. Its success has grown steadily day by day ever since its introduction three years ago.

And the dealers who depend upon it for their business know that the Marmon's stabilized design has brought a stabilized market.

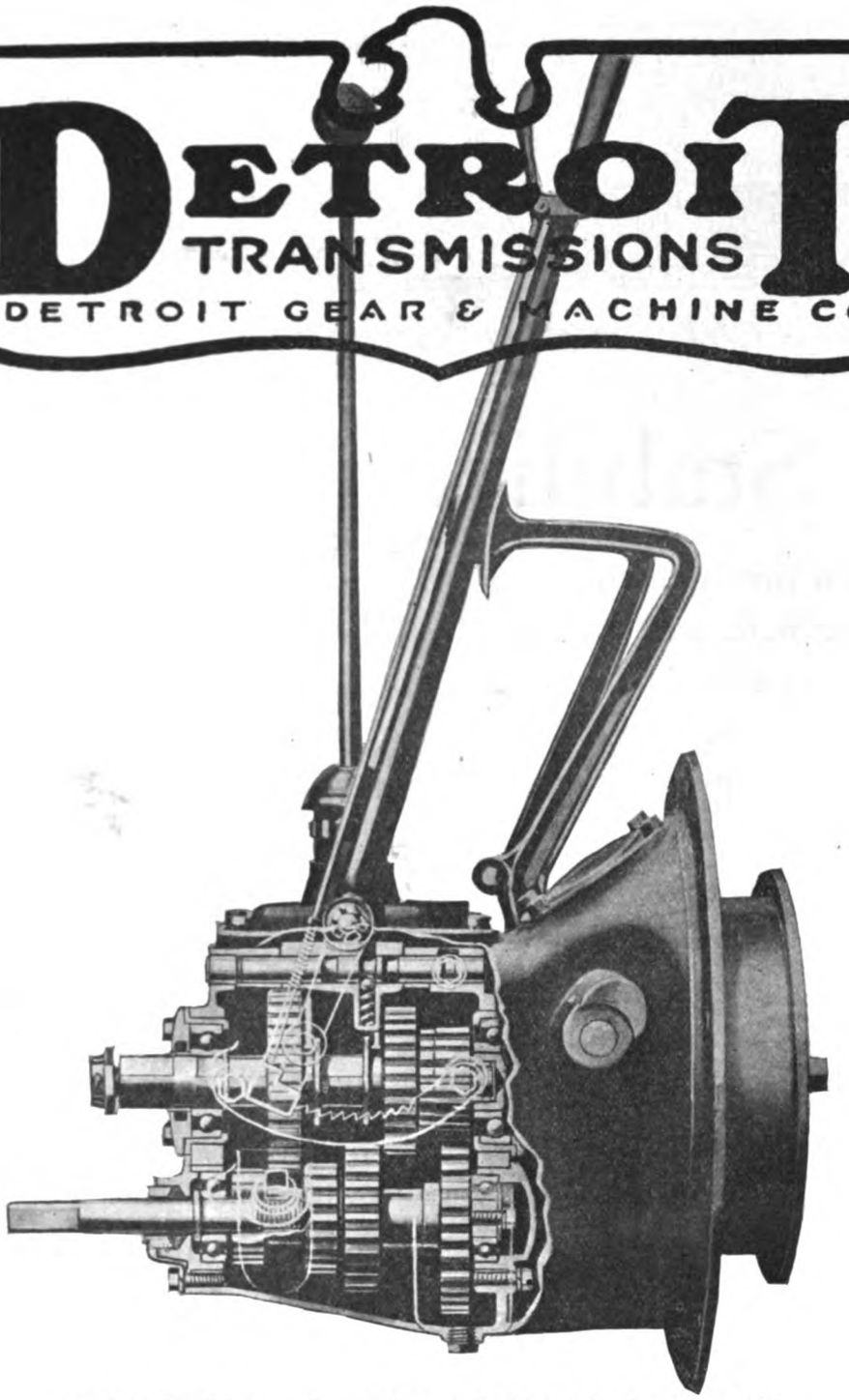
NORDYKE & MARMON COMPANY

Established 1851 : Indianapolis

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DETROIT TRANSMISSIONS

DETROIT GEAR & MACHINE CO.



MODEL C TRANSMISSION

Unit Power Plant Type for Trucks of 1, 1½ and 2-Ton Capacity—3 Speeds

A sturdy truck transmission that has proven its value by five years of service in the product of half a dozen of the best truck manufacturers in the country. It is furnished with clutch housing to fit motors requiring a No. 3 or No. 4 S. A. E. standard flange, also to fit the Model N and 7-N Continental Motor flange. We can either furnish the 12-plate Model "G" disc clutch shown above or can make provision for Borg & Beck 12 inch clutch.

Gears are 6-8 pitch, ¾" width face, made from drop forged, heat treated high carbon 3½% nickel steel. Countershaft and gears are one solid forging, running on ball bearings. Gear ratios are as follows:

High—Direct Second—1¼ to 1 Low—3.2 to 1 Reverse—3.88 to 1 Weight with clutch, 162 lbs.

The countershaft may be extended as shown, at the purchaser's option, to provide for power takeoff, or Wood's Hoist attachment can be applied to tire pump boss shown on side in view of CX transmission.

A model that can be used interchangeably by manufacturers having two models of 1, 1½ or 2-ton capacity that prefer unit power plant construction.

For tractor use a modification of this transmission is finished having direct drive on second speed. Other gear ratios are:

First Speed—1.565 to 1 Third Speed—1 to 1.72 Reverse—1.9 to 1

DETROIT GEAR & MACHINE COMPANY

Detroit [redacted] Michigan

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Keeping Out the Cold

Look at the radiator on this car.

Notice the tightly closed shutters barring out the cold, helping to keep the engine and jacket water warm.

This car is equipped with a Harrison Radiator with automatically controlled shutters.

The Harrison Radiator Shutter saves gasoline and oil—increases engine efficiency—makes starting easier.

It saves wear by eliminating the racking of parts from imperfect carburetion and ignition.

Every car is "a car for any climate" when equipped with a

Harrison Radiator Corporation
Lockport, New York

These photographs courtesy of Columbia Motors Company

Upper, shutter closed; lower shutter open

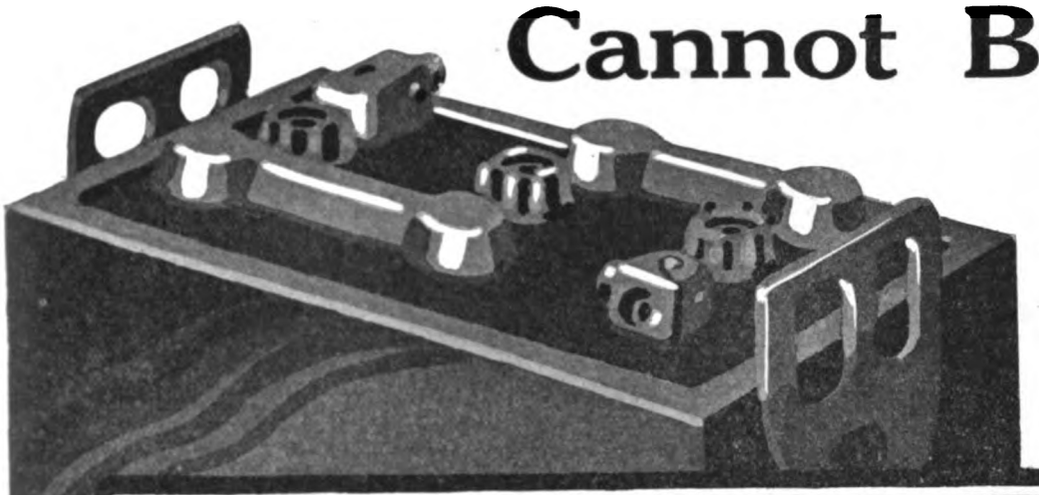
HARRISON

Automatically Controlled Shutter-Equipped

Radiators

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Permalife Plates Cannot Buckle



No Permalife plate ever did buckle. The vital importance of this Permalife feature is evidenced by the fact that 75% of all battery trouble is caused by buckling or bending plates.

NOTHING in the Permalife Battery receives greater attention than the plates. From the first, Wright, the Permalife inventor, saw clearly that herein lay the dominant requisite for the best service, and he gave long, intensive effort to this one feature. How well he succeeded is shown in Permalife performance.

The Permalife grid has a special bend resisting construction which braces it and keeps it straight in every direction against every strain.

Then to give added strength—the active material is packed by hand (not pasted) in such a manner that it is locked in and cannot loosen.

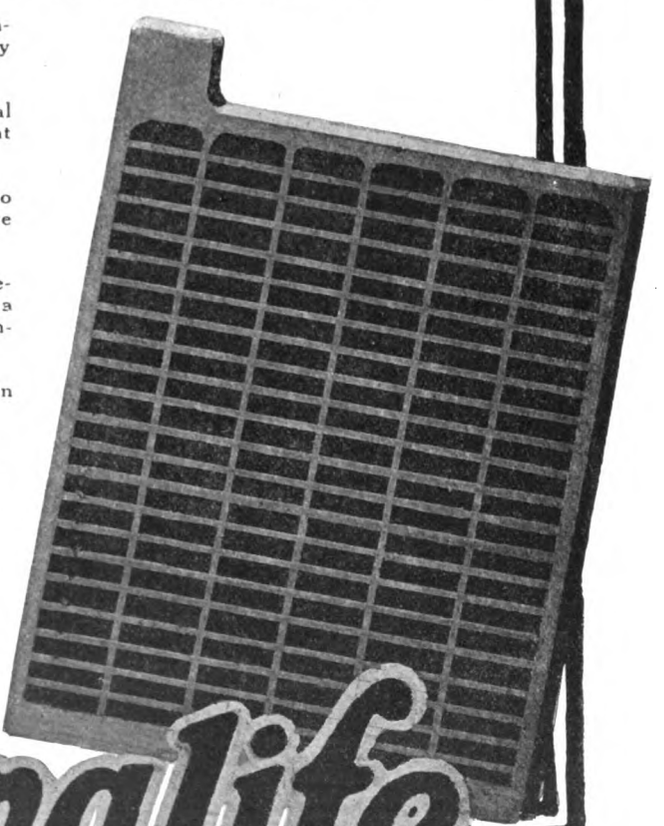
The active material is of such permanence as to give great durability and yet so porous as to facilitate the quick chemical action of the electrolyte.

Permalife Separators are made of the most carefully selected wood—quarter sawed and treated to a process of electrical sifting to eliminate any conductive material.

Permalife delivers a higher rate of discharge than any other make.

Write for the Permalife Merchandising Plan—it presents a co-operative proposal by which the dealer is able to gain and hold the bulk of local battery business.

Permalife Storage Battery Co., Inc.
Poughkeepsie, N. Y.



Permalife

THE EVERLASTING BATTERY

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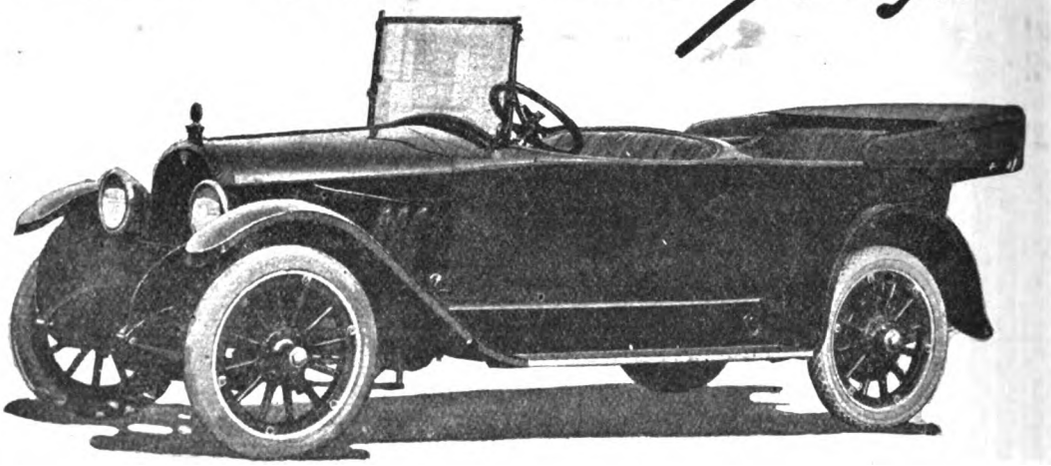
To Eastern Dealers:

THIS IS YOUR OPPORTUNITY TO MAKE 1918 A YEAR OF PROFITS

Louis Chevrolet says-



Every American bears the personal O.K. of Louis Chevrolet. You find it on the inside of the dash just below the name-plate, when you raise the hood, in Chevrolet's own hand —"O.K., Chevrolet."



You can see the handwriting on the wall. You know it will not be a question of MAKING sales this season—**But of getting cars to meet the demand.**

The demand for cars this year will be as great as it ever has been—but between greatly reduced output on the part of manufacturers on the one hand and traffic conditions on the other, no Eastern dealer will be able to secure his full allotment of cars. Many will get **none at all.**

But AMERICAN dealers are going to have all the cars they can sell—**as fast** as they can sell them. This is **positively guaranteed**—because we are not affected either by freight tie-ups or government contracts. The AMERICAN plant, located at Plainfield, New Jersey—is within driving distance of practically every Eastern locality.

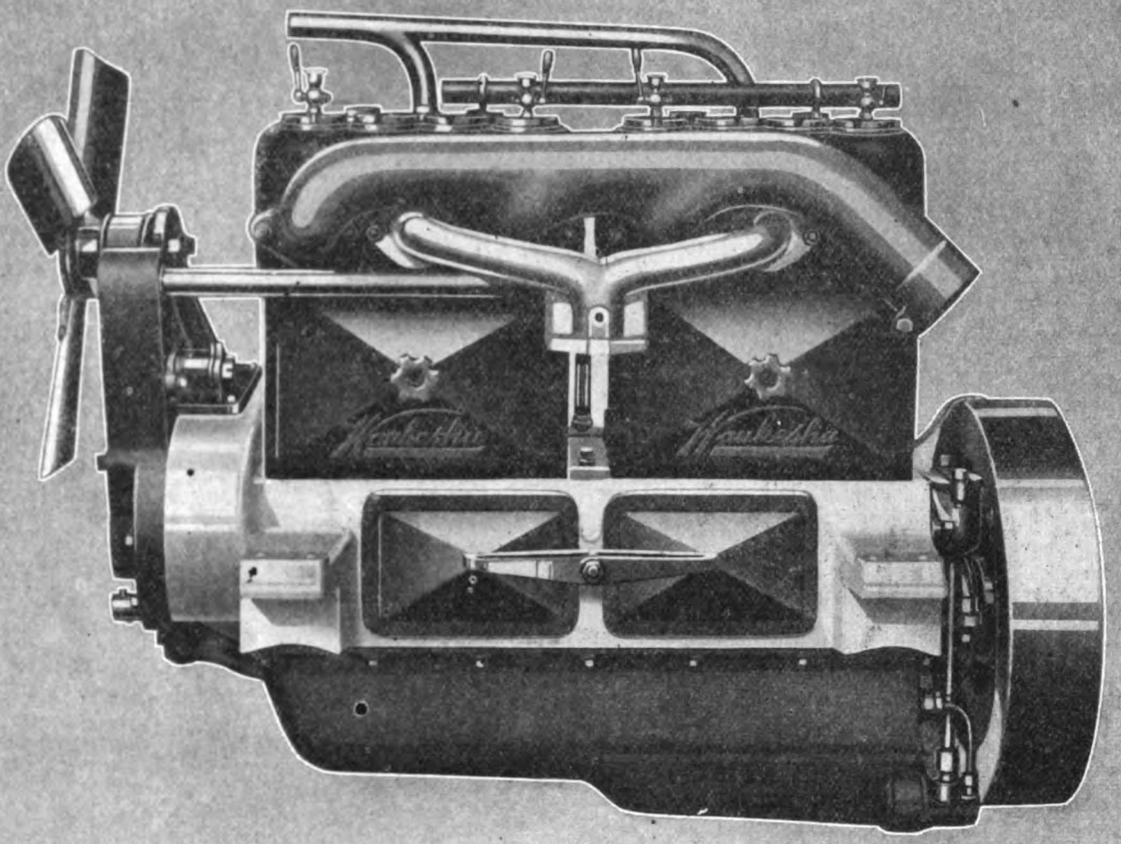
You can see how profitable it will be to have the AMERICAN in your territory. It is a car with all the attributes and appurtenances of the more expensive makes—a car endowed with a dignity of beauty and inherent qualities of goodness that will appeal to you. You can push it with the sure knowledge that every one you sell will make a staunch friend for it and for you.

This is a real opportunity for Eastern dealers to make 1918 a record-breaker for profits. Write or wire us today for detailed specifications and liberal dealer proposition.

AMERICAN MOTORS CORPORATION
LOUIS CHEVROLET, Vice-President and Chief Engineer
PLAINFIELD, N. J. 25 Miles from New York

AMERICAN "THE CAR OF 1918"

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They who render the final verdict are not the ones who judge by sentiment or superficialities but are those guided by the inherent character of the product. That

Waukesha
TRADE MARK

Four-Cylinder Motors for Trucks and Tractors

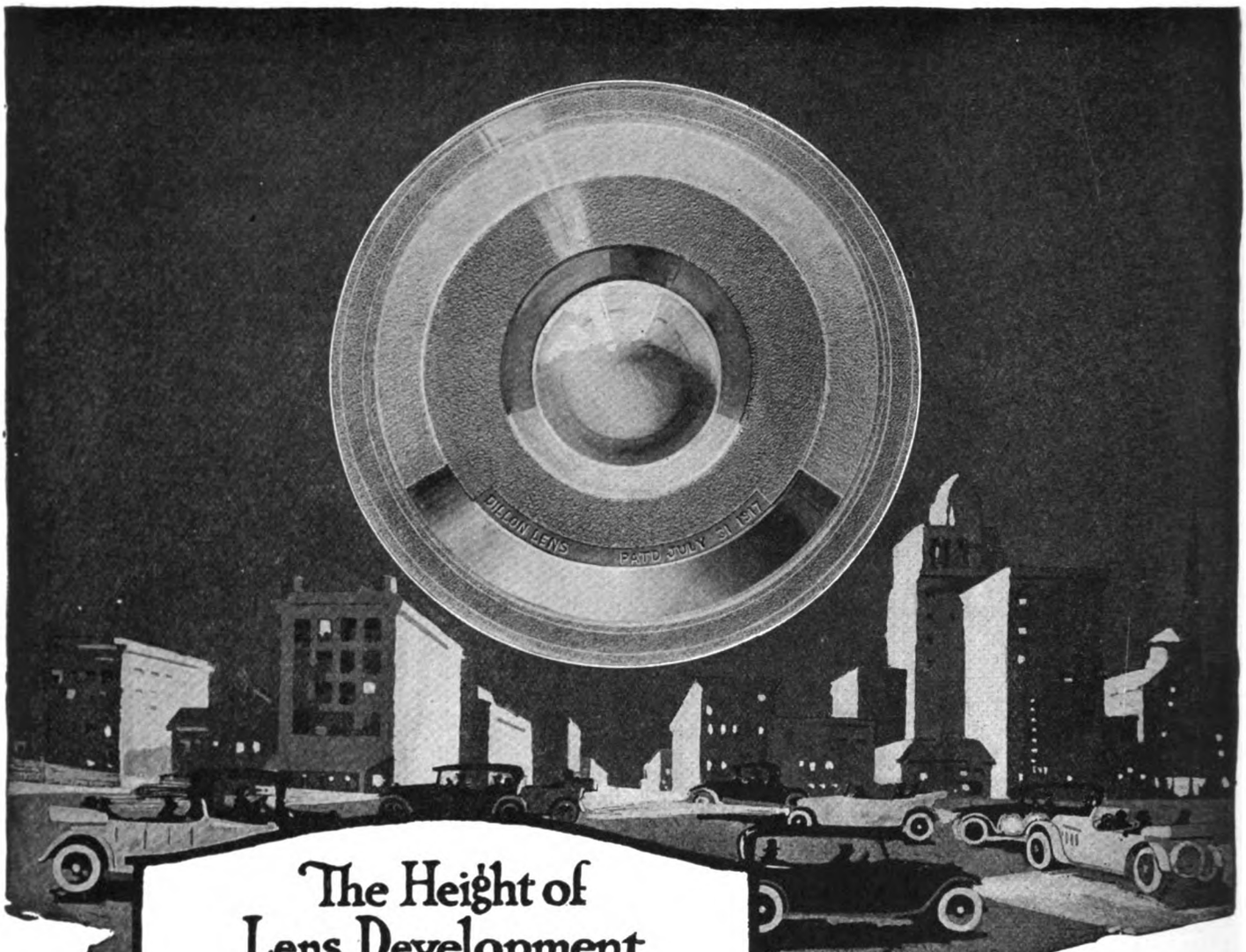
are possessed of exceptional character is evidenced by their dominance of the tractor field and their enthusiastic approval by truck authorities. Waukesha Motors have become an institution in national commercial life.

"Demand a Waukesha Motor in the Truck or Tractor YOU Buy"

WAUKESHA MOTOR CO., Waukesha, Wis.

World's Largest Manufacturers of Truck and Tractor Motors Exclusively

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The Height of Lens Development

THE Dillon Multi-Vision Lens marks a new era in lens performance. Not only is it a radical departure in design, but it is evolutionary in results.

The central bull's-eye, for instance, is an exclusive advantage of the Dillon. This bull's-eye has an important function—that of concentrating and magnifying the light on the road. This light is made glareless by the light from a carefully determined proportion of clear glass above the bull's-eye. The clear glass at the bottom provides the necessary front and side lighting.

The Dillon is the only lens made that gives you TWICE the lighted area, by projecting a SQUARE path of light. It is also the only lens made that projects entirely beyond the rim.

In no respect is the Dillon excelled and any of its chief features alone make it supreme in its field.

Write for literature, or send cash, check or money order, together with make and model of your car if you cannot obtain Dillon Lenses.

National Distributing Co.

Exclusive Distributors for the Dillon Multi-Vision Lens

Oliver Building,
Pittsburgh, Pa.

Dealers—

Get in touch with your jobber or write us at once. Liberal proposition, exclusive talking points, selling co-operation, national advertising—everything you need for success.

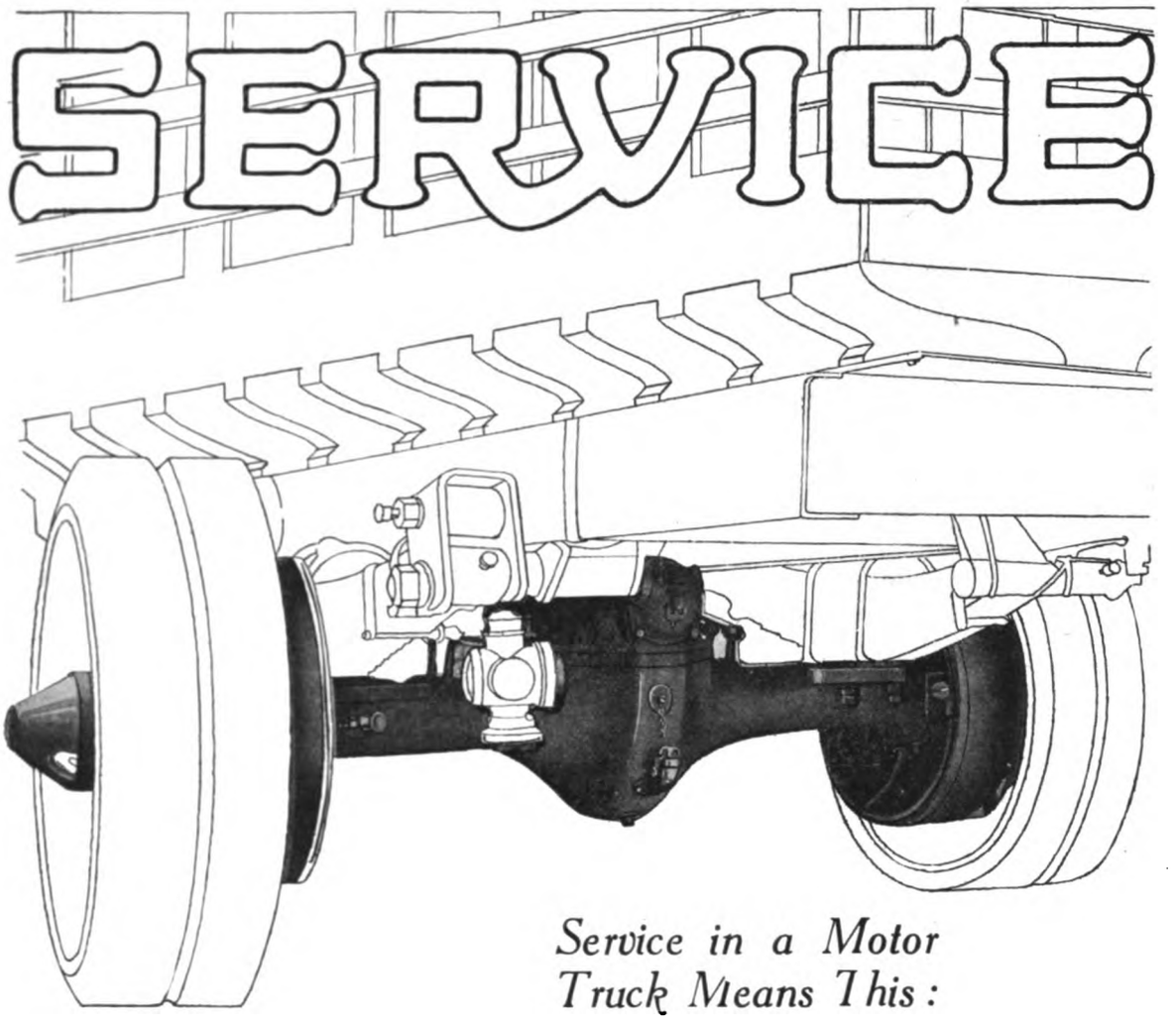
DILLON MULTI VISION LENS

$3.50 per pair

Any Size—Anywhere in U.S.A.

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SERVICE



Service in a Motor Truck Means This:

SERVICE is measured by the length of time for which any mechanical unit will continue to do the greatest amount of work with the least amount of trouble.

The Sheldon Worm Drive Rear Axle ***improves with use.*** The longer you use it, the better it serves you—right up to the point of final destruction.

It is strongly protected against trouble—of any kind. And if it ***should*** sustain injury by some unavoidable accident, it is quickly and easily repaired.

It is simply designed and powerfully constructed of quality material by men whose years of training have given them a skill far beyond the ordinary.

Its record for long, unbroken, efficient service under grinding work of the hardest possible character has won for the Sheldon Worm Drive Axle first place in the opinion of those whose business demands just such service.

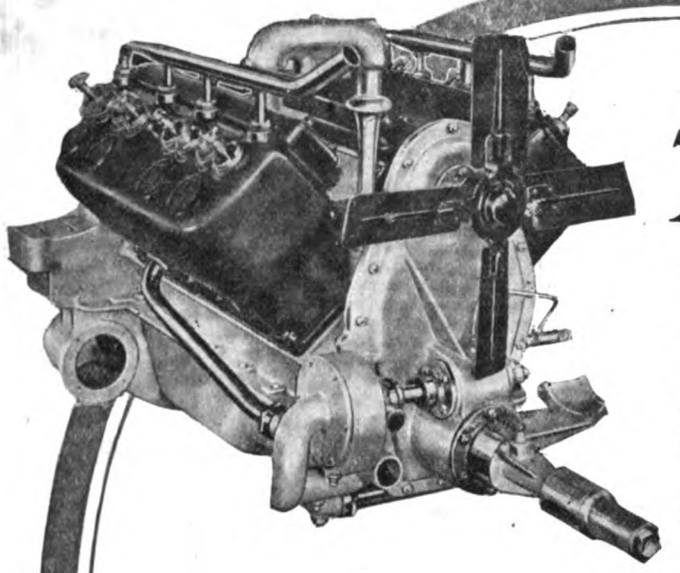
SHELDON

WORM GEAR AXLES

SHELDON AXLE & SPRING CO. *Makers of springs and axles for heavy duty service for more than fifty years.* WILKES-BARRE, PA.

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SPILLMAN "8"



Special Advantages

1. A lubrication system superior to all others.
2. A cooling system of the highest efficiency.
3. Unusual accessibility of parts.
4. An even, constant supply of fuel equally to both blocks of the motor.
5. A design that is not an experiment but a proved certainty.

THE SPILLMAN "8"

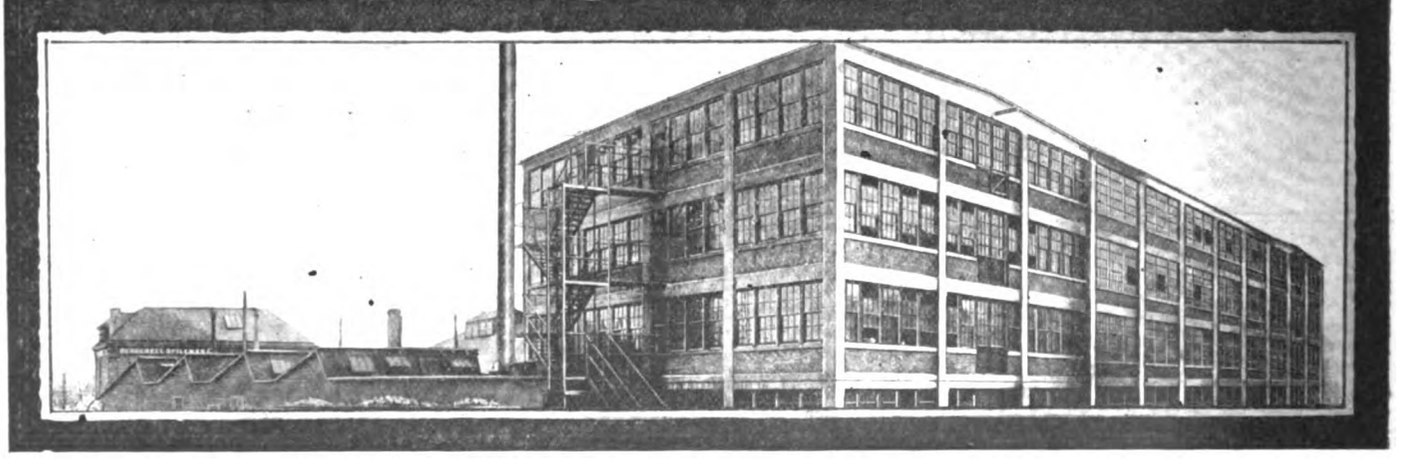
is offered as the most efficient and most highly developed 8-cylinder motor on the market. Accessibility, lubrication, cooling and fuel supply — the four big requirements — are squarely and efficiently met in the SPILLMAN.

Leading 8-cylinder cars are SPILLMAN equipped, and their motors are among their very best selling points.

Herschell-Spillman Company

Builders of Automotive Motors

North Tonawanda, New York



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Built for Sturdy Service

Rugged endurance is built into every Mason Tire that leaves our factory. Every step in the making of Masons compounds sturdy service with perfect resiliency.

It's the sort of tire you want for every day service—the consistent, long-lasting tire that sells at a popular price. Equip your spare rim with a Mason. As soon as it goes into service it will prove Mason quality.

1918 Will Be a Mason Dealers Year

With prices of everything so high, motorists appreciate popular priced quality more than ever. Mason reputation is established. And Mason dealers will reap a rich harvest from the demand for Mason Tires this year.

A line to the factory will bring you a mighty interesting dealer's offer

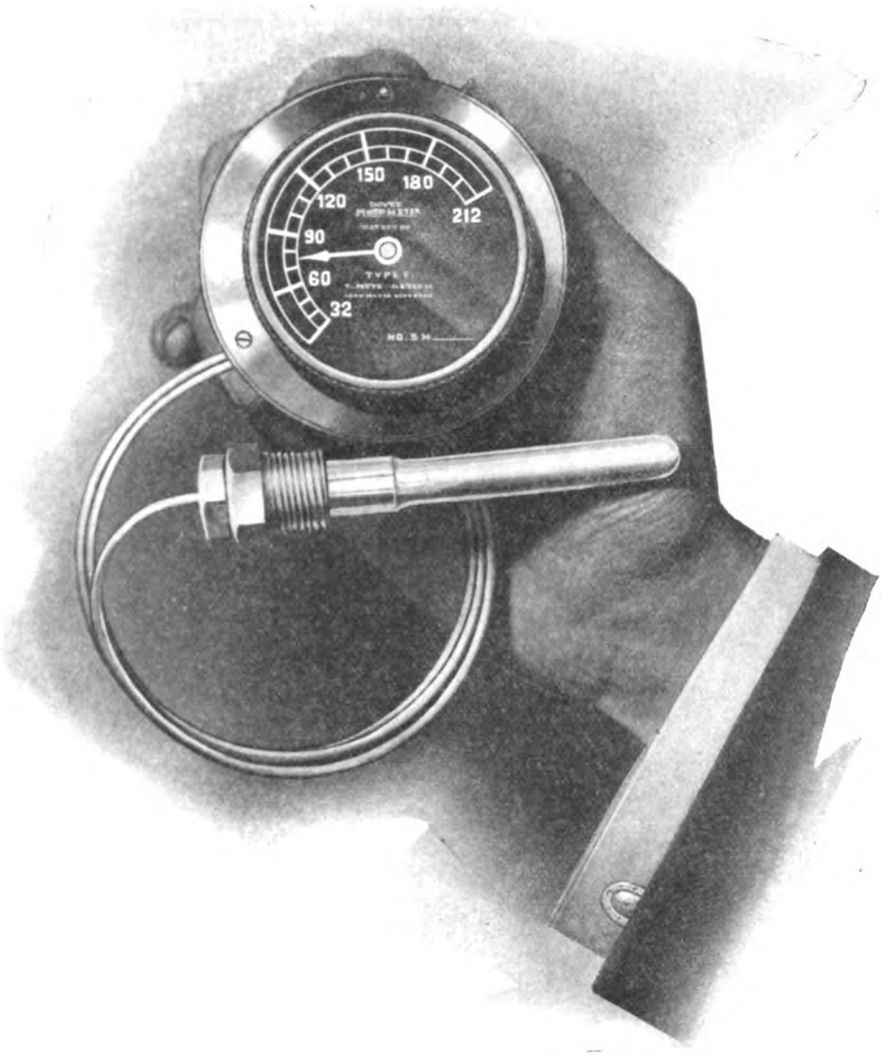
The Mason Tire & Rubber Co.

Factory and Home Office: **Kent, Ohio**

DISTRIBUTING BRANCHES:

Cleveland	Chicago	New York	Kansas City	Buffalo	Atlanta	Akron
1806 Euclid Ave.	2120 Michigan Ave.	28 W. 63d St.	1732 Grand Ave.	834 Main St.	21 Houston St.	34 W. Market St.

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BOYCE MOTO-METER

DISTANCE TYPE

For aeroplanes, tractors, stationary engines and motor boats.

BETTER BECAUSE—

FIRST, it registers the full scale of 32° to 212°. This is important. (Others from 100° to 212° only.)

SECOND, no gears, direct movement of the pointer. (All others built with an unreliable 15 to 1 gear movement.)

THIRD, smooth, unbroken, non-vibrating movement of the hand. (Others are unreadable under vibrations.)

FOURTH, remains accurate up to 25,000 feet altitude. (Others read 5 to 19 degrees *inaccurate*.)

FIFTH, weight with 12 feet of tubing only 12 ounces.

There Is Only One Reliable Motor Heat Indicator. The Name "Boyce" Is Your Guarantee

May we ask you to compare this instrument with others before ordering your requirements? Don't pay more for a less reliable instrument.

SPECIFY THE BOYCE MOTO-METER DISTANCE TYPE

THE MOTO-METER CO., Inc., Long Island City, New York

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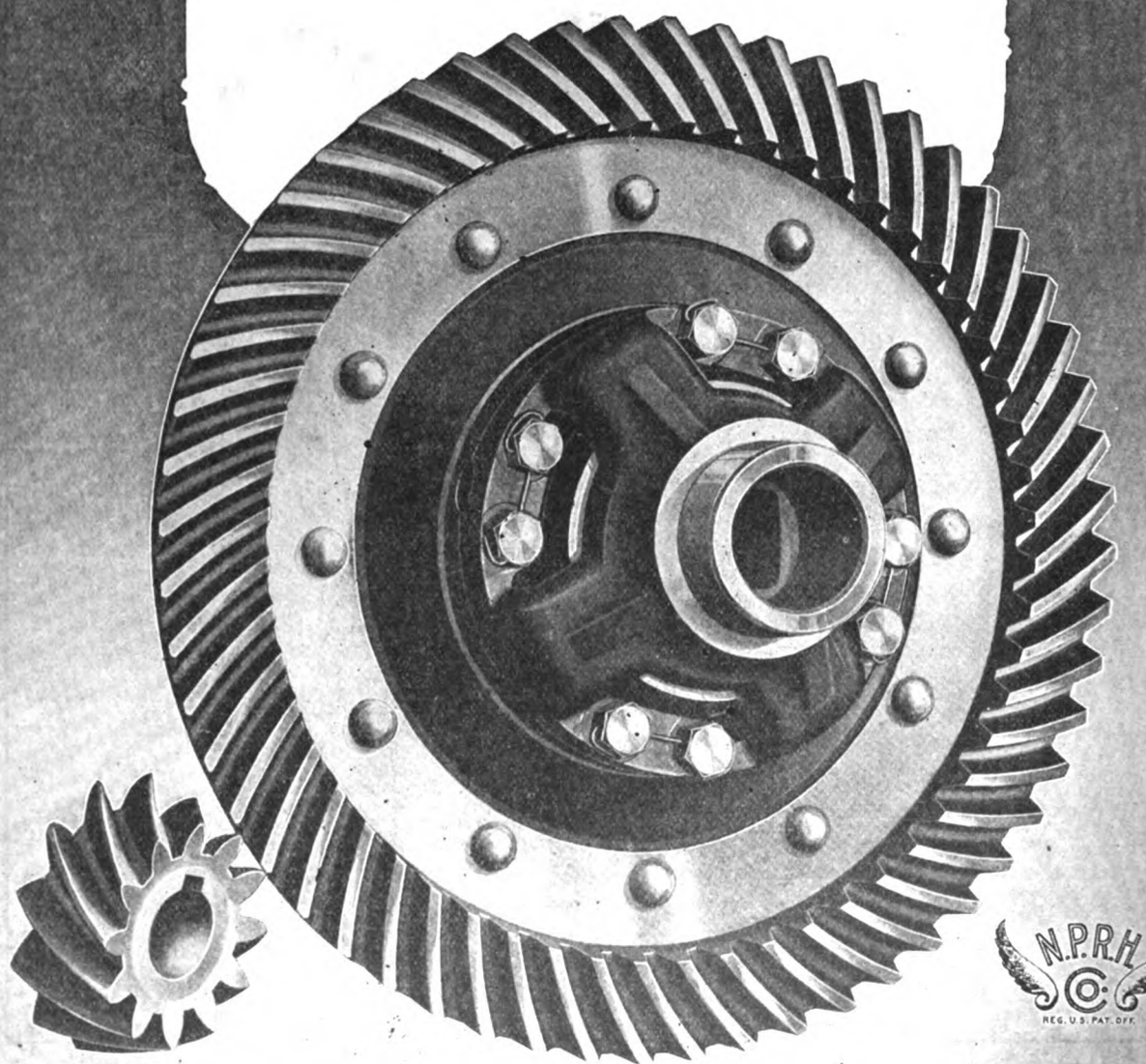
COMPLETE DIFFERENTIALS
GEARS FOR TRANSMISSIONS

Made to order in any quantities

Our enormous plant concentrates entirely on gear work, and the bulk of our output has gone into the automobile field.

We have the organization, equipment and capacity to meet any automobile truck or tractor manufacturer's requirements with every assurance of prompt delivery as well as quality.

N.P.R.H. NEW PROCESS GEAR CORPORATION N.P.R.H.
SYRACUSE, N.Y



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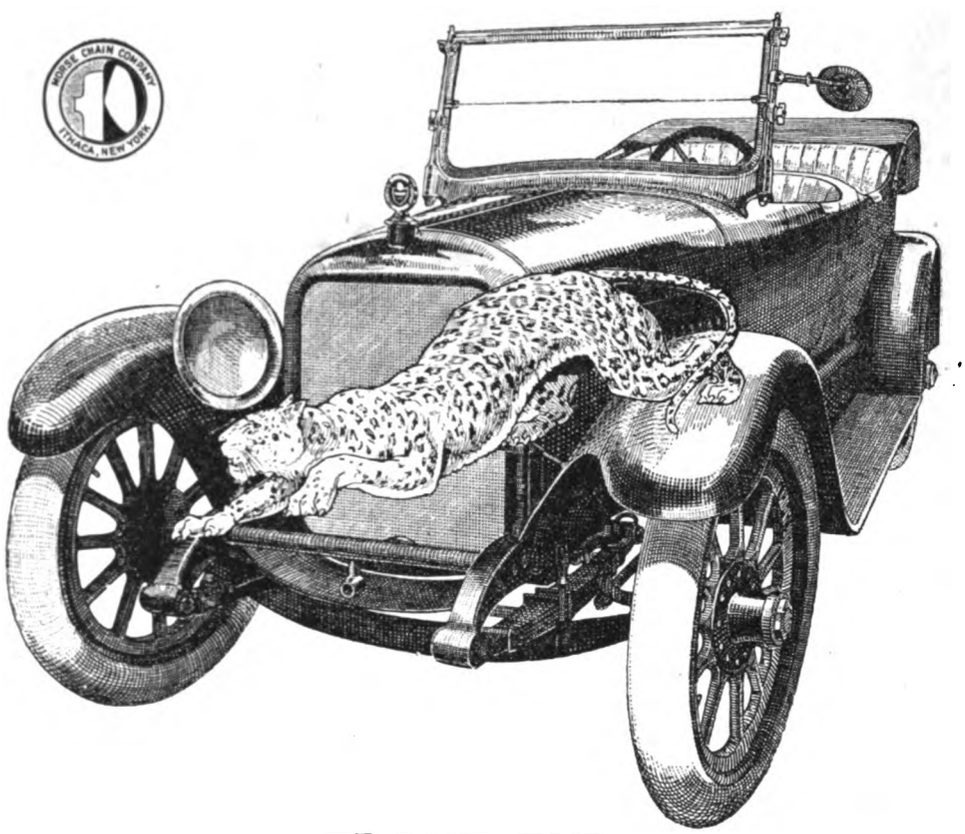
PACKARD "12"
1916-17-18

MORSE

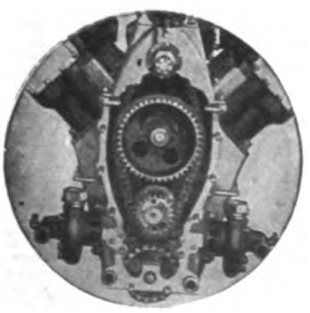


STEARNS-KNIGHT "8"
1916-17-18

THE CORRECT DRIVE FOR CAM AND ACCESSORY SHAFTS



FRONT END DRIVES OF PRECISION

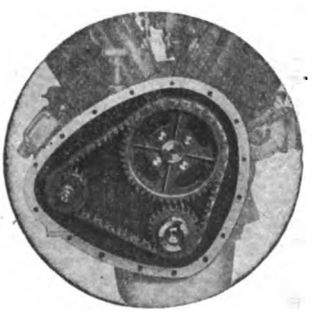


CADILLAC "8"
1915-16-17-18





WINTON "6"
1916-17-18

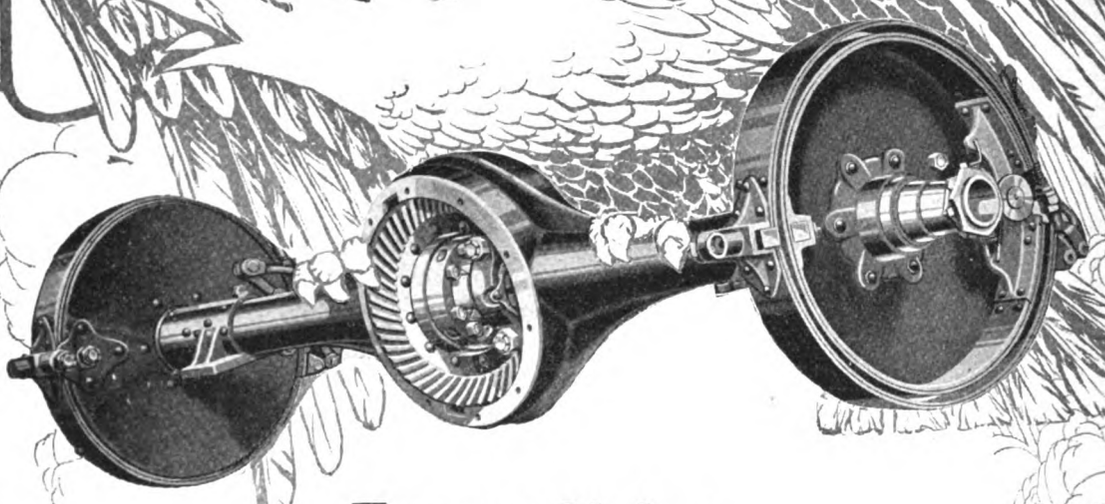


HAYNES "12"
1917-18

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Columbia



Excess Value Without Excessive Cost

The standards we have set for ourselves are your best protection for higher quality
—of engineering—of materials—of workmanship.

The manufacturing methods we have attained—by applying scientific low-cost production—are your best protection against paying any more for the greater quality we give you.

These accomplishments merit the earnest consideration of every manufacturer of motor cars.

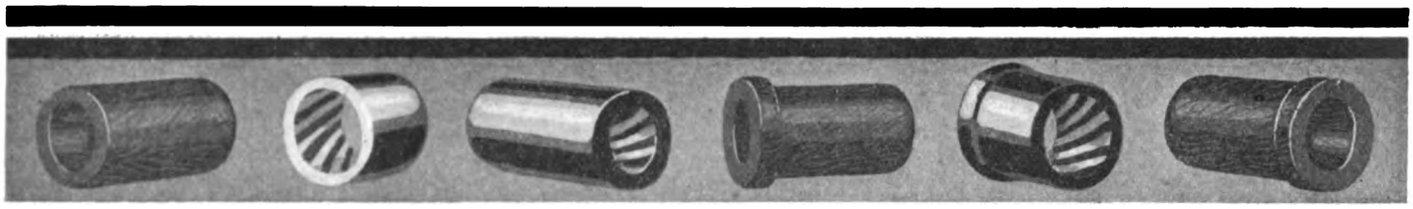
We invite the closest and most searching investigation into our methods and product.

If you are looking for higher quality, fair prices and prompt deliveries, write us today.

We are ready to serve you.

The Columbia Axle Company
Cleveland, Ohio

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Safeguarding the Templar Car

THERE are 26 genuine oil-less bushings in the Templar Car. They are put there to guard it against neglect, to assure it a long life of efficient service in spite of careless and indifferent treatment.

These bushings are in out-of-the-way, liable-to-be-neglected places. They would never be noticed by the average purchaser. But they form an important part of the network of protection that the Templar's manufacturers have built around the reputation of their car.

The thoroughness with which the Templar Engineers have studied the problem of safe-guarding their car is indicated by the number and location of these Oil-less Bushings, as follows:

BOUND BROOK & NIGRUM

Trade Mark Reg. U. S. Pat. Office — Trade Mark Reg. U. S. Pat. Office

Oil-less Bushings

"BOUND BROOK" (trade mark reg. U. S. Pat. Off.) Graphite-and-Bronze Oil-less Bushings in the Steering Gear, the Water Pump, and in the Transmission as a pilot bushing.

"NIGRUM" (trade mark reg. U. S. Pat. Off.) Impregnated-Wood Oil-less Bushings in the Rear Springs, Front Springs, Brake Cross Shaft, Pedal Shaft, Foot Pedal and Rear Spring Bracket.

Far-sighted manufacturers throughout the Automotive Industries, as well as makers and users of machinery, both in this country and abroad, are using these genuine oil-less bushings in places about machines that are difficult to lubricate or to keep lubricated.

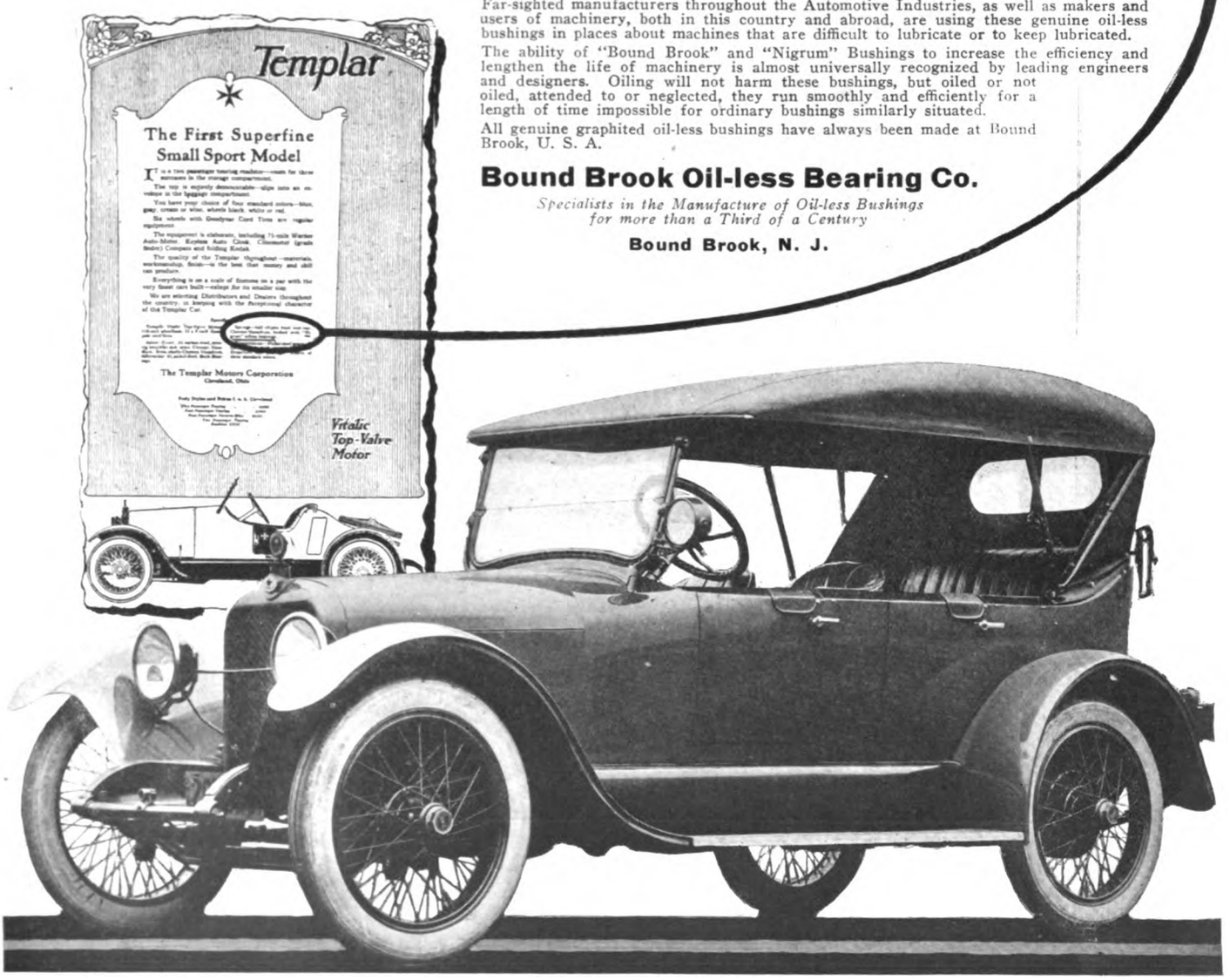
The ability of "Bound Brook" and "Nigrum" Bushings to increase the efficiency and lengthen the life of machinery is almost universally recognized by leading engineers and designers. Oiling will not harm these bushings, but oiled or not oiled, attended to or neglected, they run smoothly and efficiently for a length of time impossible for ordinary bushings similarly situated.

All genuine graphited oil-less bushings have always been made at Bound Brook, U. S. A.

Bound Brook Oil-less Bearing Co.

Specialists in the Manufacture of Oil-less Bushings for more than a Third of a Century

Bound Brook, N. J.



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OBANNON LEATHER
REG. U. S. PAT. OFF.

OBANNON INTERNATIONAL
TRADE MARK

O'BANNON



EVERY MANUFACTURER APPRECIATES THE DIFFERENCE between prompt shipments of satisfactory fabrics and delays in delivery plus disappointments in the quality of the goods delivered.

THE O'BANNON GUARANTEE IS WELL KNOWN for its generous provisions and its full value in actual service.

THE REPUTATION OF "MOLESKIN QUALITY" UPHOLSTERY AND "NON-LEEK" TOP MATERIAL is a guarantee in itself.

THE COMBINED PLANTS OF THE O'BANNON CORPORATION assure prompt delivery of large orders with the extremely high quality of O'Bannon Fabrics unfalteringly maintained.

We should be glad to send samples on request.

O'BANNON CORPORATION

200 Fifth Avenue, NEW YORK

Detroit Representative:
Matthew L. Sullivan
Lenox Apartments

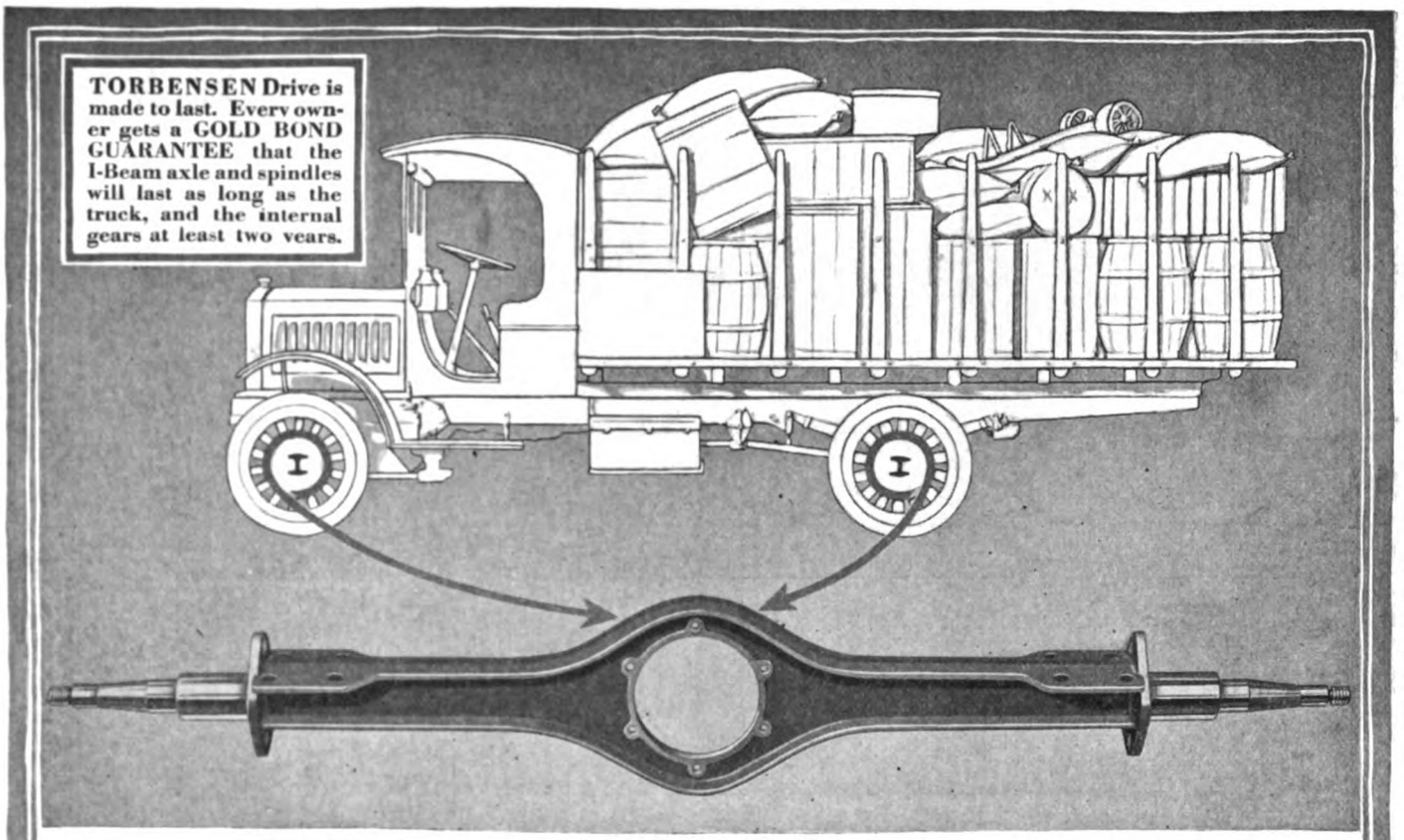
Chicago Representative:
James F. Sanborn
5311 *Harper Ave.*

COATED FABRICS

MOLESKIN
THE SUPERIOR LEATHER SUBSTITUTE

NONLEEK
THE IDEAL TOP MATERIAL

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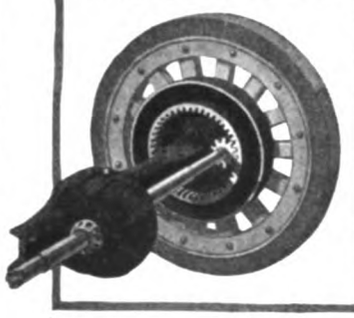


Strength your Customers can see

The *patented*, forged-steel I-Beam carries *all* the load. The driving parts are confined entirely to *driving*.

The strength and light weight of the I-Beam makes Torbensen Drive long-lasting and economical.

Driving *at* the Wheel and *near* the Rim gives great driving leverage—great pulling power.



Your customer *knows* that an I-Beam is the strongest and lightest load carrier. He knows that in bridges and all structural work I-Beams are employed to carry the load. He knows that all front axles are I-Beams.

He can *see* that the rear load of a Torbensen Drive Truck is carried on a forged-steel I-Beam.

He doesn't have to be an engineer to understand that a Torbensen, because of its I-Beam, is stronger and yet lighter than any other type of truck axle drive.

When you tell him that the Torbensen I-Beam is patented and that no other rear axle drive does or can have this patented I-Beam, you clinch his belief in Torbensen superiority.

Your customer also knows that power applied near the rim of a wheel is more effective than power applied at the hub. He can move a truck by hand when he takes hold at the rim, but he cannot stir it with a wrench on the hub.

So he understands at a glance the advantage of the Torbensen Internal Gear Drive.

Once more, your customer's common sense tells him that driving gears which are subject to road shocks and the full strain of a truck load cannot work as efficiently nor last as long as driving gears which are relieved from all load and road strain. He sees that Torbensen driving gears have nothing to do but *drive*. They work as freely as the gears of a stationary lathe.

It is because the soundness of Torbensen principles is self-evident to the non-technical buyer that more Torbensen Driven Trucks are sold than any other type.

THE TORBENSEN AXLE COMPANY

Cleveland, Ohio

Largest Builder in the World of Rear Axles for Motor Trucks

TORBENSEN INTERNAL GEAR TRUCK DRIVE

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Good Places for BAKELITE

Bakelite has proved an unqualified success in the automobile field because of an unusual combination of qualities possessed by no other material.

Bakelite is ideal for Steering Wheels, Dial Plates, Radiator Caps, Distributors, Commutators, and other parts of Electric Starting, Lighting and Ignition Systems.

BAKELITE

Is not affected by heat.

Is mechanically strong and chemically inert.

Is not affected by water, steam, oils, solvents, or ordinary chemicals.

Automatically assumes a polish in the process of moulding.

Can be economically moulded with metal inserts.

All pieces come from the dies in exact duplicate.

Let us have your specifications and we will tell you just how Bakelite can be utilized to meet your requirements.

GENERAL BAKELITE COMPANY

2 RECTOR STREET NEW YORK

55-171

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MERITAS
LEATHER CLOTH

To Motor Car and Truck Builders

Whatever you need in leather substitutes for upholstering, trimming and top covering purposes we can supply you with the right goods from our extensive line of MERITAS Leather Cloth.

We operate five plants and are producing every weight, color, finish and grain in MERITAS Leather Cloth that car and truck builders could ask for.

The quality of every yard of goods we make is guaranteed by our trade mark stamped on the back of each piece.

It will pay you to get acquainted with this leading leather substitute.

Write for Samples

Mention for what purpose you want the goods and we will submit samples exactly suited to your requirements.

The Standard Oil Cloth Company
INCORPORATED
320 Broadway, New York
Dept. K

MERITAS STANDARD OTC COMPANY LEATHER CLOTH

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DU PONT AMERICAN INDUSTRIES

DU PONT

Dealers Wanted

Our Nation-wide advertising campaign is producing thousands of inquiries, which must be referred to local dealers near the inquirer.

We need at once in many cities of 10,000 or more population:

The Leading Auto Top Maker
The Leading Auto Body Upholsterer
The Leading Auto Refinishing Concern
The Leading Auto Accessories Dealer
The Leading Boat Maker and Repairer

to supply the inquirers who answer our advertisements of

Rayntite Fabrikoid Top Material
Fabrikoid Motor Quality Upholstery
Fabrikoid Marine Special
Fabrikoid Truck Special
Harrison Auto Enamel
Harrison Marine Paints and Varnishes
Py-ra-lin Transparent Curtain Windows
Pontoklene Tar Remover and Cleaner
Du Pont Leather Renovator
Du Pont Outdoor Brass Lacquer

To insure quick action, please give us the following information:

Do you buy through a jobber? State whom and where.

If you buy direct and are not rated, give bank and commercial reference.

State nature of your business and line which interests you.

If we refer to you all inquirers from your vicinity, will you do your best to sell them our product?

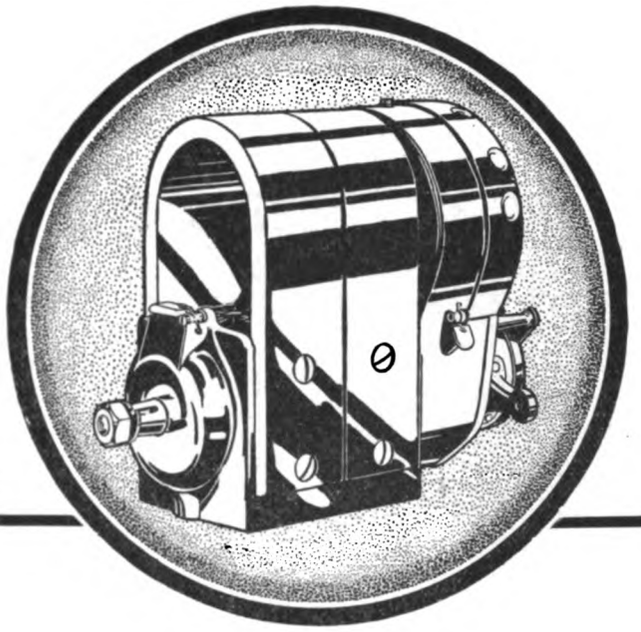
If you are not a "live wire" and prepared to handle business with push and enterprise, please do not answer this advertisement.

SALES PROMOTION DIVISION
Du Pont, Wilmington, Delaware

DU PONT

Please mention Automotive Industries when writing to Advertisers

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The Difference between Magnetos

It lies primarily in the design.

Any Magneto maker can use the best of selected materials if he will. Some do.

But designs are exclusive. They account for the differences both in sturdiness and in electrical efficiency.

For example, the fewer parts in Eisemann Magnetos, and in particular the one-piece frame, contribute enormously to durability and therefore reliability.

Then, too, the direct route by which the current is picked up and distributed prevents electrical losses.

The patented pole pieces and the excellent proportions of the windings are important factors.

To the combination of all these points of superiority may be traced the power of the Eisemann spark.

When thorough investigation and comparison is the basis for selecting the Magneto, Eisemann almost invariably earns the decision.

THE EISEMANN MAGNETO CO.

Sales and General Offices: 32 Thirty-third Street, Brooklyn, N. Y.

Chicago, Ill., 910 So. Michigan Avenue
Detroit, Mich., 802 Woodward Avenue

THE



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IF you are contemplating placing outside work along these lines you will find it to your advantage and profit to refer to the

CONTRACT WORK DEPARTMENT

Page 98 of this week's Number

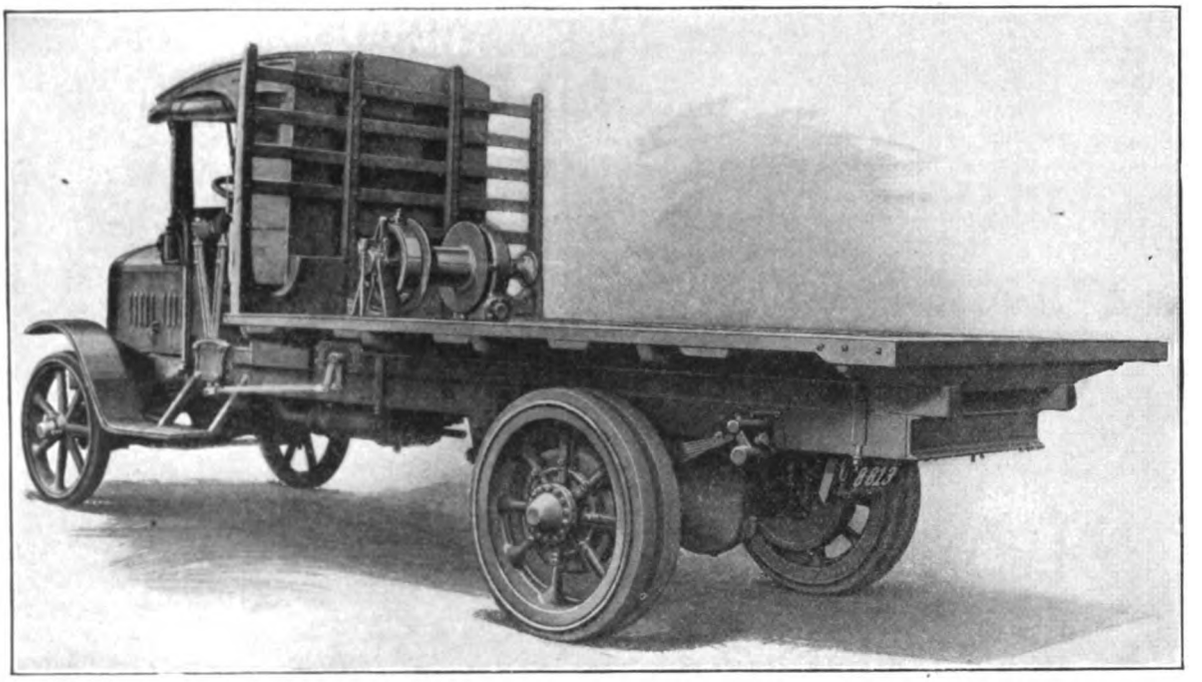
Dies
Tool and Die work
Metal Stampings
Punch Press Work
Screw Machine Work
Machine Parts
Gear Cutting
Grinding
Cam Cutting
Bar and Clutch Work
Forgings
Drop Forgings
Lathe & Milling Machine Work
Patterns (wood and metal)
Plating
Automobile Stampings

Contract Work Department

AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

239 West 39th Street, New York City

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Insure Loading Efficiency for Users of Your Trucks

Loading motor trucks by man-power alone is costly and slow. In handling heavy materials a small crew is unequal to the strain and a large crew is "in its own way." The net result is inefficiency.

Eliminate all such delays, unnecessary labor and losses of time and money for your patrons by equipping your motor trucks at the factory with the

Otis Power Winch

Thus you will greatly increase the service value and salability of your trucks, and at the same time you will put yourself behind the national campaign for industrial economy.

The Otis Power Winch, compact, simple, strong—backed by the internationally known Otis reputation for quality, enables a small crew to do quickly what a large crew accomplished slowly and laboriously. It makes more trips possible and keeps the trucks operating always at maximum capacity.

We have a convincing booklet on the Otis Power Winch for manufacturers of motor trucks. Let us send it to you.

Industrial Department

OTIS ELEVATOR COMPANY

Eleventh Avenue and Twenty-Sixth Street, New York City

Makers of Otis Electric Steel Wheels

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Steel for Service

Asset or Liability?

Gears may be an asset or a liability. The best gears that experience and engineering skill can devise are a distinct asset to any manufacturer in these days of maximum production; uncertain deliveries and delayed transportation make many gears a particular liability at this time.

Speeded up production means that each gear must stand its share of increased strain and wear. Breakdowns and frequent renewals are tremendously expensive.

Protection against such delays and unnecessary expense may be secured at slight additional cost by using gears made from

Carnegie Rolled Steel Blanks

These blanks are forged by hydraulic pressure, then subjected to rolling and forging actions simultaneously, a process which imparts a great uniform strength and toughness to the blanks, which are then ready for machine cutting.

Gears made from Carnegie Rolled Steel Blanks are unusual in strength, and endurance. Severe industrial use has proven that they wear three to seven times as long as a cast steel gear.

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Carnegie Steel Company

General Offices: Pittsburgh, Pa.

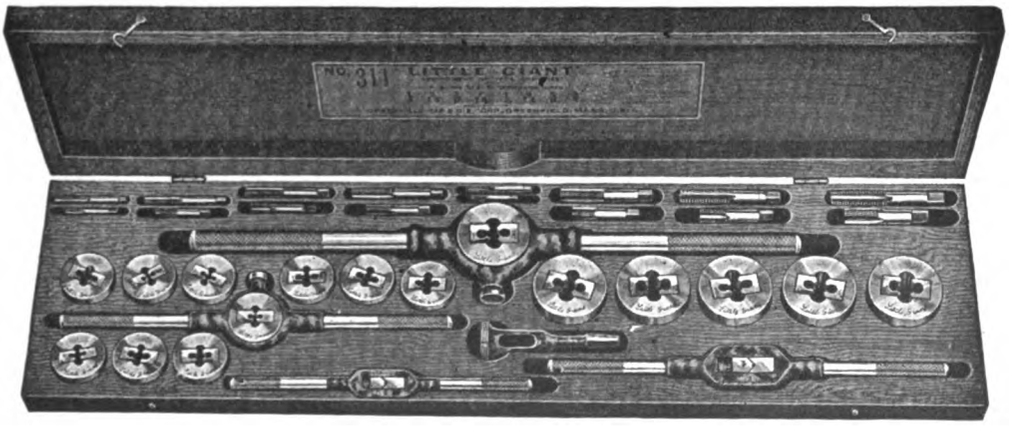
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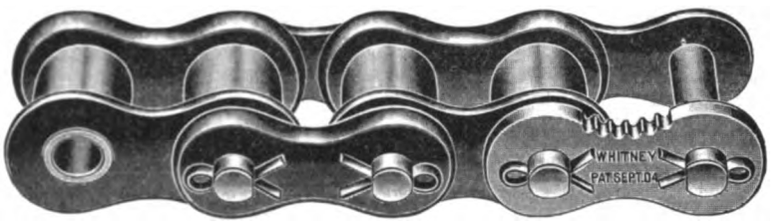
Greenfield Tap & Die Corporation
Greenfield Mass.

New York, 28 Warren St.
Chicago, 18 S. Clinton St.
Canadian Factory: Wells Brothers Co. of Canada, Ltd., Galt, Ontario.

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The MATERIAL for SHIMS

Built up of a number of layers of brass, held together by a metallic binder. Just peel off enough layers to required thickness and the job is done. Time saved: labor saved: money made—and a better, smoother, truer surface. Let us send you a sample.

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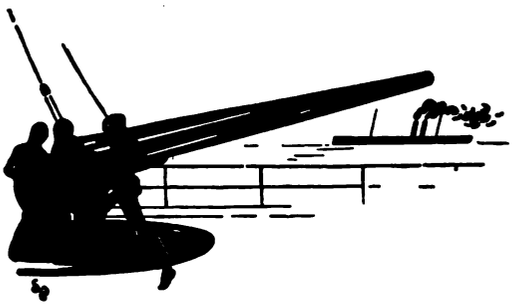


Fine mechanisms relying on steel balls for quick, easy and accurate operation are best served by the scientifically constructed Hoover Steel Ball—accurate to .0001 inch.

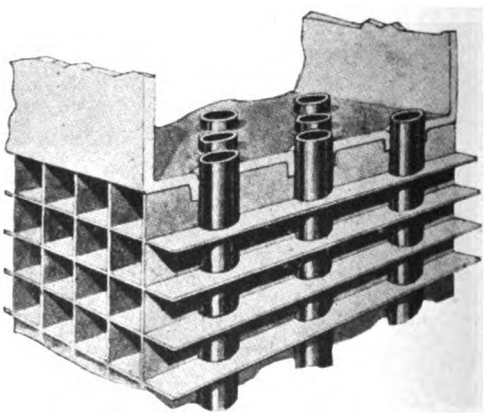
The first Hoover Steel Ball was manufactured five years ago. Billions are in use, but there is yet to be the first report of breakage. This because Hoover hard surface, tough center construction provides for expansion and contraction and allows for fatigue in service.

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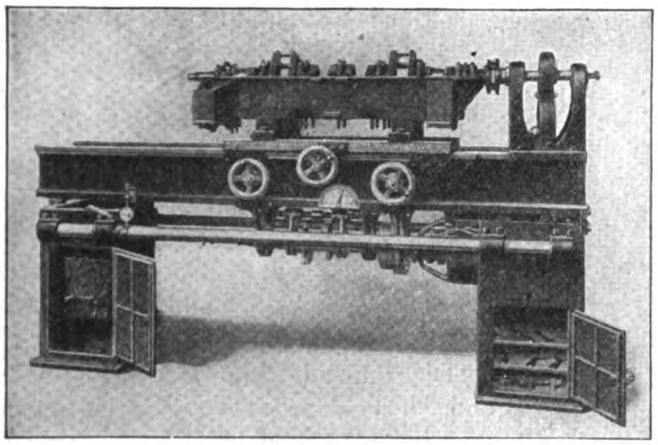
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smoother-running engines

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Anything that tends to secure smooth running quickly helps to increase motor production by releasing skilled labor from the task of balancing.

The Carwen method of balancing crankshafts embodies an exact mathematical principle in simple mechanical form. It reduces the time spent in balancing from hours or even days to approximately twenty minutes per crankshaft.

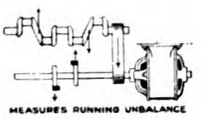
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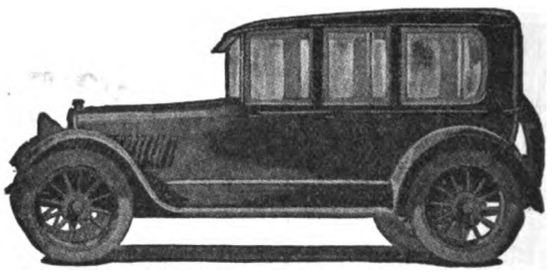
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Dynamic Balancing Machine

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Save Money Without Sacrificing Appearance

In this time of nation-wide economy, are you finding ways of cutting costs—and **still** retain **quality?** One item of saving—and it's no inconsiderable part of motor equipment either—is

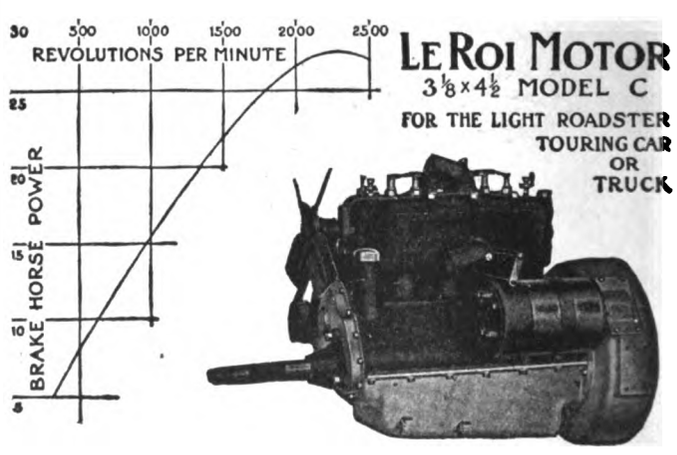
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In Army Service

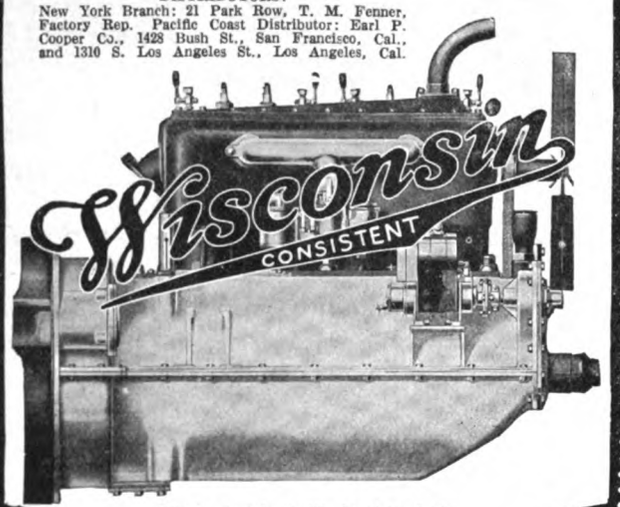
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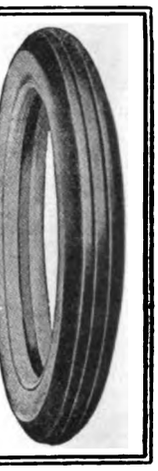
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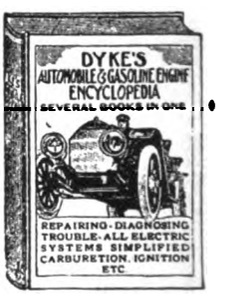
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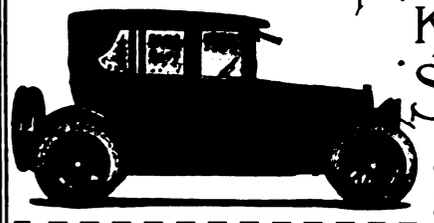
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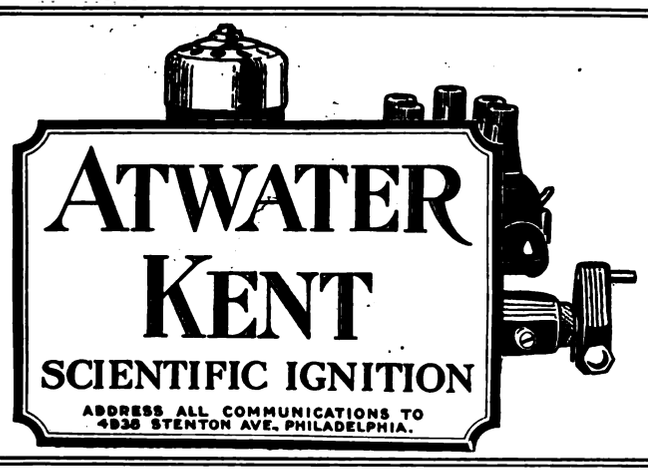


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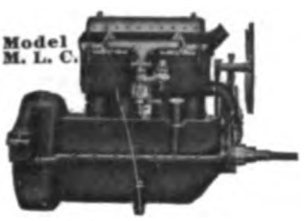
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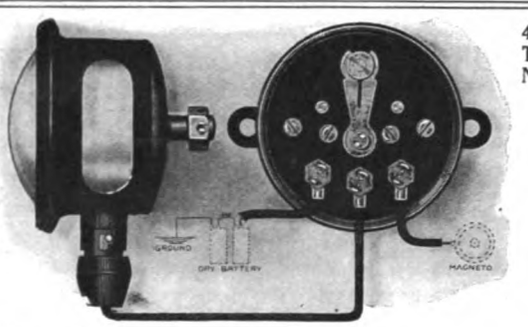


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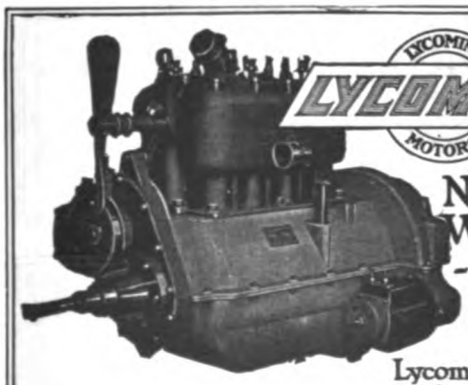
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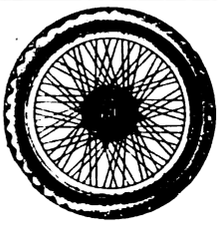


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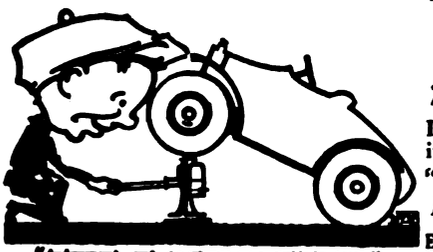
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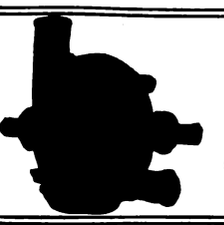
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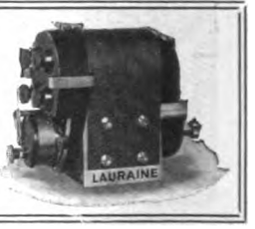
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The receiver or trustee thereafter to be appointed will present his report of sale to Charles M. Mason, referee in bankruptcy, for confirmation, at the Bankruptcy Court room in the Essex Building, corner of Clinton and Beaver Streets, Newark, N. J., on Thursday, March 14, 1918, at 11.30 o'clock in the forenoon, at which time and place all parties in interest may attend.

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Alloy STEELS
IN THE "LAB"

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Massillon, Ohio

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Agathon Chrome Nickel
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Agathon High Carbon
Agathon Special Analyses

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because the Russel Drive is efficient at all speeds—and does not require a large motor to secure maximum power.

Economical on Tires

because the Russel Drive is 50% lighter than other types—due to the fact that it employs no heavy housings for load-carrying duties.

Economical to Lubricate

because the Russel Drive is not sensitive to the lack of lubrication.

Economical on Upkeep

because the Russel Drive can be overhauled by any good mechanic.

"I See"—Said The Truck Buyer

The Truck Buyer looked long and carefully at the "load-carrying axle." He tapped it with his pencil from end to end.

"Carried back of the power-axle—isn't it?" he said.

"Yes," said the Truck Salesman.

"Not connected with the power-axle at all—is it?" he said.

"No," said the Truck Salesman.

"This load-carrying axle is all one piece—of chrome nickel steel—with integral spindles—no 'shoulders'—no weak spots—good idea."

"We believe so," said the Truck Salesman.

"I begin to see," said the Truck Buyer, "why there are no 'broken spindles' in the Russel Internal Gear Drive Axle."

"I thought you'd find it," and the Truck Salesman grinned.

Russel Motor Axle Company
North Detroit

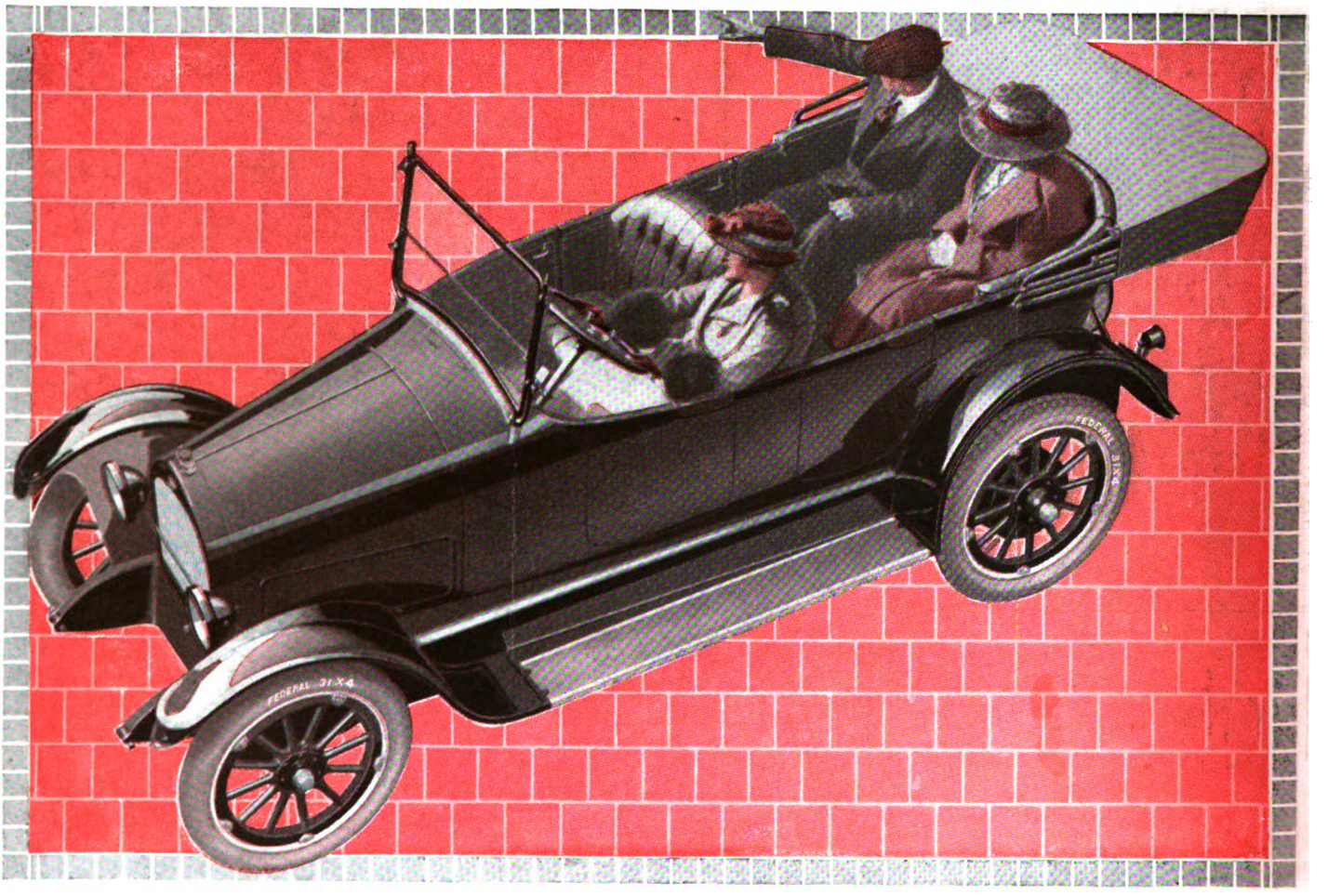
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MASTER OF ROAD AND LOAD
Internal Gear Drive Axles

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The more people demand of a car, the more they value the Overland.

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Touring Car . $795	*Country Club $ 840*	*Touring Car . $930*		*Touring Car . $1130*	*Roadster . $1115*
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Willys-Overland Inc., Toledo, Ohio

Willys-Knight and Overland Motor Cars and Light Commercial Cars

Canadian Factory, West Toronto, Canada

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Vol. XXXVIII
No. 11

NEW YORK, MARCH 14, 1918

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Three dollars a year

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Dependable Spark Plugs Big Ones This Year



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Good big ads in The Christian Herald, Sunset Magazine, Country Gentleman, Successful Farming, National Stockman and Farmer, Breeder's Gazette, Hoard's Dairyman and twenty other agricultural publications—

In all, over a hundred million big advertisements of Champion Dependable Spark Plugs are being printed and circulated this year.

And the return to Jobbers and Dealers everywhere is more good hard cash than has ever before been possible in spark plug profits.

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Johnson's Radiator Cement blends perfectly with the water until it reaches the leaks—just as soon as it comes in contact with the air it forms a hard, tough, pressure-resisting substance which is insoluble in water and consequently makes a permanent seal.

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Johnson's Radiator Cement contains nothing which can coat or clog the cooling system. It will seal leaks in from two to ten minutes.

Quarts, $1.75. Pints, $1.00. Half-pints, 65c.

If your dealer cannot supply you, send us $1.00 and we will forward you a pint, all charges prepaid.

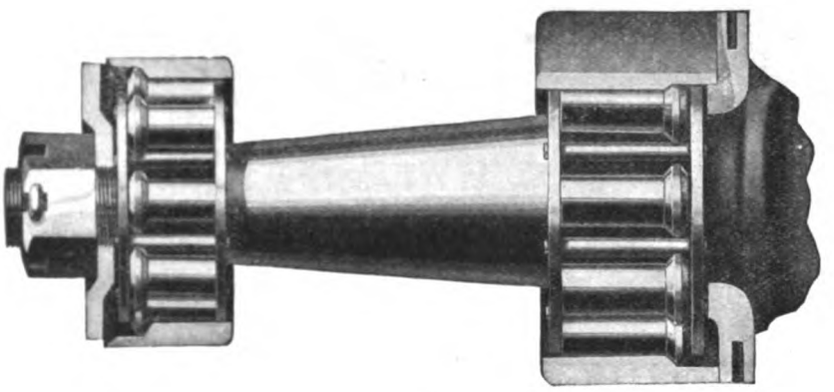
Write for our folder on
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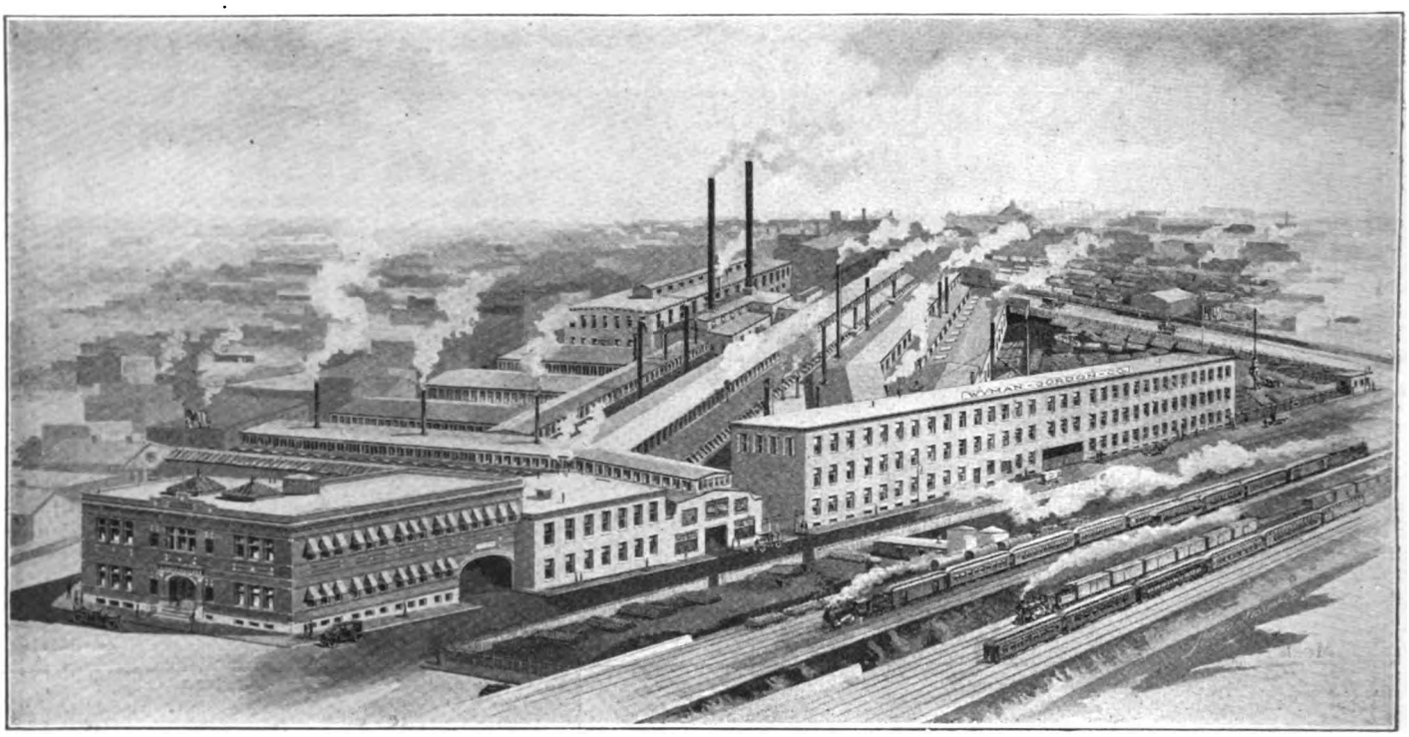
The front wheel bearings of a pleasure car or motor truck have two distinct thrusts to sustain. First, the downward thrust from the load; second, the side thrust that arises from turns and from the jolts and shocks of rough roads.

Bower Bearings are scientifically designed with a separate surface for each thrust. The downward pressure or "radial thrust" is met by the straight line contact of the roll and raceway, while the flanged head on the roll takes care of the side pressure or "end thrust."

BOWER

ROLLER BEARING CO.
Detroit Michigan

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The Plant Behind

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The Standard of the World

WYMAN-GORDON COMPANY, Worcester, Mass., U. S. A.

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AUTOMOTIVE INDUSTRIES
THE AUTOMOBILE
THE CLASS JOURNAL COMPANY
231–241 W. 39th STREET NEW YORK CITY

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"NORMA"
BALL BEARINGS
(Patented)



The user of a car or truck notes only the bare fact of failure. He concerns himself little with the cause of that failure. He puts the full responsibility up to the builder of the car or truck. His condemnation covers the machine as a whole—no matter how small the part to which the failure is directly chargeable.

Failure of a bearing in magneto or lighting generator means, in effect, failure of the car or truck. Responsible builders, therefore, have protected themselves by adopting magnetos and lighting generators embodying the security against bearing troubles for which "NORMA" stands.

Be *Sure*—See That Your Electrical Accessories Are "NORMA" Equipped

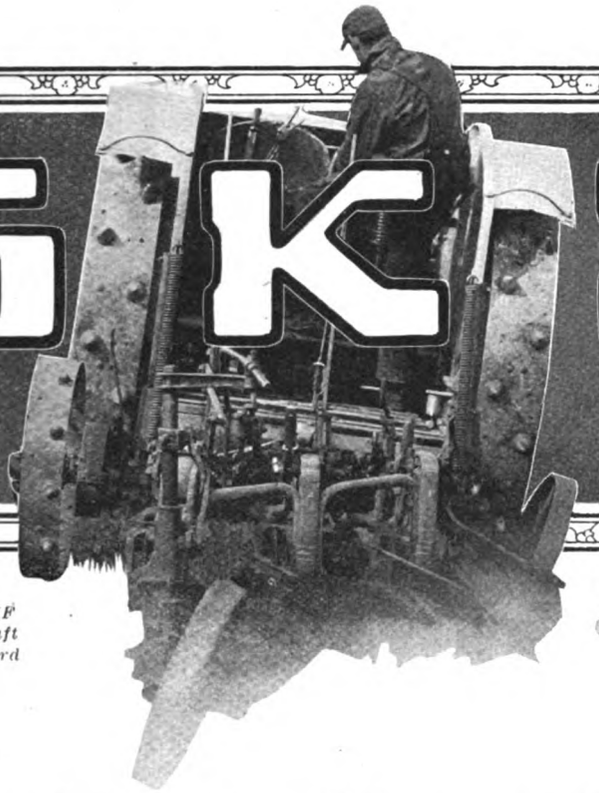
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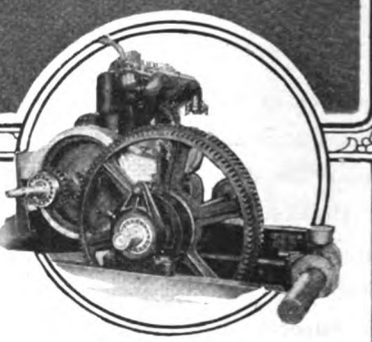


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Proof Against Wear and Tear

Ball Bearings marked SKF are self-aligning. That is, they adjust themselves to the agonizing twists, strains and distortions of a farm tractor working over the uneven surfaces of a rolling field.

They do not "stand and take it"; they swiftly, gently, silently adjust themselves to all shaft deflections and load changes, keeping every bit of their efficiency all the time and avoiding the pinching, binding, wearing strain sustained by bearings that are **not** self-aligning.

SKF BALL BEARING CO.
HARTFORD 337 CONN.



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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XXXVIII NEW YORK—THURSDAY, MARCH 14, 1918—CHICAGO No. 11

Opposition to War Truck Is Acute

Strenuous Objection to It in Spite of Small Numbers Needed As Compared With Great Commercial Demand—War Standardization Needs Different

THE standardized war-truck program which has been under way since last July continues to be the center of attack by a few truck manufacturers, and it is difficult to see why there is such determined opposition to the standardized truck program, when the number of these trucks ordered for army use in France is so small compared to the output of trucks needed for commercial uses at home.

The present order is for 10,000 of these war trucks, which is a relatively small number compared with special types of trucks that have been ordered in much larger numbers for moving artillery where the drive is distributed to the four wheels and where traction is one of the great objects to be obtained. Should this order be raised to 20,000 per year or even higher its proportion then to the total output of the country is so small that it is difficult to understand why the great attack upon it. The truck has been developed to meet peculiar war needs just as special types driving through all four wheels have been purchased in great quantities for use in special war fields. The output of motor trucks for this year for both war and industry will approximate 300,000. It may go higher if materials can be obtained and it is possible to get them delivered to the customer.

It is impossible to compute the total number of trucks needed in the war per million of men. Great Britain and France differ very materially in the numbers needed as compared with each other and as compared with Italy. It is possible that we will require a higher percentage of trucks than either; in fact, the amount of motor apparatus to be used with our army will perhaps be greater than that used by any of the allies; but even then those percentages of standardized vehicles will be very small, perhaps not 10 per cent compared with the consumption of trucks at home.

The present standardized war-truck idea had its conception in the Mexican service two years ago, when truck makers generally agreed that the average commercial truck was not robust enough for such service and a heavier and stronger vehicle was needed. Soon after a committee was formed to work with Washington and it was in this co-operative work that the seeds of the standardized war idea germinated. Later the Washington work passed from one set of hands to another, but the one idea of a standardized war vehicle continued.

When the government last summer issued a call for engineers to assist in the development and design of a standardized truck, including all of the standardized units, there was a very generous response and some of the companies that are to-day opposing the standardized truck movement were co-operators at that time. The majority of them still are.

It is unfortunate that the attack on the war truck should have been delayed until the very month in which production is coming through, as there were ten days ago complete parts for over 200 of the

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Class B trucks. Much time and energy have been spent on developing these truck parts and manufacturing them, which energy might have been saved if the truck is a failure, as many of those attacking it would like to make out.

Every standardized program that embraces some new scope is sure to be the center of an attack. The standardization program on railroad equipment is now being attacked and yet the railroads are short of equipment and short of men to manufacture it. The standardized boat program was attacked and held up for many valuable months. The standardized aviation engine program has been constantly attacked and has been the goal of some pernicious pro-German propaganda; and the attacks against this engine would have been immeasurably greater if a real aviation industry had existed previous to the time when work was started on the aviation engine. There was very little aviation industry, and while there were a few companies making aviation engines and planes they have very commendably buried existing prejudices and entered into the very imperative air program.

Opposition in France and England Also

In France and England there has been continual opposition to standardized programs. Had several companies been manufacturing tanks previous to the war there is not any question but that there would be on the British front to-day and throughout England a stirring controversy as to which tank should be used and it might be that home politics would declare that two or three different makes be used to the confusion of the army in the field.

Previous to the time the government took hold of the motorcycle situation there was very acute opposition to standardization, although there were relatively few motorcycle manufacturers; yet when the urgent demand for a motorcycle with certain standardized parts was made the job came through. There was not a necessity for a better machine than was being built, but it was essential to have standardized parts in order to eliminate the needless complications of drivers, to reduce the work of part storage and to facilitate repair work. The special war needs had to be met and are being met in the new jobs.

An Example from France

The tank situation in France offers a little example of what a standardized tank means in the matter of repair, because Chinamen are generally used for the repair work on these. These Chinamen are not skilled mechanics. There is a shortage of skilled mechanics in France, but it has been possible to train them into making good repairs when each movement is analyzed and special conveniences devised to effect these several repairs. When trained in this work they do it effectively and speedily. It is questionable if it would be possible to train schools of such mechanics to care for ten or more different models of tanks. The armies in the field would be loaded with a needless burden.

We are to-day not so short of trained mechanics in France that we have to get Chinamen to man our big repair depots, but we are not yet into the war, in a large fighting sense. Recently an army officer of one of our Allies when asked when the war would end, replied: "I do not know when the war will end, but I know when it will begin—the summer of 1919 when the United States gets its fighting machine into work."

We must not forget that the actual fighting of this war is being done in France and Belgium and not at home, and while it is easy to stay at home and run the war and win it, as nine persons out of ten know how to do, it is scarcely fair to our forces on the other side to do a single act that will complicate the job they have on hand. It is scarcely fair to do a single act that will tax more than it is to-day our very acute shipping facilities. It is scarcely fair to do any act that will draw more heavily on our short supply of skilled repair men on the other side. It is scarcely fair to take any step that will require a single additional man in France to do a job, when by some principle of war it could be done with fewer men.

Essential and Non-Essential in War

It is permissible to ask the pertinent question, *Does a time not arrive in any industry which is a prime essential in war, but which has heretofore been only an industry of commerce,* when the war aspect of it must be entirely divorced from the industrial side?

Take an example: Perhaps it is scarcely realized as generally as it should be that the motor truck is a first essential in war. This is the first war the truck has been used in, and when the war started the essential character of the truck in the battle zone was not realized. The war has developed types of motor apparatus that are highly successful in war but at present we cannot see any fields for them in commercial life. We have rifles that are suited for war, there are machine guns for war, but nobody would go shooting in a forest with a military rifle or use a machine gun at a pigeon shoot. This differentiation in firearms has been a program of centuries and as a result the field has very clearly divided itself into two divisions, one of which is war and the other non-war.

Must Not Inject Commercial Aspect

One of the American trucks that is giving a first-class account of itself in France, and has been doing so for nearly three years, is looked upon as quite old-fashioned and almost obsolete at home, and when the contracts for it were first placed there was very general criticism of that particular country for making such a selection. Yet continual reports, and some of them are through official channels, show that it is a favorite, because it is very robust and powerful and gives a good account of itself in the rough work in France and Belgium. This truck is scarcely heard of in commercial circles at home, and its case is an example of how attention must be given to the job of war, and if necessary the products for war must be entirely divorced from those of peace. At least, we must not make our war program suffer because of our desire to inject the commercial aspect too forcibly.

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It is highly probable that we will yet have to do many things in this war that were not conceived possible only a year ago, and yet we have not had a real battle with the Hun. We must not play this war as if it were to be over in November, as too many think possible. We at home must play the war as it is best played on the slopes of France.

We hold no special brief for the standardized war truck any more than for the standardized tank, the standardized aviation engine, the standardized motorcycle, the standardized machine gun, the standardized rifle and standardized ammunition. The essential reason for all of these standards is best shown in the war zone. There they use standardized houses, standardized hospital depots, standardized ambulance bodies and standardization in everything else that will make it possible to accomplish a greater job in the war zone, in less time and with fewer men than it would otherwise be possible to do it.

May Prove Suitable for Commercial Purposes

The standardized war truck had its inception as a weapon of war on the Mexican plains. It was designed as a weapon of war for the rough work of France. If it might prove suitable for commercial lines that would be a secondary consideration. Because of this it is difficult to construe the present attacks against it, before it has had a fair chance to demonstrate its worth. Some conditions in France are not so bad and some are worse. The ammunition must be moved to the front, and to-day the motor truck is used. Perhaps the truck is not the eventual vehicle for this work. It may soon be done by special types of tanks which will afford much greater protection to the men. That, too, if developed, will unquestionably be a standardized job.

This is no time when financial interests should attempt to serve the purposes of commerce at the expense of our armies in the field. If standardization is good in peace, and we deem it essential in the automobile industry, then it is doubly needed in war.

Standardized Truck Should Have Fair Test

AUTOMOTIVE INDUSTRIES asks for a fair test for the standardized war truck, and not a premature condemnation. Give it as fair a chance as other weapons of the war. The Liberty aviation engine is proving so admirable a job that the use of it in other departments than aviation is at present under investigation, not by us but by our Allies. They have learned the urgent needs of standardization. They have learned the lesson of repair work at the front and training men to make speedy and efficient repairs. They have learned the lesson of the problem of spare parts for multiplicity of machines. Yet the Liberty engine is not through its growing and developing pains, and parts are being changed, and it would be a miracle if there were not parts that had to be changed. Some there are who have continuously condemned it and will continue to condemn it, but the engine goes on and already represents a great war conquest.

It would be surprising if there are not some mechanical defects in the war trucks. There will be some, and there will continue to be some, the same as with all war apparatus. France still has troubles with premature explosions in her guns, but they are not condemned.

Assembling Standardized War Trucks



Class B standardized war trucks in one of the fourteen factories that have contracts to assemble these trucks. Production was to have started in December but it has just started and 300 are to be completed this month

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4,941,276 Cars and Trucks

in the

United States

First Year of War Shows Record Gain of 1,396,324—One Car for Every 20 Persons—Eight States Each Have Over 200,000 Vehicles

Number of Cars and Trucks Registered on Jan. 1 for Four Years

	1915	1916	1917	1918
Alabama	8,425	13,798	22,354	32,873
Arizona	4,774	7,320	12,122	19,890
Arkansas	5,642	8,021	14,704	28,862
California	123,101	163,801	212,918	243,116
Colorado	17,951	26,611	44,180	66,850
Connecticut	26,218	38,950	56,048	74,642
Delaware	2,894	4,924	7,520	9,655
Dist. of Columbia	8,000	10,200	13,118	21,198
Florida	11,366	13,123	14,220	39,216
Georgia.	20,800	24,059	45,775	70,496
Idaho	3,272	7,093	12,996	24,316
Illinois	131,140	182,290	251,300	340,292
Indiana	65,500	96,915	139,138	189,433
Iowa	106,087	139,808	172,791	278,213
Kansas	50,467	74,956	114,364	154,442
Kentucky	11,746	19,500	31,500	47,400
Louisiana	3,500	10,880	20,014	31,650
Maine	14,300	18,600	28,951	38,499
Maryland	20,213	27,638	33,364	56,129
Massachusetts	76,832	89,133	136,790	155,044
Michigan	76,389	114,845	159,639	215,001
Minnesota	67,365	91,829	137,500	191,500
Mississippi	3,894	11,500	20,474	31,650
Missouri	50,998	76,462	107,865	146,142
Montana	10,706	14,520	24,585	41,896
Nebraska	50,000	59,140	101,201	148,101
Nevada	1,487	2,177	4,609	6,760
New Hampshire.	8,738	10,819	14,338	18,146
New Jersey	58,820	67,556	75,108	87,421
New Mexico	3,090	4,947	8,028	14,086
New York	156,173	212,844	279,406	404,247
North Carolina.	14,815	21,160	35,150	55,950
North Dakota.	17,348	24,678	41,761	62,993
Ohio	121,265	179,767	252,179	333,630
Oklahoma	7,360	25,615	52,718	100,199
Oregon	16,347	23,758	30,917	48,132
Pennsylvania	107,141	150,729	230,648	325,153
Rhode Island.	12,331	16,362	21,406	25,142
South Carolina.	15,000	14,500	19,000	36,822
South Dakota.	20,080	29,336	44,271	67,158
Tennessee	19,668	27,266	31,400	48,500
Texas	64,732	90,000	197,687	213,334
Utah	6,139	7,994	13,507	21,226
Vermont	7,613	11,499	14,251	18,550
Virginia	13,985	21,357	35,426	55,661
Washington	30,253	36,905	62,546	93,822
West Virginia.	7,217	13,256	20,437	31,306
Wisconsin	53,180	81,371	117,603	164,531
Wyoming	2,428	3,976	7,125	12,001
	1,754,570	2,423,788	3,544,952	4,941,276

THE total registration of automobiles and trucks during the calendar year of 1917, the first year of the war, shows an increase over the 1916 registrations, and sets a new record. During 1917 there was a total gain in registration of 1,396,324 automobiles and trucks over 1916. This is greater than the gain of 1916 over 1915, when the increase was over a million. The nine months of war failed to stem the increase in registration, and this stands as an indication of how necessary the automobile is considered even in war days.

The total automobile and truck registration in the country as of Jan. 1, 1918, according to official figures furnished from all of the forty-eight states, is 4,941,276. This figure does not include duplicate registrations, and, of course, does not include hundreds and perhaps some thousands of cars in remote districts, all of which are not registered. In round figures there must have been very close to 5,000,000 automobiles and trucks in the country on the first day of January this year.

One Motor Vehicle for Every 20 Persons

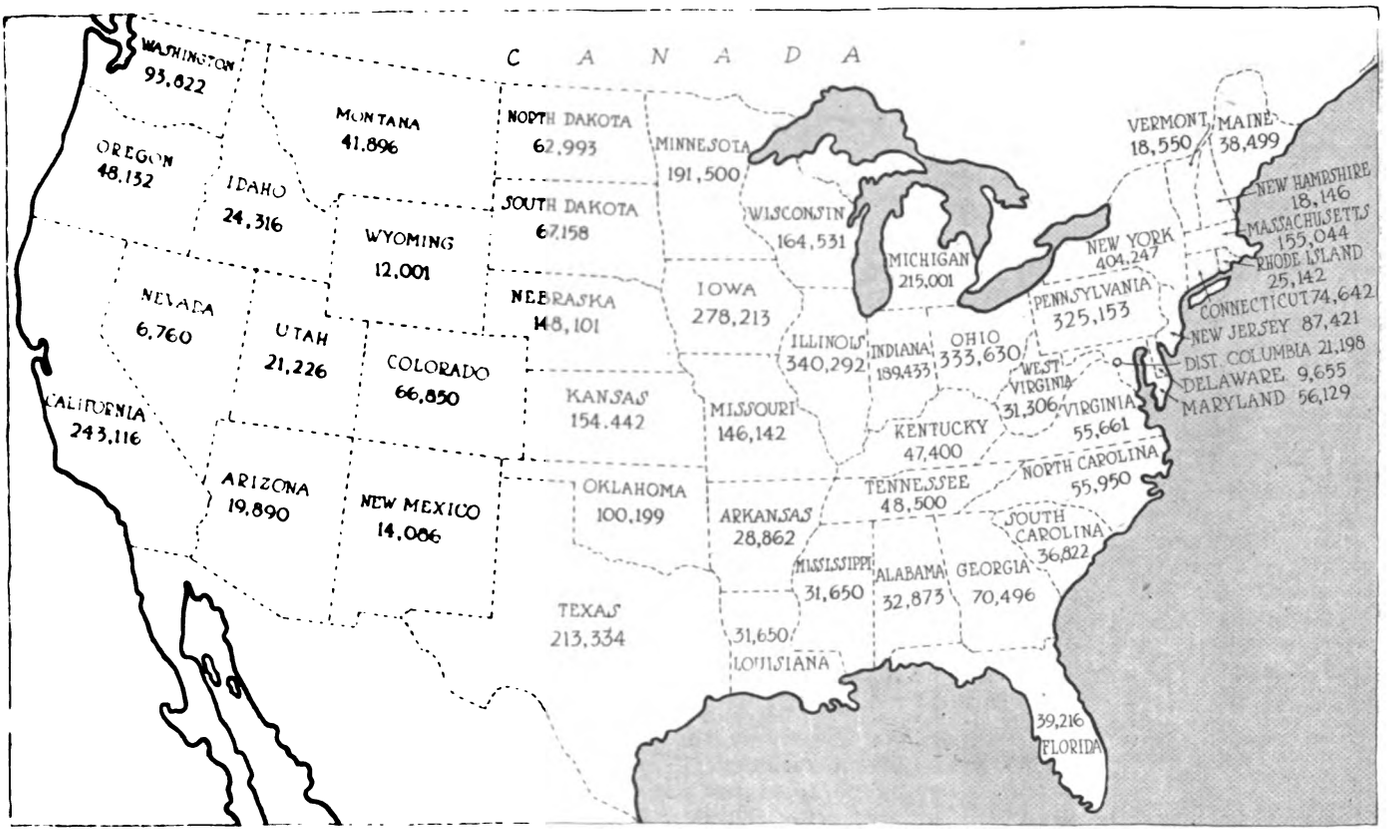
Taking the figures compiled from the registration departments of the states, and placing the population at 103,000,000, there is now one motor vehicle for every twenty persons in the land. A year ago there was one vehicle for every twenty-nine persons. Two years ago there was one vehicle for every forty-two persons.

The gains in registrations during the past three calendar years are:

1915 registration gains	686,998
1916 registration gains	1,070,143
1917 registration gains	1,396,324

The total increased registration of 1,396,324 compares favorably with the estimated output of automobiles and trucks during 1917 of 1,938,778, as computed, and generally accepted as being nearly correct. It is natural that a goodly number of cars went out of commission during the year, but not 542,000, as the difference between these figures would indicate. Part of this difference is owing to many automobiles built during the last 3 months of 1917 which were placed in storage by the makers and

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Registration of passenger and commercial cars in the United States segregated by individual states. Eight states have more than 200,000 vehicles each

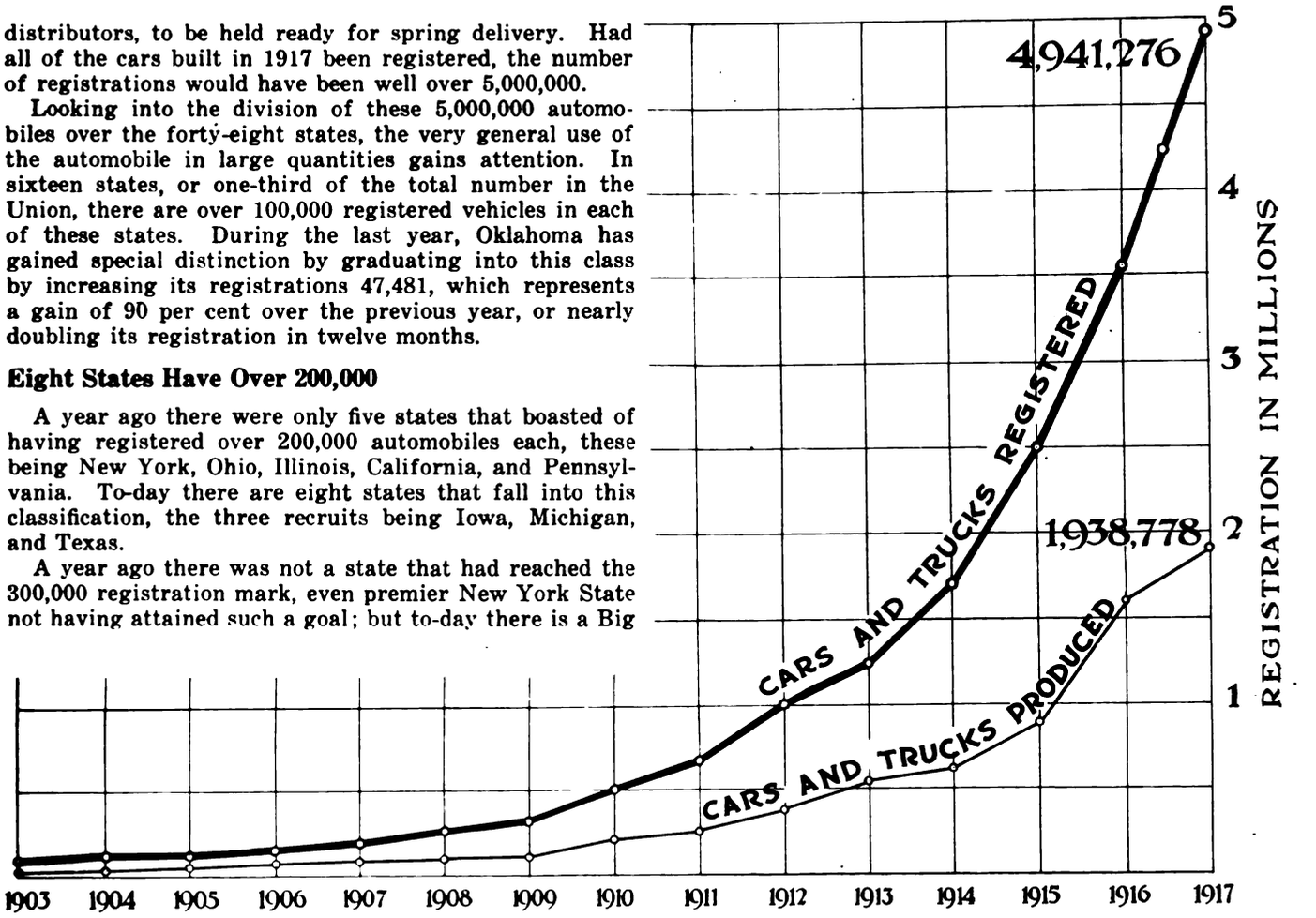
distributors, to be held ready for spring delivery. Had all of the cars built in 1917 been registered, the number of registrations would have been well over 5,000,000.

Looking into the division of these 5,000,000 automobiles over the forty-eight states, the very general use of the automobile in large quantities gains attention. In sixteen states, or one-third of the total number in the Union, there are over 100,000 registered vehicles in each of these states. During the last year, Oklahoma has gained special distinction by graduating into this class by increasing its registrations 47,481, which represents a gain of 90 per cent over the previous year, or nearly doubling its registration in twelve months.

Eight States Have Over 200,000

A year ago there were only five states that boasted of having registered over 200,000 automobiles each, these being New York, Ohio, Illinois, California, and Pennsylvania. To-day there are eight states that fall into this classification, the three recruits being Iowa, Michigan, and Texas.

A year ago there was not a state that had reached the 300,000 registration mark, even premier New York State not having attained such a goal; but to-day there is a Big



Since 1903, the curve of registrations of cars and trucks has been a steadily rising one until to-day it nearly touches five million. The production curve has not shown such a consistent rise

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Registration and Population

State	Pop. July 1, 1917 Census	Cars and Trucks	Pop. Per Car
Iowa	2,224,771	278,213	8
Nebraska	1,284,126	148,101	8
South Dakota	716,972	67,158	10
Montana	472,935	41,896	11
Minnesota	2,312,445	191,500	12
North Dakota	765,319	62,993	12
Kansas	1,851,870	154,442	12
California	3,029,032	243,116	12
Arizona	263,788	19,890	13
Michigan	3,094,266	215,001	14
Indiana	2,835,492	189,433	15
Wisconsin	2,527,167	164,531	15
Colorado	988,320	66,850	15
Ohio	5,212,085	333,630	15
Wyoming	184,970	12,001	15
Nevada	110,738	6,760	17
Connecticut	1,265,373	74,642	17
Washington	1,597,400	93,822	17
Dist. of Col.	369,282	21,198	17
Oregon	861,992	48,132	18
Illinois	6,234,995	340,292	18
Idaho	445,176	24,316	18
Vermont	364,946	18,550	19
Maine	777,340	38,499	20
Utah	443,866	21,226	20
Delaware	215,160	9,655	22
Oklahoma	2,289,855	100,199	22
Missouri	3,429,595	146,142	23
Florida	916,185	39,216	23
New Hampshire	444,429	18,146	24
Texas	4,515,423	188,334	24
Maryland	1,373,673	56,129	24
Massachusetts	3,775,973	155,044	24
Rhode Island	625,865	25,142	24
New York	10,460,182	404,247	25
Pennsylvania	8,660,042	325,153	26
New Mexico	423,649	14,086	30
New Jersey	3,014,194	87,421	34
Virginia	2,213,025	55,661	39
Georgia	2,895,841	70,496	40
North Carolina	2,434,381	55,950	43
South Carolina	1,643,205	36,822	44
West Virginia	1,412,602	31,306	45
Tennessee	2,304,629	48,500	47
Kentucky	2,394,093	47,400	50
Louisiana	1,856,954	31,650	58
Arkansas	1,766,343	28,862	61
Mississippi	1,976,570	31,650	62
Alabama	2,363,939	32,873	72
Total	103,640,473	4,941,276	21

Four in this 300,000 classification, made up of New York, Illinois, Ohio and Pennsylvania. These four leaders have made large registration gains in the last year, making additions as follows:

New York added.....124,841
Illinois added..... 88,992
Ohio added..... 81,451
Pennsylvania added..... 94,505

New York State still occupies a premier position, and carries the unique distinction of being the only state to have a registration over 400,000, its official figure as of Jan. 1, 1918, being 404,247.

When an analysis of the forty-eight states with regard to actual gains in registration is made, the leaders are New York, followed by Iowa, the automobile Goliath from west of the Mississippi, which has taken the leadership away from such great central states as Illinois, Ohio, Pennsylvania and Michigan. With the possible exception of Oklahoma, with its record gain during the year the State of Iowa leads in percentage of gains of the fifteen states that have the largest registrations.

Iowa, as a premier agricultural state, gives to the entire world the potent meaning of the necessity of motor apparatus for the great farming areas. There are only five other states in the Union that show a greater percentage gain and these are states of much smaller actual registration.

There is a little coterie of states that have set very high percentages of increase in registration during the year, these including Florida, South Carolina, Arkansas, Idaho, Montana, Arizona, Wyoming, New Mexico and Maryland and the District of Columbia. Florida literally ran away with itself, showing an increase of 176 per cent during the year. Last year there was sold in the state nearly twice as many cars as there were formerly in the state.

South Carolina nearly doubled its car population in the year and so did Arkansas and Oklahoma. Idaho might be classed in this group.

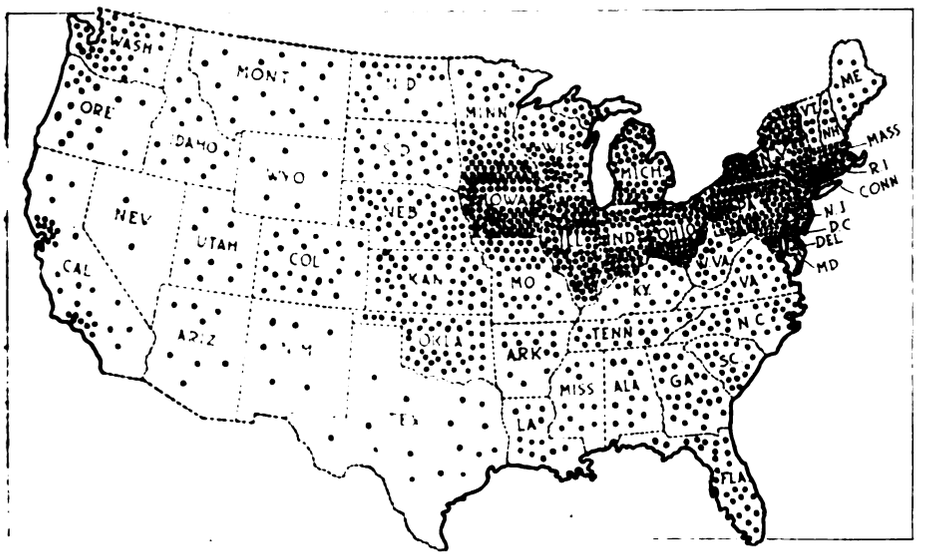
Increase in Registration

State	Increase in Cars	Per Cent Increase
New York	124,841	45
Iowa	105,422	61
Pennsylvania	94,505	41
Illinois	88,992	35
Ohio	81,451	32
Michigan	55,362	34
Minnesota	54,000	39
Indiana	50,295	36
Oklahoma	47,481	90
Wisconsin	46,928	40
Nebraska	46,900	46
Kansas	40,078	35
Missouri	38,277	35
Washington	31,276	50
California	30,198	14
Florida	24,996	176
Georgia	24,721	54
South Dakota	22,887	52
Maryland	22,765	68
Colorado	22,670	51
North Dakota	21,232	51
North Carolina	20,800	59
Virginia	20,235	57
Connecticut	18,594	33
Massachusetts	18,254	13
South Carolina	17,822	89
Montana	17,311	70
Oregon	17,215	56
Tennessee	17,100	54
Kentucky	15,900	50
Texas	15,647	7
Arkansas	14,158	96
New Jersey	12,813	16
Idaho	11,320	87
Mississippi	11,176	54
West Virginia	10,869	53
Louisiana	11,636	58
Alabama	10,519	47
Maine	9,548	67
Dist. of Col.	8,080	61
Arizona	7,768	63
Utah	7,719	57
New Mexico	6,058	75
Wyoming	4,876	68
Vermont	4,299	30
New Hampshire	3,808	26
Rhode Island	3,736	17
Nevada	2,151	47
Delaware	2,135	28
	1,396,324	54

Dealers, Garages, Machine Shops and Supply Houses in Operation

State	Dealers	Garages	Repair Shops	Cos. Having Supply Depts.	Jobbers	Supplies Exclusively	Total
Alabama	185	116	92	47	2	27	299
Arizona	124	101	63	50	..	13	199
Arkansas	214	124	76	50	..	24	323
California	1262	1412	1002	448	19	173	2457
Colorado	356	327	191	135	3	23	556
Connecticut	464	486	302	163	7	87	851
Delaware	74	70	32	23	..	6	108
Dist. of Columbia	66	56	35	10	3	23	151
Florida	254	264	168	119	2	39	474
Georgia	392	277	163	97	2	55	651
Idaho	177	126	74	66	1	16	24
Illinois	1931	1700	999	530	18	132	3063
Indiana	1002	803	377	300	10	69	1450
Iowa	1681	1374	770	690	7	69	2389
Kansas	996	850	450	352	8	34	1562
Kentucky	303	249	100	79	3	26	453
Louisiana	170	92	61	39	3	18	251
Maine	353	288	142	131	3	17	555
Maryland	230	253	124	77	2	31	420
Massachusetts	816	923	435	216	15	145	1675
Michigan	971	871	362	272	7	90	1594
Minnesota	1101	833	465	276	14	43	1547
Mississippi	133	92	49	44	..	15	197
Missouri	804	672	419	222	16	69	1387
Montana	266	217	140	96	2	14	385
Nebraska	856	695	290	239	8	23	1198
Nevada	60	60	30	20	..	5	103
New Hampshire	187	218	107	95	..	10	326
New Jersey	703	967	461	239	2	87	1468
New Mexico	95	91	39	41	..	7	154
New York	2023	2344	1178	616	15	335	4064
North Carolina	331	269	116	113	1	24	480
North Dakota	521	343	192	148	1	10	705
Ohio	1829	1464	686	513	26	148	2793
Oklahoma	459	364	155	160	3	30	719
Oregon	229	252	124	76	4	28	412
Pennsylvania	1831	1867	864	630	14	220	3083
Rhode Island	97	142	92	18	5	14	274
South Carolina	211	127	68	55	2	19	316
South Dakota	446	348	173	114	2	10	636
Tennessee	227	157	115	77	3	29	366
Texas	877	644	324	236	9	89	1464
Utah	111	74	51	27	3	13	174
Vermont	175	166	102	75	..	10	305
Virginia	291	211	128	75	2	44	456
Washington	418	353	201	108	6	48	636
West Virginia	227	155	69	66	..	14	302
Wisconsin	1085	937	438	339	8	48	1508
Wyoming	88	74	41	25	..	9	137
Territory of Hawaii	11	9	10	9	..	5	20
West Indies	27	22	4	9	..	4	41
Canada	955	860	421	223	18	82	1423
Mexico	9	11	4	2	..	2	17
Total	28,704	25,800	13,574	8,880	279	2,626	46,657

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This map will give some idea of where the big increase in registrations has taken place. Each dot represents 1000 vehicles gained during 1917

While phenomenal gains in registrations have been made in these states, all of which except Oklahoma have relatively small registrations, the big substantial gains that make up the 1,396,324 increase in 1917 are found in the great agricultural states, with the possible exception of New York. Here are a few examples of how registrations have gained in the big grain-growing states:

Iowa gained in 1917	105,422
Illinois	88,992
Ohio	81,451
Michigan	55,362
Minnesota	54,000
Indiana	50,295
Oklahoma	47,481
Wisconsin	46,928
Nebraska	46,900
Kansas	40,078
Missouri	38,277
Washington	31,276

Here is a total of nearly 700,000 increased registrations in this dozen of the leading grain-growing states. They head the list of increases in registrations, with two exceptions, New York State and Pennsylvania. They lead California, that was a close runner-up for first honors after New York. They lead Massachusetts, that shows a gain of but 13 per cent in increased registrations during the year, which is the second smallest percentage gain of the year, Texas, with a percentage gain in registrations of 8 per cent, standing at the foot of the ladder of increases. Western Texas suffered very severely from the dry weather, a fact that explains to quite an extent the small gain in 1917.

Taken as a group, the Southern States, by their increased registrations, gave evidence of the flow of

Automobile and Truck Registrations in United States to January 1, 1918

State or Territory	Total Registration	New Registration	Registration Up to Jan. 1, 1917	Gasoline Passenger Cars in Use	Electric Passenger Cars in Use	Gasoline Commercial Cars in Use	Electric Commercial Cars in Use	Motorcycles in Use	Non-Resident Registration*	Re-Registered**	Chauffeurs Registered	Total Fees	Remarks
Alabama	32,873	10,519	22,354	.....	.....	.....	.....	1,240	.....	.....	1,631	$187,696	
Arizona	19,890	7,768	12,122	.....	.....	1,439	.....	868	.....	.....	3,453	117,643	
Arkansas	28,862	14,158	14,704	.....	.....	.....	.....	.....	.....	.....	485	.....	
California	245,866	32,948	212,918	245,866	.....	10,765	.....	32,489	2,750	None	14,935	2,846,030	
Colorado	66,850	22,670	44,180	.....	.....	.....	.....	4,504	.....	.....	.....	.....	
Connecticut	74,642	18,594	56,048	.....	.....	9,702	.....	4,905	.....	.....	.....	.....	
Delaware	10,700	3,180	7,520	.....	.....	.....	.....	730	.....	1,045	.....	133,883	
Dist. of Col	21,198	8,080	13,118	20,939	267	.....	.....	346	.....	.....	59,800	83,110	
Florida	39,216	24,996	14,220	.....	.....	.....	.....	.....	.....	.....	6,000	.....	
Georgia	72,851	27,076	45,775	†68,751	†800	†3,000	†100	1,400	355	2,000	1,400	230,862	
Idaho	24,716	11,720	12,996	.....	.....	.....	.....	752	None	†400	1,181	413,929	
Illinois	340,292	88,992	251,300	.....	.....	.....	.....	13,750	.....	.....	45,000	2,237,545	
Indiana	192,192	53,054	139,138	.....	.....	.....	.....	10,315	.....	2,759	.....	1,096,106	
Iowa	278,213	105,422	172,791	.....	.....	.....	.....	7,684	.....	.....	None	2,249,655	
Kansas	159,342	44,978	114,364	.....	.....	.....	.....	5,599	None	4,900	None	83,258	
Kentucky	47,400	15,900	31,500	.....	.....	.....	.....	1,450	.....	.....	.....	287,212	
Louisiana	31,650	11,636	20,014	.....	.....	3,165	.....	382	.....	.....	.....	170,000	
Maine	41,499	12,548	28,951	38,067	†50	3,382	None	1,516	.....	3,000	.....	487,873	
Maryland	60,943	27,579	33,364	3,051	.....	3,656	†500	5,436	†1,500	3,314	15,524	807,395	
Massachusetts	174,274	37,484	136,790	.....	.....	26,964	.....	.....	.....	19,230	51,690	1,969,813	
Michigan	226,693	67,054	159,639	206,380	.....	20,313	.....	8,727	306	11,386	20,157	2,476,525	
Minnesota	192,000	54,500	137,500	†170,000	†500	†20,000	†1,500	15,000	None	500	†5,000	334,000	Triennial
Mississippi	31,650	11,176	20,474	.....	.....	.....	.....	.....	.....	.....	None	.....	Perennial
Missouri	151,027	43,162	107,865	.....	.....	.....	.....	4,179	.....	4,885	18,040	617,943	
Montana	42,749	18,164	24,585	.....	.....	†600	.....	923	.....	853	3,056	295,207	
Nebraska	148,101	46,900	101,201	.....	.....	.....	.....	3,500	.....	.....	None	.....	
Nevada	6,885	2,276	4,609	6,882	3	†225	.....	238	None	125	.....	32,320	
New Hampshire	22,267	7,929	14,338	22,000	100	.....	.....	2,218	1,721	2,400	8,288	425,305	
New Jersey	141,918	66,810	75,108	.....	.....	9,622	.....	13,198	28,383	†26,114	177,568	1,923,164	
New Mexico	14,086	6,058	8,028	.....	.....	.....	.....	345	.....	.....	None	80,343	
New York	410,950	131,544	279,406	.....	.....	55,402	.....	28,773	4,257	2,446	132,833	4,251,991	
North Carolina	55,950	20,800	35,150	.....	.....	.....	.....	1,253	.....	None	None	321,923	
North Dakota	62,993	21,232	41,761	.....	.....	.....	.....	1,834	.....	.....	.....	211,536	
Ohio	342,630	90,451	252,179	.....	.....	.....	.....	21,925	.....	9,000	.....	1,766,427	
Oklahoma	100,199	47,481	52,718	.....	.....	.....	.....	2,368	None	.....	None	836,400	
Oregon	48,632	17,715	30,917	44,844	†100	3,648	†40	3,400	†500	None	3,476	196,788	
Pennsylvania	325,153	94,505	230,648	.....	.....	12,952	.....	24,567	.....	.....	.....	3,268,025	
Rhode Island	25,142	3,736	21,406	.....	.....	4,065	.....	1,133	.....	.....	.....	346,117	
South Carolina	38,322	19,322	19,000	.....	.....	.....	.....	1,250	500	1,000	None	113,557	
South Dakota	67,158	22,887	44,271	.....	.....	.....	.....	1,554	None	None	None	.....	
Tennessee	48,500	17,100	31,400	.....	50	.....	10	900	None	None	None	317,000	
Texas	†219,721	22,034	197,687	.....	.....	.....	.....	3,468	28	6,359	12,714	858,611	
Utah	21,576	8,069	13,507	18,227	100	2,500	.....	1,385	100	†250	1,547	106,863	Perennial
Vermont	20,367	6,116	14,251	18,970	7	1,262	4	758	.....	1,817	3,655	362,541	
Virginia	55,661	20,235	35,426	.....	.....	.....	.....	2,135	.....	.....	3,530	518,566	
Washington	93,822	31,276	62,546	82,066	.....	11,656	.....	6,320	.....	None	None	519,526	
West Virginia	31,306	10,869	20,437	.....	.....	.....	.....	825	None	.....	.....	.....	
Wisconsin	164,531	46,928	117,603	.....	.....	†6,000	.....	8,479	None	None	None	861,283	
Wyoming	12,501	5,376	7,125	.....	.....	.....	.....	352	None	500	None	57,400	
Total	5,085,959	1,541,007	3,544,952	946,043	1,977	210,318	2,154	254,373	40,400	104,283	590,963	$34,501,371	

NOTE.—Steam cars and trucks are included with the gasoline vehicle statistics, as segregation is not carried out by registration officials. *Number of cars registered owned by citizens of other states. **Number of vehicles re-registered, owing to transfer of ownership, etc. ..... Statistics not available. †Estimated by Secretary of State.

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Vehicles Per Capita for 3 Years

	1915	1916	1917
Alabama	168	104	72
Arizona	34	19	13
Arkansas	215	118	61
California	18	14	12
Colorado	36	22	15
Connecticut	32	22	17
Delaware	43	28	22
Dist. of Columbia	35	28	17
Florida	67	63	23
Georgia	117	62	41
Idaho	59	33	18
Illinois	33	25	18
Indiana	29	20	15
Iowa	16	13	8
Kansas	24	16	12
Kentucky	121	76	51
Louisiana	167	108	57
Maine	41	27	20
Maryland	49	41	24
Massachusetts	41	27	24
Michigan	26	19	14
Minnesota	25	17	12
Mississippi	168	95	62
Missouri	44	32	23
Montana	31	19	11
Nebraska	21	13	9
Nevada	48	23	16
New Hampshire	41	31	24
New Jersey	43	39	34
New Mexico	82	50	30
New York	48	37	26
North Carolina	113	68	44
North Dakota	29	18	12
Ohio	28	20	16
Oklahoma	83	42	23
Oregon	35	27	18
Pennsylvania	56	37	27
Rhode Island	37	29	25
South Carolina	111	86	45
South Dakota	23	16	11
Tennessee	84	73	48
Texas	49	22	21
Utah	54	32	21
Vermont	32	26	20
Virginia	102	62	40
Washington	41	25	17
West Virginia	103	68	45
Wisconsin	31	21	15
Wyoming	45	45	15

weather due to cotton, sugar and timber. They literally, with the Lone Star State excepted, represent a solid South in big gains, all running over 50 per cent, if we overlook Texas and Alabama, the latter showing 47 per cent only. The roll of honor begins with Florida running wild at 176 per cent gain and followed by the list as follows:

	Per cent gained 1917.	
Florida	176	24,996
South Carolina	89	17,822
Oklahoma	90	47,481
Arkansas	96	14,158
Maryland	68	22,765
North Carolina	59	20,800
Louisiana	58	11,636
Virginia	57	20,235
Mississippi	54	11,176
Georgia	54	24,721
Tennessee	54	17,100
West Virginia	53	10,869
Kentucky	50	15,900
Alabama	47	10,519
Texas	7	15,647
District of Columbia	61	8,080

This represents a total increase of registration in these Southern States of 296,779, or scarcely one-half the gain in the agricultural states previously analyzed. The phenomenal gains give indication of the still greater ability of these Southern States to absorb automobiles and trucks during 1918. With continued prosperity in the South under the stimulation of war it will not be surprising if 1918 shows a registration increase in these states of 500,000. All during the present winter the South has been asking for cars and there have been factory driveaways on a scale never contemplated before. For the first time the South has given indication of its automobile-buying strength.

Other groups of states to profit under war régime are the mining and oil states. In this group those states such as Oklahoma which possess the profitable combination of oil, and crops as well as live stock give evidence of the increased wealth under war.

In the mining group of Western States, comprising Idaho, Montana, Wyoming, New Mexico, Arizona, Utah, Colorado and Nevada, the gains are very nearly as spectacular as in the solid South. Here the gain percentages run well over 50 with the single exception of Nevada, which, like Alabama in the South, fell below this mark. Idaho gets the leadership, with 87 per cent gain, which is nearly on a par with Oklahoma, which profited so well from oil, agriculture and live stock.

The percentages of gains and the net increases in registrations in this Western group of mining states are:

State.	Per cent gained.	
Idaho	87	11,320
New Mexico	75	6,058
Montana	70	17,311
Wyoming	68	4,876
Arizona	63	3,768
Utah	57	7,719
Colorado	51	22,670
Nevada	47	2,151
Total		79,793

The six New England States as a unit show very low registration gains over the 1916 calendar year, the percentages all running under 50, in fact, the highest percentage is 33, which honor is shared by Connecticut and Maine, whereas the smallest gain, namely 13 per cent, went to the pioneer motoring State of Massachusetts. The New England gains by states in

Statistics by Years

Year	Registration	Production	Value, Output
1911	677,000	210,000	$262,500,000
1912	1,010,483	378,000	378,000,000
1913	1,253,875	483,000	425,000,000
1914	1,736,790	573,114	465,042,474
1915	2,471,595	892,618	691,778,950
1916	3,544,952	1,617,708	1,274,625,864
1917	4,941,276	1,938,778	1,660,134,976

percentages and actual registrations are:

State.	Per cent gained.	
Maine	67	9,548
Connecticut	33	18,594
New Hampshire	26	3,808
Vermont	30	4,299
Rhode Island	17	3,736
Massachusetts	13	18,254
Total		58,239

Compared with the calendar year of 1916, the entire New England territory did not show gains in 1917, as might have been expected. The percentages of registration gains in 1916 were much higher. Maine had 55 per cent, Massachusetts had 53 per cent, as compared with 13 per cent last year. The only New England State that showed a bigger percentage increase in 1917 than in 1916 was Ver-

(*Continued on page* 573)

DISTRIBUTION OF CAR, TRUCK AND ENGINE MANUFACTURERS IN THE UNITED STATES AND CANADA

State	Automobiles	Commercial Vehicles	Engines	Total
California	5	14	..	18
Colorado	1	..	..	1
Connecticut	4	3	2	8
Delaware	..	1	..	1
Dist. of Colum.	..	1	..	1
Georgia	..	3	..	3
Illinois	19	50	4	68
Indiana	24	16	5	41
Iowa	..	9	..	9
Kansas	1	2	..	3
Kentucky	2	3	..	4
Louisiana	1	1	..	2
Maine	..	1	..	1
Maryland	1	1	..	1
Massachusetts	5	14	..	15
Michigan	43	44	17	99
Minnesota	6	35	..	38
Missouri	4	11	..	14
Nebraska	1	2	..	3
New Hampshire	..	1	..	1
New Jersey	4	7	1	11
New York	17	43	8	64
North Carolina	..	1	..	1
Ohio	32	51	7	81
Oklahoma	1	1	..	1
Oregon	..	..	..	..
Pennsylvania	10	29	5	39
Rhode Island	..	1	..	1
South Carolina	1	..	..	1
South Dakota	..	1	..	1
Texas	1	1	..	2
Virginia	2	1	..	3
Washington	2	4	..	4
West Virginia	2	2	..	2
Wisconsin	6	24	9	37
Canada	20	16	..	29
Total	215	394	58	608

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Guiding the Workman's Personal Expenditures

Ford Reduced Turnover 350 Per Cent by the Simple Psychology of a Peaceful Mind as a Result of Domestic Content

By C. J. Shower

THERE are three ways by which industries can permit employees to share in their profits. The first is to issue stock and allow them to buy it at the inside, rock bottom prices. In this way the employee can share in the prosperity of the company in proportion to the interest given his work. There is no human element connected with it. The employee in this method is, in a sense, an equal to his employer.

The second way is to put money into gymnasiums, libraries, lunch rooms, swimming pools, etc., for the benefit of employees, the employer believing that he can better and more economically spend the money for their welfare than they can themselves.

The third way is to place the money right in the hands of the employee and let him use it as his own judgment dictates. This latter is Henry Ford's view. But there is danger in this method if no guidance accompanies it. Some men cannot use good judgment in the expenditures of money; they are unable to spend it wisely and constructively.

The plan as worked out by Henry Ford has indeed been successful. Statistics show that it has reduced turnover from 370 per cent to only 16 per cent in one year. This is worthy of note, for one of the big problems the employer has is reducing the cost of hiring and training men.

In 1913 the Ford Motor Co. suffered an enormous turnover. There was some reason for that and the company took steps to find the cause. After a long investigation and an analysis of the situation it was found that there were three destroying elements to contend with:

1—The men were working too long hours.

2—Their wages were too small.

3—Housing conditions were unsatisfactory.

Any one reason would tend to make an employee leave and seek work elsewhere. It is obvious that a man would rather work shorter hours for the same pay. He would have more leisure time. If he can obtain more wages elsewhere for the same hours of employment, he will change. And if he is not entirely satisfied with his home surroundings he will move and later he will want to find work nearer his home.

Years ago, when industries were small, there was a close contact between the employer and employee. The employer knew nearly every one of his men more or less intimately and knew his requirements. There was more of a personal element in the connection than now, when industries have grown to large proportions and it is impossible, perhaps futile, for an employer to come in personal contact with such great numbers—30,000 to 50,000 individuals. For this reason it was advisable to organize at the Ford plant a special department whose function it is to keep in personal relation with the employees.

This department is the outcome of the investigation made



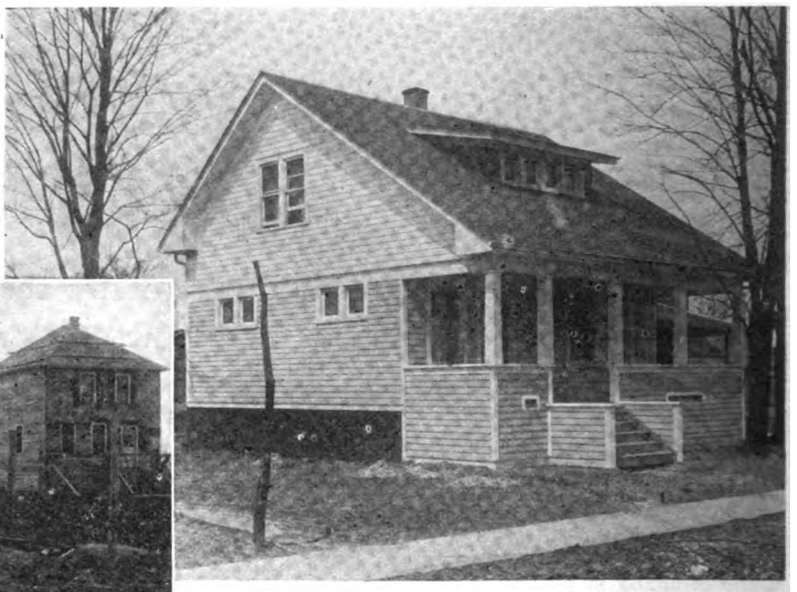


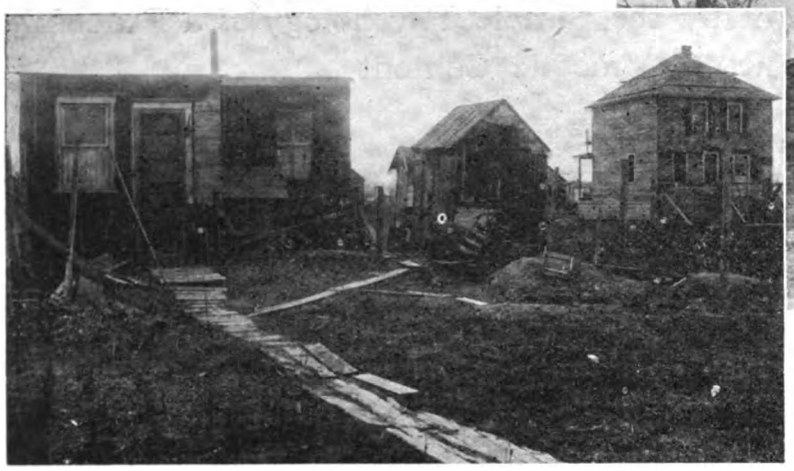
Above—The Employment Department, showing men filling application blanks. Right—Employees attending the outdoor Ford English school

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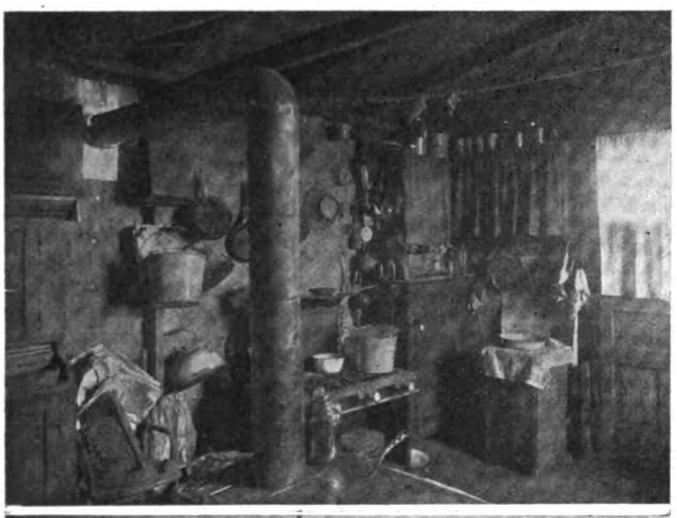
Before and After Views of Ford Employees' Homes

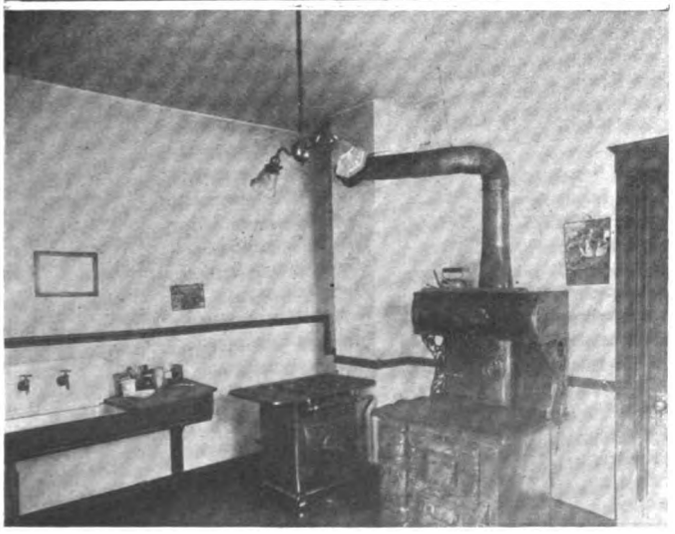
These pictures illustrate the transformation wrought in the home life of the workmen by the Ford company's profit-sharing system



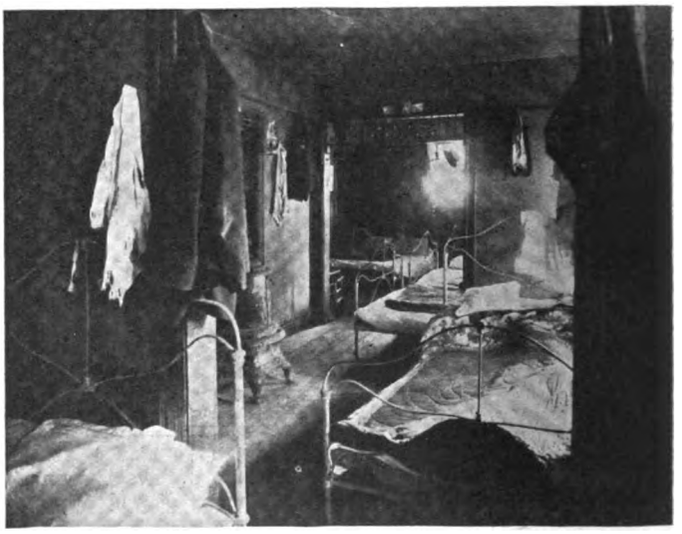


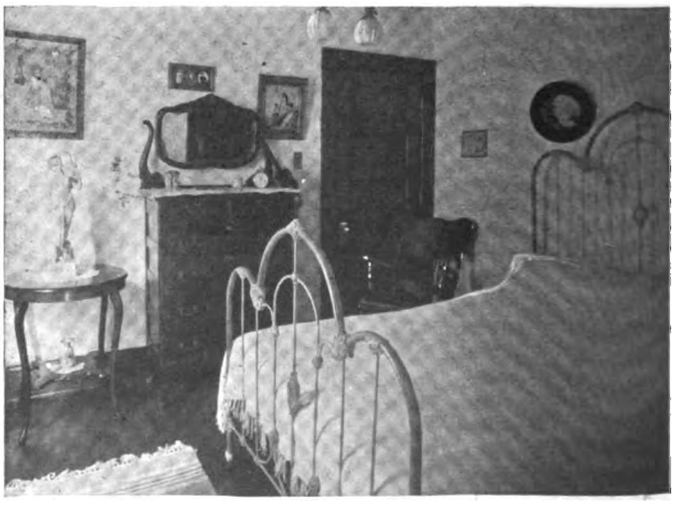
Housing conditions as they were found and the new home of a profit-sharer





A typical kitchen as it was found during the investigation and as the profit-sharing plan transformed it





As many as four beds were found in one room by the investigator; the lower picture shows how it looks now

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A result of the new régime



A typical dining room in a profit-sharer's home

several years ago and the results thus far accomplished are praiseworthy. It aims:

1. To improve a man's tastes and at the same time increase his earning power;
2. To teach a man to use his income in a constructive manner;
3. To put a man into a right relation with his family;
4. To put a man into right relations with his community;
5. To put a man right with his work and his employer;
6. To fit the foreigner to become a citizen and to encourage him to do so;
7. To give the man who is down and out a chance to come back.

Shorter Hours—More Pay

The three causes of dissatisfaction on the part of the men, it is believed, have been removed. The working hours have been shortened to 8 hr. a day and the minimum wage was set at $5 a day. Steps have been taken to improve the housing conditions. All three have resulted in very materially reducing the turnover.

An idea of the commendable work done by this department can be gained by reciting a few statistics: In November, 1912, the factory was working on a 9-hr. basis, and was paying about sixty different rates of wages. During that month in order to maintain a working force of 8820 men it was necessary to hire 3732 men, or 42 per cent of the total working force, and during that time 4126 or 46 per cent of the force left its employ. A year later, due to the organization of the Profit-Sharing Plan, it was necessary to hire only 1085 men to maintain a force of 13,500. This shows a percentage of only 8 per cent.

January 12, 1914, the profit-sharing plan was put into effect. Two months later statistics show that the percentage of turnover was decreased still more. The factory had been working on a 9-hr. basis until this time when it adopted an 8-hr. working day. With men being paid higher wages and working shorter hours a marked effect was noted on the production. Almost immediately with these changes an increase was felt.

In the motor department with relatively the same number of men there was an output of 7200 parts in 8 hr. as against that of 6125 in 9 hr.

The radiator department jumped their output from 750 in 9 hr. to 1300 in 8 hr.

In the fender department where 38 fenders were produced in 9 hr. heretofore, the same group of men increased the number to 50 within the 8-hr. day.

Where it took 65 men formerly to produce 800 gasoline tanks in 9 hr., 60 men in the 8 hr. made a total of 1200. Increases were noted in other departments.

In 1913, 52,445 entered the employ of the company and 50,488 left. Note that a number nearly equal to the total force departed. The cost of hiring and fitting each of these men for a job and the expense of firing him have never been definitely determined, but in any event it is exceedingly costly. Some men place the figure as high as $50 per man. This is prohibitive and if any means can be devised to reduce this excessive cost, it is to the advantage of every manufacturer to do so. To-day if the Ford company wishes to increase its working force 100 men only 136 men need be hired, while 5 years ago it was necessary to hire 963 to accomplish the same results. This means that only one-seventh as many men need be hired to get the same increase.

Rules for Profit Sharers

Now in order that a man may enjoy a share in the profits of the Ford company he must comply with certain rules and regulations as laid down by the institution. When this profit-sharing idea was first formulated it was readily seen that it would attract droves of men from other factories and from other cities. To prevent such a catastrophe it was necessary to make a strict rule that no one could secure work at the Ford plant that was at the time employed in another factory. And it was also made clear that no person was to be hired who lived in the city for a period less than three to six months. This first stipulation discouraged an exodus from other plants, while the latter gave little encouragement to the newcomers to the city in search of a soft job. To be entitled to any share of the profits an employee is put on six months' probation. If after that time he has shown that he is using his money in a wise manner and qualifies in other ways, he is at once put on the profit-sharing list. But he must be over 18 years of age before he is put on this list. If he is younger, he is not entitled to any profits unless he has someone solely dependent upon him.

This Welfare Work is done by several departments, each of which takes care of one phase of the work, thus: real estate matters, garnishments, legal matters, etc. But it must not be understood that these divisions are entirely separate; they are all co-ordinated and it is difficult to draw a dividing line.

The work, however, is divided. There are two ends, the outside and the inside:

The outside men, formerly called investigators but now termed advisers, investigate the housing condition of the employee, whether or not he practises thrift, whether he is

(*Continued on page* 547)

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The Mechanics of Tractor Spring-Mounting

An Analytical Investigation of Effects Produced When Tractors of Different Types Pass Over Rigid Obstacles

By E. Goldberger

Efficiency Engineer, The Packard Motor Car Co.; formerly Assistant Chief Engineer, The Holt Mfg. Co.

LET us suppose a tractor wheel climbing over an obstacle. If the vertical distance which the wheel is lifted in unit time is large, we say the vertical velocity is large. Vertical velocity = vertical motion in unit time. To impart velocity to a body is to accelerate it. Vertical acceleration = change of vertical component of velocity in unit time. Now, to create such an acceleration requires a force. Experience has taught that the force required to accelerate a body is equal to the product of the mass of the body by the acceleration in unit time.

If the obstacle is hard and strong enough so as not to crumble under the weight of the machine, then it will force the tractor upward, exerting upon the wheel at the point of contact between wheel and obstacle the force required to create that upward motion; hence, if we know the path followed by the wheel we can easily determine the force exerted upon the wheel at any moment.

In Fig. 1 is shown a wheel crossing an obstacle which we will suppose to be perfectly rigid. The shape and size of the obstacle will be considered constant throughout the following investigation, in order to make it easier to compare the effects upon different types of tractor carrying members.

The first curve, marked *s-t*, shows the travel of the point through which pressure due to the weight of the machine is transmitted to the ground, or, vice-versa, the shock from the ground to the machine. If the tractor moves at a uniform speed in a horizontal direction, then the horizontal scale of this curve can be made to represent either the distance or the time of travel, while the vertical scale represents the lift of the center of the forces transmitted to or from the chassis and machinery. The full-drawn *s-t* curve supposes a rigid connection between center of wheel and chassis.

Measuring Vertical Travel

By subdividing the horizontal axis into equal parts, which we may call units of time, and drawing verticals through these points, we can easily scale the vertical travel during every one of these units of time and consider it the average velocity for that small period. Plotting these values in a new curve, we obtain the *v-t* curve, which represents the vertical velocities of the wheel and that part of the tractor which rests on it. The velocities will be positive while the tractor is being raised and negative while it is descending.

Following the same process, *i.e.*, subdividing the horizontal axis into units of time and scaling the change in vertical velocities, then taking the averages during the small periods and plotting them in the new curve at the top of the graph, we obtain the *p-t* curve, which represents the vertical acceleration of the wheel and chassis.

To find the forces that act upon the wheel, other than that due to the weight it carries, it is only necessary that we read these lengths in the correct units for acceleration and multiply them by the mass of that part of the tractor which rests upon the wheel axle. For our graphic illustration it is advantageous to move the zero line down a distance corresponding to the gravity acceleration, as we can then read both the acceleration force while the tractor is moving over level ground and the increase or decrease of same when it is meeting an obstacle. Since the mass of the body resting on the axle is constant, the *p-t* curve also illustrates the actual forces in play. We note the following:

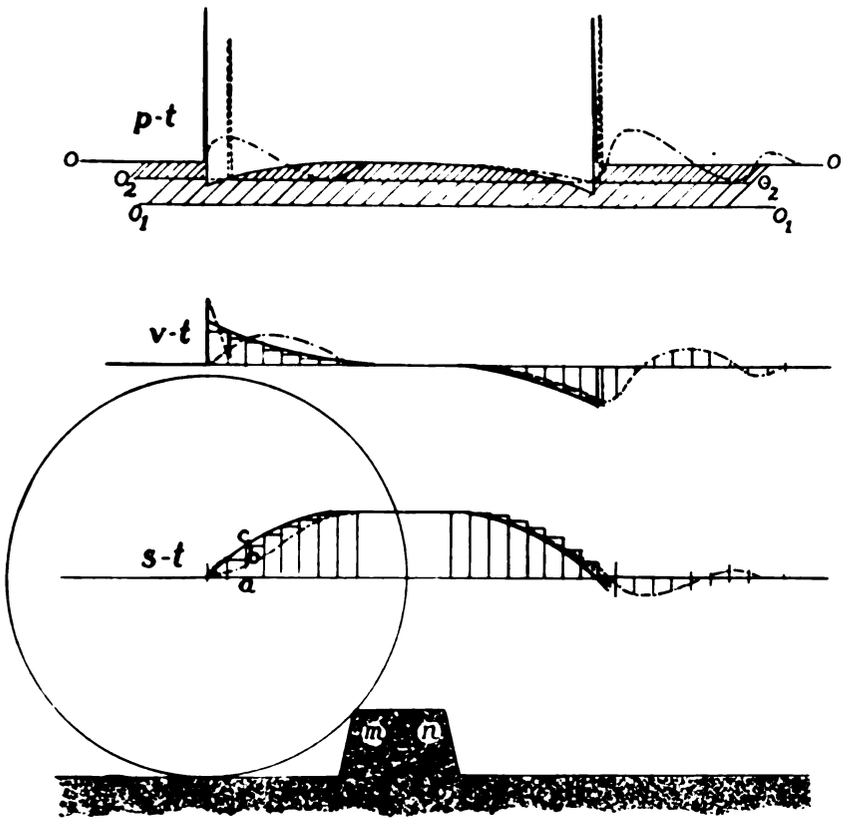
Impact Force on Rigidly Supported Wheel

If both tractor and ground are supposed to be perfectly rigid, the moment the wheel hits the obstacle, an unlimited upward force acts upon the machine. This force disappears just as quickly as it appeared, and for a moment the tractor loses contact with the ground. The pressure due to weight reappears slowly until the wheel reaches the top of the obstacle. During the descent, the weight disappears slowly again and when the wheel hits the ground it is struck a quick upward blow, the force disappearing again quickly. Not only do these forces attain high values, but they change in value very rapidly, and in consequence they act upon all parts and joints of the machine, not like the pressure of a hydraulic press but like the blows of a hammer. All curves, *i.e.*, those of motion, velocity and acceleration, and, hence, force and impact, are identical whether the wheel is going up or down.

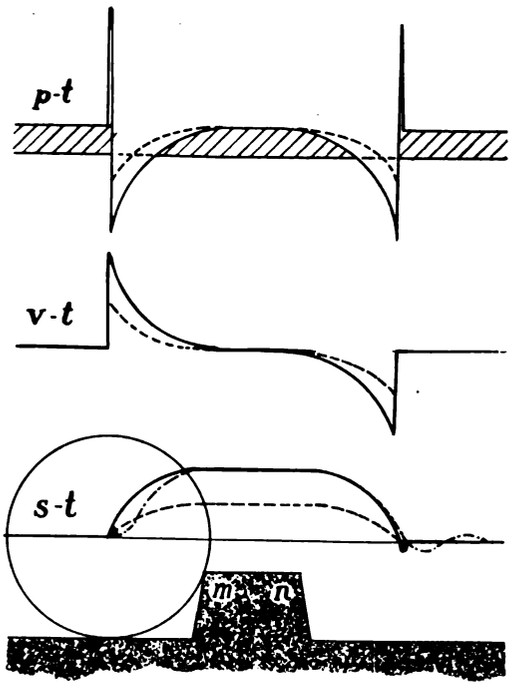
If the traveling speed of the tractor is doubled, the unit of time on the horizontal axis will become a half unit, hence, while the vertical motion is not changed the unit for velocities (used in measuring the *v-t* ordinates) is halved, which means that the vertical velocities are doubled. In the same way we find that the acceleration and the accelerating forces will be quadrupled or increased as the square of the tractor speed.

If the tractor speed is sufficiently high to cause the wheel to lose contact with the ground altogether, due to the blow from the rigid obstacle, then the tractor in coming down to ground again will be dealt another blow, which, however, will not be as severe as the previous one. Not only does the number of the blows increase with increasing speed, but the severity of the impact increases without limit, the dynamic energy being the product of mass by the square of vertical velocity. It is different while the tractor is descending the obstacle. First of all there will be no repeat blows; then, there being no downward force acting on the body, other than gravity, the

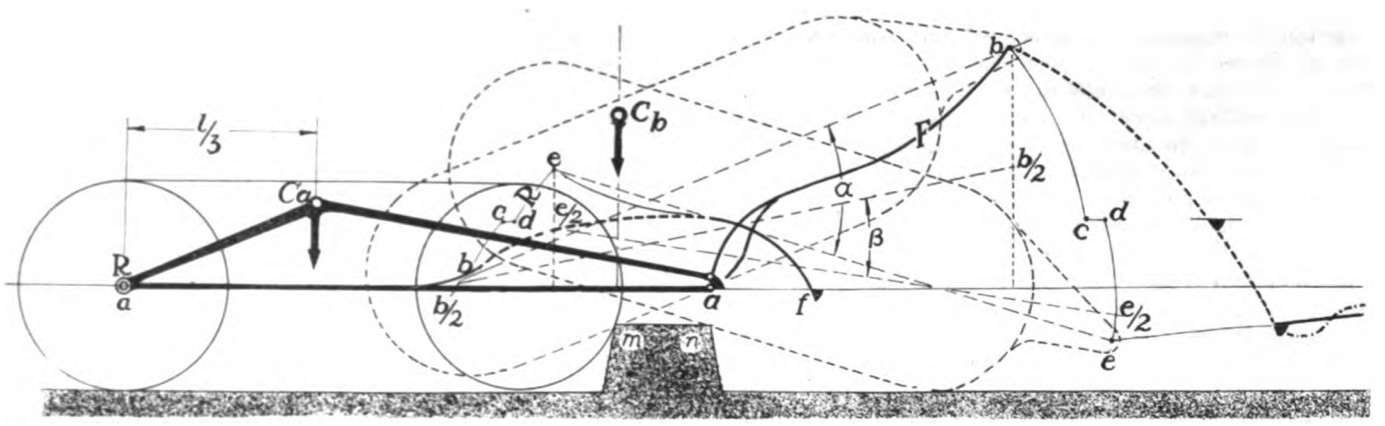
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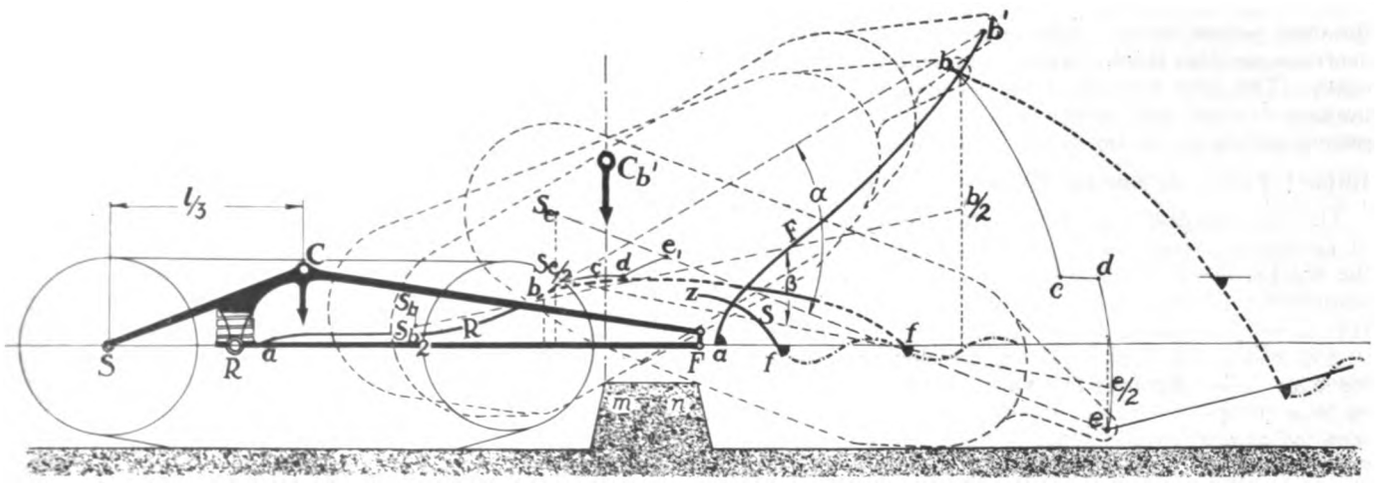
Graph 1



Graph 2

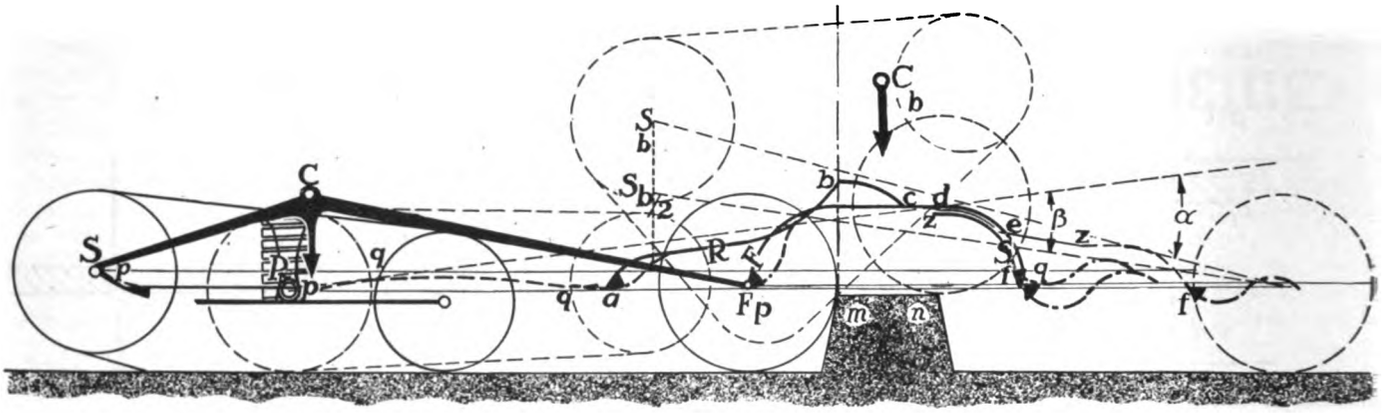


Graph 3—Type A Creeper



Graph 4—Type B Creeper

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Graph 5—Type C Creeper

accumulated dynamic energy cannot increase beyond that represented by the product of weight and height of fall. The dotted lines in Graph 1 represent the *s*, *v* and *p-t* curves while the body is off the ground.

With obstacles that are not rigid conditions are somewhat changed. Before the force reaches its peak, due to the reaction working upon the non-rigid obstacle, it will either crumble down or compress, hence the *s-t* curve will look somewhat like the dot-and-dash curve on the ascending member. The *v-t* and *p-t* curves will also be changed and will have no indicating blows.

We also note that any sudden break in the curvature of the *s-t* curve corresponds to a blow in the *p-t* curve and the greater the change in direction of the *s-t* curve (all other conditions being identical) the harder the blow will be. This we shall use later in comparing different types of wheels with respect to the blows that occur.

Graph 2 represents a wheel of half the size as the one in Graph 1, passing over the same obstacle. It is readily seen that the angle in the *s-t* curve is greater. So are the vertical velocities and accelerations, which are here drawn to the same scale as in Graph 1.

If the two front wheels of a tractor are connected by a front axle which itself is pivoted on the frame, then when one wheel crosses an obstacle the frame resting on the pivot will be raised only half as much as the wheel; with this reduction in the rise, the angle, velocities, impact, etc., are also halved. With one front wheel rigidly connected to the chassis the blows transmitted are twice as large as with two wheels on a pivoted front axle, provided one wheel passes over an obstacle and the other wheel runs on the level ground. Any good tractor driver will prefer to cross ditches at an angle than straight on.

Since the impact increases with the mass of the body, a heavy tractor is at a great disadvantage as far as force of impacts and durability are concerned. However, the most potent means of decreasing impact forces are a decrease in the tractor speed and changes in the *s-t* curve. The first method is not economical in a general purpose tractor, and where we have to run over rough ground spring mounting is the only practical solution.

Impact Force on Spring Mounted Wheel

The dot-and-dash curves in Graph 1 show the effect of spring-mounting tractors. To accelerate the body of the tractor upward requires a very large force, which is transmitted through the connection between wheel and frame, but if a spring is interposed the force of the blow to the wheel will first compress the spring. In the *s-t* curve *a-c* is the distance the wheel center has been raised up to a certain time; *b-c* is the distance the spring has been compressed, so the heavy chassis has been lifted only a distance *a-b*. From the *p-t* curve we can see that the pressures that reach the chassis will be much smaller and change only gradually. No blow comes upon the heavy chassis and the mechanism of the machine either in the ascent or the descent. Further, the ascending and descending, *s*, *v*, and *p-t* curves are no longer identical. Of course, if a certain spring *s-t* curve be chosen there still remains the problem of adapting the spring to the curve.

Impact on Creeper Tractors

After having thus far considered the principles of spring mounting and their application to wheel tractors, in the following these considerations will be applied to three distinct types of creeper tractors. The following will suffice to describe these types:

A_1. Two tracks without front wheel; weight of main frame transmitted to the track sub-frame through the rear axle and in front through a balancing bar pivoted at the middle on the main frame and connected on its ends to the front side of the sub-frames. Intermediate links make up for the unequal travel of the ends of the balancing bar and the sub-frames when crossing obstacles.

A_2. Front balancing bar replaced by leaf spring.

B_1. Two tracks without front wheel; weight of main frame transmitted to sub-frames in the rear through a special, rigidly mounted connecting shaft, and in front the same as on A_1. It is to be noted that there is no connection between the rear axle and sub-frame, and that the track drive sprocket under normal conditions has no contact with the ground, hence does not carry any weight.

B_2. Springs transmit the weight in the rear from main to sub-frame, instead of a rigidly mounted connection; in front there is a solid bar or leaf spring.

C_1. Two tracks and one front wheel. The weight of rigidly mounted connecting shaft placed about in the middle of the sub-frame, and in front to the ground through the front wheel.

C_2. Same as C_1, with the exception that instead of the rigidly mounted connecting shaft, a spring makes a flexible connection between the main frame and the sub-frame.

All the above chassis have three-point suspension. Attention is called to the fact that in the following investigation all three tractors are reduced to the same length, *i.e.*, the center distance from the rear axle to the front supporting member, be it a solid bar, spring or front wheel, is identical on all three types. The main frames with all their parts are supposed to be identical on all types, consequently the center of all external forces acting on the machine was kept in the same point, at one-third the wheel base length ahead of the rear axle. This is not the center of gravity of the machine standing still, but the center of all forces, including that due to weight, draw bar pull (taken at 60 per cent of the actual weight)

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and its reaction and the adherence of the track to the ground. This is substantially the location of this center on tractors of the described type.

Fig. 3 refers to the Type A creeper. In riding over an obstacle of the shape shown, the front supporting point will describe the curve *F*. Portion *a-b* corresponds to the track rising until the resultant of all external forces through the above-mentioned centers falls in front of the tractor-supporting base on the ground. This point passed, the tractor balances on the obstacle and the front end drops to the ground (portion *b-c* of the curve); riding on the level top of the obstacle gives the curve *c-d;* finally the resultant force advances beyond the front edge of the obstacle, when the track will decline until its front touches the ground (curve *d-e*). During the last period, the rear part of the track, running down on the edge of the obstacle, gives the portion *e-f* of the curve. In the meantime the rear supporting center describes the curve *R*, the small letters corresponding to identical track positions on front and rear curves.

These curves would be correct if the tractor did not progress at all while dropping along *b-c* and *d-e* due to gravity. Actually the curves followed by the supporting points during this period will look somewhat like the heavy dotted line, and the greater the traveling speed the more these portions will be drawn out.

The heavy full line portions of the curves apply, whatever the traveling speed may be, assuming, of course, that the obstacle is rigid enough to resist the pressure without crumbling or changing its shape.

These curves were also drawn for the tractors of the B and C type with exactly the same restrictions in mind as with the A type, while the track starts to climb over the obstacle, the rear connection point *R* rises over above its normal level, while the sub-frame rear end still maintains contact with the ground. If the resultant of the external forces remains in front of point *R*, then the center *S* of the drive sprocket will always float over the ground, but if it falls behind point *R*, the drive shaft will drop until the sprocket supports part of the tractor weight. For tractors B and C the first case holds true. Since the second case, if it occurs on fairly level ground, is really due to a mistake which a good tractor designer should know how to avoid.

Conclusions

Let us now consider the curves and draw conclusions in regard to the impact on the tractor.

The creeper of the A type with rigid connection in passing over the obstacle will be hit once severely in the front joints, while starting the ascent, and once or twice (according to whether the tractor remains on the higher level or drops again to the lower one) during the fall. These last blows will be somewhat lighter, since they will be due to the free fall of the front part of the chassis; counterbalanced by the simultaneous lifting thus reduced, the blow will be lighter. No impact will occur in point *R* during the ascent, and only one during the descent. Since the whole tractor body is now coming down, the blow will be somewhat stronger than in front. By spring mounting the front alone not all the possible shocks are eliminated.

The contour of the tractor is softly outlined for both when in the highest and lowest positions while both tracks cross the obstacle. The dot-and-dash curves are half as high as the full curve, and represent the travel of points *F* and *R* on the axis of the tractor midway between left and right track of the chassis, when one track is crossing the obstacle while the other one is moving on level ground.

In Type B creeper the front connections are the same as those of the A type, and so are the conditions determining the motion. The rear connection, however, presents a new feature. As previously stated, the whole weight of the rear part of the tractor usually is transmitted to the sub-frame and then to the ground through point *R*, and this is the case during the ascent over an obstacle, but when the tractor is descending from the obstacle, the sprocket *S* comes slowly in contact with the ground (through the track directly) and carries part of the tractor weight, thus entirely relieving point *R*. When point *S* reaches its usual level it is floating again, and the blow occurs in the *R* connection, thus relieving the sprocket axle shaft.

By replacing the rigid connection in *R* with a spring connection, and spring-mounting the front rocking member, this tractor can easily be protected against shocks. The extreme tractor portions as well as points *F* and *R* of the tractor chassis when only one of the tracks meets an obstacle are indicated in the same way as for the A type.

Creeper Tractor with Front Wheel

With Type C creeper two blows occur in the front wheel, one during the ascent and the second during the descent. As previously stated, the first impact increases with the square of the speed without limit, while the second blow is limited by the energy represented by the product of mass of the front part of the machine by the height of the obstacle. Connection *R*, if rigid, will go through similar conditions as those described with Type B, except that when the front wheel starts the ascent it lifts point *B*, which is rigidly connected to the main frame, the weight of the rear portion of the frame being transmitted to the ground through the rear axle shaft, and without passing through the sub-frame. This results in a shock. By spring-mounting points *R* and *F* these shocks are prevented.

Besides the shocks that have a direct influence upon the durability of a machine, there is also a surging action —that plunging and heaving while passing over an obstacle which, even though a tractor or a "tank" is not destined for joy riding, it is best to avoid whenever possible.

The extreme positions of the tractor while crossing the obstacle have been outlined for all three creeper types, and it is found that if both tracks cross the obstacle simultaneously, the maximum angles between these positions are as follows:

Type	A	B	C
α	40°	53°	22°

These angles for Type C can be made still smaller by using two front wheels on an axle pivoted at the center, in place of a single front wheel, as considered above. The problem then resolves itself into one of design and not even a difficult one if approached in the right way.

Among American farm tractors of the wheel type only the Wallis is spring-mounted. The Cleveland tractor is a creeper type described above under A, having only the front spring-mounted. A tractor of the B type was built in 1916 by the Holt Company in Peoria, Ill. The rear was spring-mounted, but the front had a rigid connection, though, as shown above, it needs spring-mounting more than the rear. This tractor landed in the "morgue" of the plant after only a few trips.

Type C tractor has a representative in the Holt large size. However, in the Holt caterpillar the center of the external forces comes at what was above proven to be not the most desirable place. Also, instead of having the track sub-frame loaded by the main frame in one point (one spring) it has two rather widely spaced springs, which is of no advantage.

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Heated Passage Vs. Hot-Spot System

Polymerization a Limiting Factor in Heated-Passage Method—Progressive Evaporation Always the Case

By Percival S. Tice

THE evaporation of fuel in the intake system of an engine must of necessity be a progressive process. The liquid must be brought up to evaporating temperature, and, following this, heat must be made latent in it to bring about its change in state. This is true whether heat is applied at an increasing rate along the length of a passage, for instance, or whether the liquid is brought directly and at once into contact with a source of heat sufficient to evaporate it. Considering that all petroleum fuels are comprised of mixtures of several substances having among them a considerable range of boiling temperatures, from initial to final, the inherently progressive manner of evolution of the vapor is self evident.

Beyond this point the two cases are not directly comparable, since the conditions that must surround each of them, considering that complete evaporation is secured in each case, are widely different.

In the case of the comparatively small bore heated passage of considerable length, the length being necessary to provide a requisite area of heat transmitting surface, it is impossible to maintain the liquid fuel in entrainment in a globular condition. The walls must be wetted in order to utilize the heat transmitting surface which they provide. Here the process is progressive beyond that extent inherently necessary. As the fuel enters this heated passage it exists as a homogeneous mixture of the several substances comprising the fuel. As it passes along it is subjected to distillation and becomes increasingly richer in the higher boiling components as it approaches the discharge end of the passage. If the tube is long enough and provides sufficient surface there will be a point in its length beyond which none of the fuel will exist as liquid. Picture this process going on continuously during operation of the engine, the entrance of the passage containing the whole fuel as liquid, with a progressive diminishment of liquid content and a progressive enrichment of that content in high boiling fractions, along the useful length. Obviously the temperature gradient along the length of the passage will be an inverse of its liquid content. This seems on the surface of things to be an orderly and wholly desirable state of affairs.

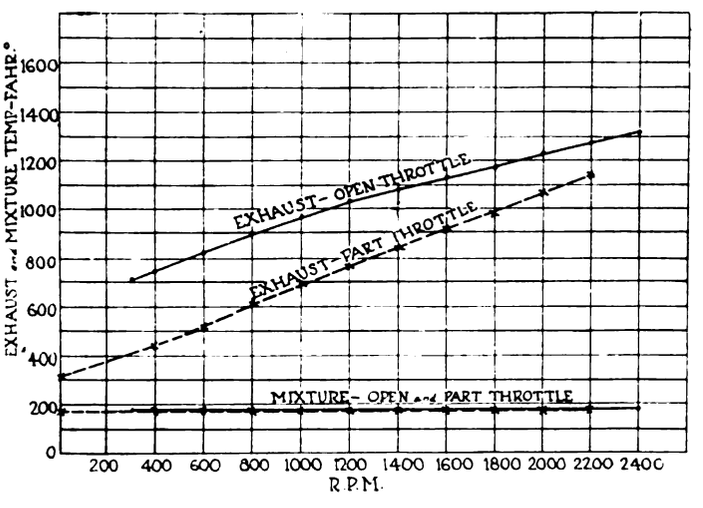
Those who have investigated petroleum fuels by fractional distillation know that at the end of the run there always remains a portion of the fuel as residue in the still. Usually we are content to permit the last 5 to 8 per cent so to remain, in order to prevent the fouling of the still by deposition of solid matter which occurs when the sample is evaporated to dryness. Further, and particularly with heavy fuels, as kerosene, the relative amount of residue or of solid matter depends upon the rate and manner of conducting the distillation. Suitable precautions minimize the residue. Also, in the case of kerosene particularly, the unsaturated hydrocarbon content is quite appreciable; and it is well known that among these substances polymerization or formation of resinous condensation products occurs under these conditions. These latter leave a considerable and very obnoxious solid deposit when treated to dryness.

The result of this is that with the heated-passage method of progressive evaporation all this residual matter and whatever polymerization products may have been formed are brought to dryness within a comparatively small portion of the length of the passage. The obvious result is a deposition in the passage of solid matter. This reduces its efficiency as a heat transmitter, and increasingly reduces the capacity of the passage. Naturally, the smaller the passage bore the sooner will it be choked to an extent to interfere with the functioning of the engine.

Choking Depends on Fuel

It has been my experience with several structures embodying the heated-passage method of vaporization that this choking with solid deposits depends largely for its rate upon the fuel that is used, that is, upon the composition of the fuel as determined by its source and method of production, though it proceeds inevitably with all petroleum fuels heavier than gasoline. It is within my experience that 10 days' continuous operation on a certain brand of kerosene caused the practically complete stoppage of a ⅜-in. bore passage.

Naturally, the more nearly constant the conditions surrounding the operation of the engine, particularly with respect to speed and load, the more rapidly will serious deposition occur, since then the process of evaporation is completed more nearly continuously within a smaller portion of the length of the passage. The deposit is thus localized to a greater extent than is the case where much throttle manipulation occurs. Under this latter condition the exhaust temperature varies widely, and consequently so does the length of passage required to complete evaporation. Maintenance of a suitable and adequate heat supply to the exterior walls of the passage, to insure that evaporation be complete under all conditions without undue superheating under certain of them, is one of the really serious problems when it is attempted to supply a flexibly operating engine with fuel vapor from a heated passage or vaporizing tube. Usually it is attempted to be met by use of a thermostatic or manual control of the mass of exhaust permitted to circulate about the vaporizing passage.



Exhaust and mixture temperatures in a 4-cylinder engine operated on kerosene

Turning to a consideration of that method wherein the evaporation is caused to be completed in one spot, as it were, by direct and immediate contact of small masses of liquid with walls sufficiently heated, the conditions are found to be considerably different from the foregoing. First, if the fuel is evenly distributed over the heated surface all portions of that surface perform equally, *i.e.*, there is no tem-

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perature gradient within the system other than that existing between the heat collecting and heat dissipating surfaces of the walls upon which the liquid is thrown. As must occur, whatever the structural method, the liquid is progressively heated to its several boiling points and absorbs those amounts of heat necessary to the evaporation of its several components. The point of distinction between a successful example of this method and the heated-passage method of the foregoing lies in the fact that in the latter the fuel is distributed over the whole of the available surface in a condition of mechanical division such that each small mass of liquid absorbs the heat necessary for its evaporation from the particular small wall area with which it comes into contact within so small a space of time that it has left that surface before another small mass of liquid appears to make use of that surface. In other words, each unit of surface handles at any one time only its corresponding portion of the total fuel supplied.

Obviously the prime consideration in a utilization of this method lies in the mechanical division or preparation of the liquid before its contact with the vaporizing wall. With this phase suitably carried out, and with the provision of sufficient heated wall area, the vaporizing surface is never wetted in the ordinary sense of the term, and vaporization goes forward at the highest rate possible in view of the nature of the liquid supplied to it. It is none the less progressive, as noted, though it is freed from artificial restraint.

With vaporization being carried to completion over the whole of the surface, in this way, localization of higher boiling components and their residual solid matter is completely avoided. Furthermore, while it is inconceivable that such solid matter is not formed in this method, it is a fact that whatever deposit is formed is being continually subjected to a sort of washing. This may account for the almost infinitesimally thin coating found on the interior walls of such a vaporizing chamber after nearly three years of continuous use. It was found to be impossible to scale off a sample for measurement, the coating being so thin as to resemble a chemically formed black finish.

Passage vs. Spot

To complete this comparison of the two methods, there remains the point of chief distinction between them. In the heated-passage method the vapor and the air used as the vehicle for the liquid fuel are constrained to pass through a highly heated portion of passage under certain much used conditions of operation of an engine. This is inherent in the method, inasmuch as varying lengths of passage are used in the actual evaporation under varying conditions of operation. Obviously the passage must be long enough to complete the process under those operating conditions demanding the greatest length—and thus under conditions where less length would be sufficient more or less superheating of the vapor and air results. Without going into the consequences, at this time, it must be said that this variation is wholly undesirable and is the one thing that is being most striven against in devices intended for the employment of the cheaper and heavier fuels.

With the carbureter and vaporizing chamber arrangement developed by the writer, and with special reference to which the above on direct vaporization method is written, the finely divided fuel is projected in minute globules into a chamber exteriorly heated by the exhaust gases. The arrangement is such that practically none of the air forming the mixture enters this chamber. The result is that the vapor issuing from the vaporizing chamber in a direction contrary to the paths of the ingoing fuel particles is never normally subjected to superheating. This follows from the fact that it at all times exists in the presence of its own liquid, and is thus always at the temperature of saturation, which in this case varies only with the pressure existing in the system. Following its issuance from the chamber in vapor form, the fuel mixes with the air of the mixture. This latter, being taken in at atmospheric temperature, is cooler than the vapor, causes it to condense into a smoke-like fog, giving up its latent heat to the air. Thus the temperature of the air is raised, giving to the resulting mixture a temperature higher than atmospheric by an amount determined by the relative masses of air and vapor and the heat of vaporization made latent in the vapor.

Since superheating of the vapor cannot occur, as noted, the only item that can cause variations in the temperature of the resulting mixture is, with any one fuel, that of variations in the proportions of the mixture. Furthermore, consistent with the state in which the fuel exists in the final mixture, the temperature of that mixture is the minimum possible. A great deal of checking of mixture proportion and mixture temperature against experimentally determined heats of vaporization, for a wide range of fuels, has shown that in every case the difference between the final mixture temperature and that of the atmosphere is exactly that which would result from the application of an amount of heat equal to the heat of vaporization of the fuel in question to the proportional amount of air used.

From both commercial and operative points of view, the inability to superheat the vapor in this method is of extreme value, in that no regulation of any sort need be imposed on the amount of heat made available to the exterior of the vaporizing chamber. All that is necessary in this direction is so to proportion the surface area of the vaporizer to the quantity of fuel and exhaust temperature that the result sought is attained under the least favorable conditions of operation. This being done, the temperature of the mixture is inflexible and is automatically fixed over the whole range of operation by that inherent characteristic of the fuel used, its heat of vaporization. On this point attention is drawn to the accompanying graph of exhaust and mixture temperatures as found in a four-cylinder engine operated on kerosene. The part throttle curves, while obtained on the dynamometer, are plotted through points read with the engine loaded and throttle set to deliver the amount of power required to drive the car from which the engine was taken at corresponding speeds on a level cement road. The powers required thus to drive the car were determined by a series of runs on the road with an accelerometer.

Guiding the Workman's Personal Expenditures

(*Continued from page* 541)

on a solid, wholesome basis of living, whether he needs medical attention, also whether or not he is in debt. This investigation is made within 30 days after the man is hired, after which a recommendation is made to the proper inside department. If he is deeply in debt, an arrangement is made with his creditors whereby they will deal more leniently with the man in question and every effort will be made to have the matter straightened out at an early date.

The power of firing a man is taken entirely away from the foreman. He can, however, discharge him from his department, in which event the employee returns to the employment office, where he is assigned to some other department.

Another phase of the educational work pursued at the Ford plant is the Ford English school which was started in 1914. The first class of 115 members was graduated in 1915. In February, 1916, a class of 519 was graduated, and in October of the same year a third class comprising 230 men was graduated.

Space does not permit going into detail regarding the many phases this work has. The work is devoted to the human side of life and every problem presents its own individual circumstances and must be solved independently. It is that kind of welfare work that is a man-to-man, character-building proposition.

It must not be assumed because it is successful with the Ford company that the same mode of operation should meet with success in other organizations. The success of the plan depends almost entirely on its correct application to the situation in hand. The same plan may not work to advantage in any other institution. The principle, however, is here and other manufacturers can well learn from what has been accomplished by this wonderfully large organization.

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Closed Body Construction

A Pronounced Tendency Toward Lighter Roofs—Three Types of Roof Models Now in Use—Striking New Brewster Design—New Ideas in Windshields and Other Fitments

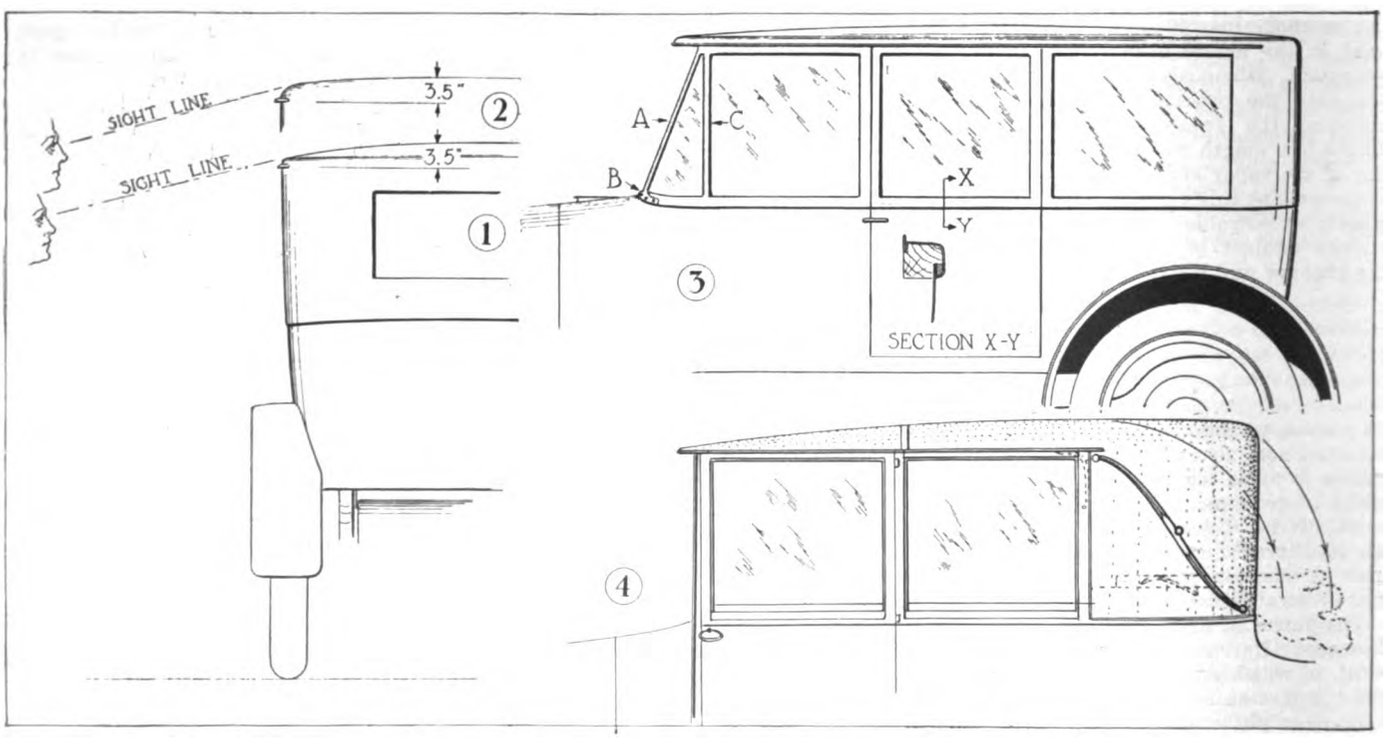
By George J. Mercer

CLOSED bodies are all made adaptable for use during the changing seasons of the year, and all radical changes in construction in the past few years, or since the flush side body was adopted, have been along the lines of making the conversion features more pronounced. The most conspicuous innovation is embodied in what is called the convertible type, in which the sides are opened from front to rear and the roof remains stationary.

The aim of designers at present is to have the closed body as light looking as possible, and while at the two January shows only the Brewster inside drive body showed originality along these lines, there was a strong undercurrent that will make itself felt in no unmistakable manner once business is back to normal. Very few bodies were exhibited with thick-looking roofs, the majority having roofs of straight lines and medium light looking. Some were very light; there were a few that were heavy, as indicated in Fig. 2, and practically none with the extreme dip at the front and rear. Fig. 3 is a good example of average practice.

Fig. 1 shows how the light appearance is attained with the top. The height of the center above the drip moulding is the same in Figs. 1 and 2, but the thickness of the edge is less in Fig. 1, and this is all that is visible to the eye, as indicated. The thin edge also decreases the framing and actually saves some weight.

The weight of a top like that shown in Fig. 3 is approximately 350 pounds, and this weight set on pillars has a momentum forward when the car is stopped suddenly, and produces a cracking strain at *B*. Therefore, a body with the front pillar at an angle as shown at *A* is better able to withstand the pressure than one with a perpendicular pillar, and manufacturers who produce in quantities make this pillar a casting and bolt through the body framing as shown at *B*, the flange and the bolt heads being visible at the top. A less conspicuous foot is fastened with screws to the top rail. The cast pillar is thinner than one made of wood. All the other pillars are of wood and are cut down in size all that the necessary allowance for runways for glass and the thickness for locks and hinges will permit. This is for the purpose of having the windows as large as possible and to obtain less obstruction to a clear outside view. Also pillar *C* is often eliminated, to improve the design. The only objection to this is that the glass window, being irregular in shape at the front, does not slide so well and is more troublesome to hold tight when down.



Figs. 1 and 2 show how the light appearance is attained. Fig. 3 is a good example of average practice. Fig. 4 illustrates a new falling top body

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Roofs are of three different types of construction, the carriage roof, the leather covered and the metal. The first two were used on carriages and the last is a development of the automobile metal body.

The carriage roof is a laminated wood panel, ⅜ in. thick, glued over the framing and bows and covered with canvas glued to the panel and painted to make it waterproof. Its disadvantage is that the edges of the canvas tend to come loose from the joint formed by the body metal side panels. To make it serviceable these edges should be secured by mouldings. The leather roof is used largely on high-class work. Its edges are secured by narrow mouldings. The even contour of the roof sweep is obtained by placing a thin wire mesh, fastened to the framing, under the leather and between layers of cotton wadding. This is the lightest roof made, and this and the carriage roof are soundproof. The criticism of the leather roof is that mouldings are required for fastening the leather edges, and these show. The metal roof is of aluminum, in one sheet, welded to the top edges of the back and side body panels. When first used it caused trouble by generating a bell sound inside the body, but this has been overcome by packing well with a deadener of felt and cotton. The metal roof is heavier, but it is also stronger than the others, because the top sheet is continuous with the sides and back, to which it is united by welding, and the solid parts of the rear of the body serve to steady the roof. One other criticism is that the metal roof will not hold the paint as well as the carriage roof under the influence of the sun's rays. Altogether, however, the metal roof is the best manufacturing proposition; the extra weight can be overcome to a large extent by using a lighter wood frame, and there are no mouldings to show. The leather top will be used for special bodies, because leather looks rich, even if a few mouldings are required.

Roof Lighting Methods

The Brewster body at the Astor Salon in New York was a study in methods of making a roof light. The covering was canvas stretched over thin framing and light bows, and the edges were fastened under the drip molding that was continued all around the top edge of the body. This roof was at least 250 pounds lighter than the average body of the same size, which shows what can be done in the way of cutting down weight. This roof will keep out the water as well as the heavier one, and, after all, that is what a roof is for.

The elimination of mouldings on the body is an important matter, the aim being to have the whole exterior unbroken. The section *XY*, Fig. 3, shows the overlap panel by which this is obtained at the belt. This is the place where the upper and lower panels are joined. The illustration shows the upper panel wrapped around a steel band, and when this band is fastened by machine screws the panels are secured in a manner that will never give trouble. Mouldings are also left off doors to a large extent, and, as shown in this same figure, the lower corners are made square, because the panel is also held by a steel band, and the square corner is better for this, because the fitting is easier and the liability of having an irregular opening around the door is less with the square corner than with the round or concave shape.

The convertible, in which the pillars are removed from front to rear, leaving the side entirely open and the roof stationary, is still the most popular of the all-year cars. In most designs the glasses all drop flush, except the rear quarter, which is taken out and put in a pocket at the rear of the back seat, and on the doors flappers are used. The Cadillac design has a much larger glass space than usual, this being made possible by having the glass between the doors and the quarter glass take up part of the pillar thickness, making the latter narrow. These glasses, of course, are too wide to drop and have to be lifted out, but the disadvantage of the extra glass to lift out is compensated for by the increased light space thus provided when the glasses and pillars are in position.

In connection with the front windshield on inside drive bodies, the problem of keeping out the rain has practically been settled by making the lower part of the glass stationary and using a removable rubber channel on the top edge when it rains, the upper part being hinged to swing outward only and coming from ¾ to 1½ in. below the top of the lower part. The sides are protected by rubber in the frame and at the top hinge. The roof projects forward, as in Fig. 3, and, in addition, there is either a metal skirt or moulding nearly covering the joint, or else rubber packing. There were fewer storm visors or double upper glasses, and ventilation at the bottom was by a ventilator in the top of the cowl.

New Falling Top Body

Fig. 4 illustrates a falling top body that is new here and may be described roughly as a combination of the coupelet and the English cabriolet. It is a close coupled four passenger body, and the roof above the door forward is stationary. It is easy to operate and not expensive to build, as no fixtures but those in regular use are required. Folding top bodies showed a slight increase over previous years, but they were nearly all of the cabriolet design. The standard town car cabriolet was exhibited among the stock cars at the Grand Central Palace in New York. The limousine landaulet, so popular a few years ago, has only a few representatives. In connection with the folding top, it is the custom to use the spring at the rear of the back pillar to assist in raising and lowering.

Other general construction features are the almost total absence of cowl lamps. Pillar lamps are confined to the ultra carriage type town car body. Packard uses the flush pillar light. Window regulators are used on the doors and division, but straps are the most common on the rear quarter windows. Extra seats when facing forward are of the floor type and the majority are concealed when not in use, the vertical position when concealed being the most numerous.

The slanting windshield is the most used, and there is a general tendency toward the close-coupled body with the divided front seat, the doors in the middle on both sides, and round corners at rear, the square corner rear being confined to the carriage town car, which generally has the six fenders and steps in place of the runboard.

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Cork Insert Brake Lining

HAVING heretofore confined itself to the manufacture of brake linings for replacement on Ford cars, the Advance Automobile Accessories Corp., Chicago, Ill., will hereafter also supply these linings for others cars. Cork insert brake lining is made of high grade fabric, into which are inserted disks of cork. The reasons for the use of cork are that it has an exceptionally high friction co-efficient and that this co-efficient is very little affected by the presence of oil on the brake surfaces. Owing to the high friction co-efficient, comparatively little pressure is required on the brake pedal. The lining is impervious to oil and grease, consequently it will not swell and the surface never becomes glazed or slippery.

We are informed that these brake linings have been used by a Chicago taxicab company for over 6 months. It is obvious that the service on a taxicab is very severe, but in spite of this fact, the cork insert lining is said to have given most satisfactory service, the brakes being still as efficient as when installed and show practically no wear.

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True Importance of Combustion Chamber Shape Not Known

Opinions Vary as to Its Effect on Economy, Particularly as Regards Ratio of Wall Area to Volume

By J. Edward Schipper

COMBUSTION chamber shape is a matter to which little or no importance is assigned by some engineers, whereas others make it one of the fundamentals of design. With the growing importance of economy, it is important to know definitely whether or not it makes any material difference. Manufacturers of certain types of overhead-valve and overhead-camshaft engines are claiming performances of between 25 to 30 miles to the gallon of gasoline, while others are quite candidly admitting that 12 to 15 miles per gallon is the best that can be secured during the colder months, with only slightly better performance than this during the warm months.

If one type of engine is twice as economical as the other in fuel we should analyze the subject and learn what a factor combustion chamber shape is in this.

The ideal combustion chamber shape, from the theoretical standpoint, is a hemisphere with the base formed by the piston head. Engineers differ as to how important the attainment of this ideal is. It is a practically impossible commercial proposition to attain the spherical shape, but there are makers who endeavor to approach this, and it is important to note whether those who do approach this spherical combustion chamber closest are obtaining, or at least claiming, the highest fuel economy.

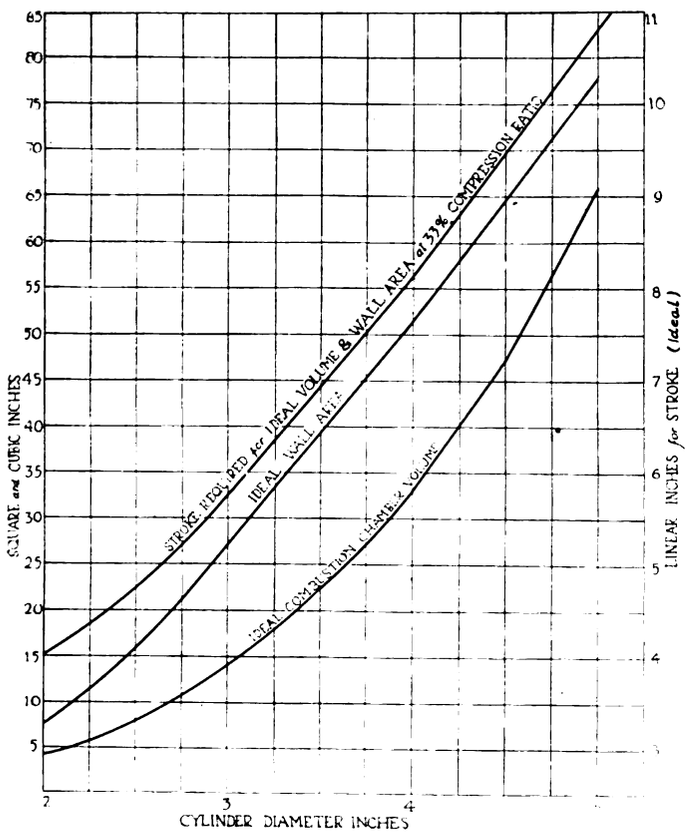


Fig. 1—Curves showing combustion chamber ideal volume (were it possible to secure a perfect hemisphere) for bore diameters from 2 to 5 in. Curves also indicate ideal wall area for hemispherical combustion chamber shapes and the stroke required for ideal volume and wall area at a 33 per cent compression ratio

Big Valves Cause Difficulty

One of the biggest difficulties to overcome in combustion chamber shape is that engineering practice leans toward small bores and large diameter valves. This is true because the valve lift must be taken care of, together with the inertia of the valve gear itself, when the engine is running at very high speeds. This causes the combustion chamber to be higher above the valves than any other place. With these conditions holding true, the shape of the combustion chamber is really controlled in most instances by the exigencies of design, with care taken that both intake and exhaust have a clean sweep so that the gases can flow freely into and out of the cylinder. This creates a condition which is difficult because the smaller the valves the easier it is to secure a good combustion chamber shape, whereas, on the other hand, if the valves are too small there is a reduction in volumetric efficiency, and hence the output for any given cylinder displacement. It seems to be the general consensus of engineering opinion that the shaping of the combustion chamber so that the intake gases act as a cooling agent on the exhaust gases is an erroneous method; in fact, it

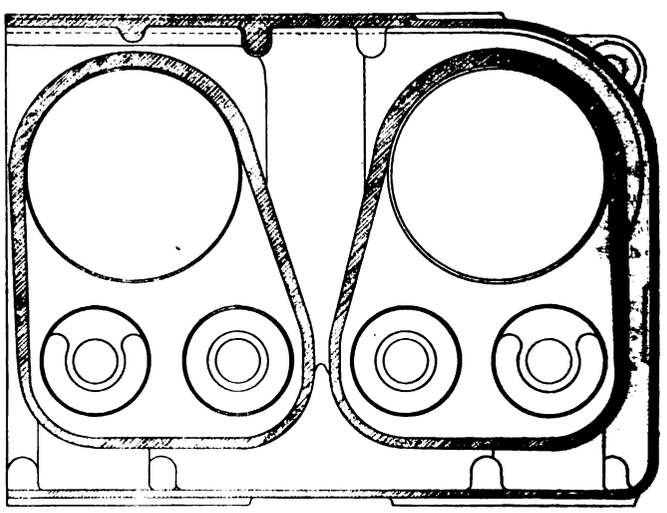


Fig. 2—Horizontal transverse section through combustion chamber of L-head engine, illustrating wide departure from theoretical shape, which would be a hemisphere, and indicating large ratio of superficial wall area to volume

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is generally believed that the intake gases have very little to do with the cooling of exhaust valves, either on the L, T, or valve-in-head engine. What is of considerable importance is that the superficial wall area does not attain too great a total in comparison with the volume of the combustion chamber.

Lose 30 Per Cent by Cooling

The heat passing from the combustion chamber into the cooling jacket is in direct proportion to the area of interior cylinder wall exposed to combustion temperature. When it is rememberd that approximately 30 per cent of the heat of the fuel is dissipated through the cooling water, it is quite important that a careful study be made of the possibilities of reducing this percentage. Since economy has become one of the cardinal virtues of engine design this becomes a matter of prime importance.

Gasoline engines are non-economical when they waste heat; in other words, when all of the heat which could be transformed into useful energy is not taken advantage of because of the thermal inefficiency of the plant. The problem of reducing the amount of heat thrown away through the waterjacket is largely one of combustion chamber shape, and combustion chamber shape is largely a matter of valve location.

A thoroughly impartial study of the subject, both in the laboratory and on the road, would more clearly bring to light the underlying principles of combustion chamber which most closely bear upon this point. The crucial question is: "Can we start with a desirable combustion chamber shape and make the valve layout coincide with this, with the minor modifications necessary for manufacturing reasons; or must we start in the other direction and let the combustion chamber shape follow as it will?" In the true determination of the real effects of combustion chamber shape on performance lies the answer to the question.

As a matter of theoretical interest, there is only a limited range where the volume inclosed by a hemispherical combustion chamber would give practical results. This is true because the stroke required to give a normal compression ratio would either be too small or too large beyond a certain range. This range is indicated graphically in the curve herewith. With a 33-per cent compression ratio, that is, where the compression chamber volume is one-third that of the piston displacement, the stroke required within the range of bore diameters between 2 and 5 in. has a ratio to the bore of about 2 to 1. Beyond bores of 3 in. this is impractical for high-speed work, and in fact is not desirable practice throughout the entire range, as a ratio of 1.5 to 1 is much closer to what has been found desirable.

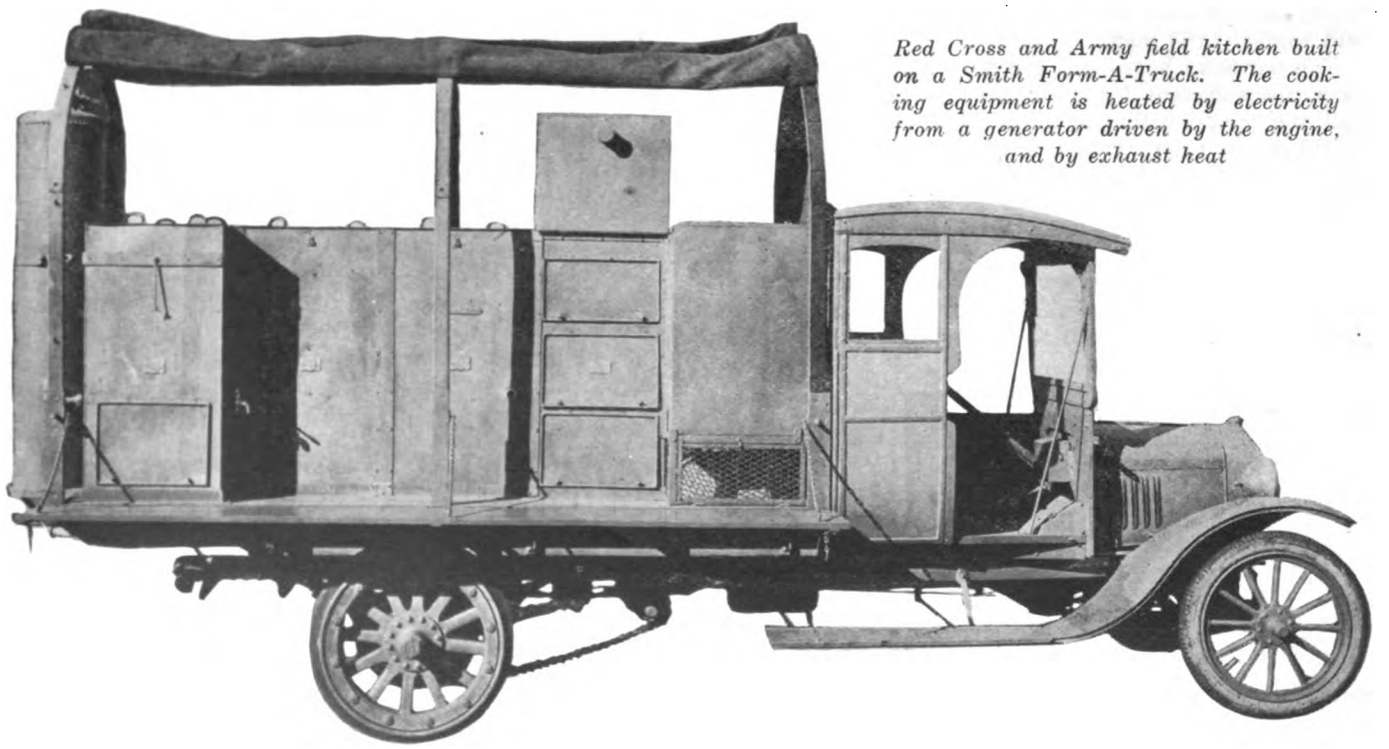
Smith Form-A-Truck Army Kitchen

ONE of the uses to which motor trucks are put in war time is as portable army kitchens. The cut herewith illustrates such a kitchen built on a Smith Form-A-Truck. It has been worked out to meet every requirement of Red Cross and army field service. Heat for cooking is obtained from an electric heater receiving current from an electric generator driven by the truck engine, and this heater is assisted by heat derived from the exhaust of the engine.

The portable army kitchen is equipped with two 30-gal. fireless cookers, with a 26-hr. cooking heat efficiency, a 30-gal. coffee urn, a 30-gal. vegetable and soup urn, exceptionally well-constructed baking and warming ovens and two large hot-water sterilizing tanks which will sterilize 120 gal. of water in two hours.

In addition to supplying current for the cooking equipment the electric generator has sufficient capacity for operating a 13-in. electric searchlight and 600 electric incandescent lamps working at 110 volts. The searchlight will throw a beam of light for a distance of 3 miles.

The generator being direct connected to the automobile motor, this Red Cross and army kitchen can be operated either while traveling or while standing still.



Red Cross and Army field kitchen built on a Smith Form-A-Truck. The cooking equipment is heated by electricity from a generator driven by the engine, and by exhaust heat

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First Standardized Repair Depot For Quartermaster Mechanical Transport

Model for Others Here and in France Will House 2000 Soldiers and 100 Officers—Four Truck Trains Arrive Daily

By Allen Sinsheimer

BALTIMORE, March 9.—The first standardized repair depots for the Quartermaster Mechanical Transport Units at this city and Atlanta, Ga., are well under way. Barracks have been constructed to the number of thirty-two, with a capacity for housing 2000 men at each depot. Ground has been broken for the construction of storage houses, crating shops, and the repairshops. The depots will do truck and passenger-car repair work, assembly work, crating for oversea shipment, and will store parts and complete vehicles and will act as commissaries for automotive supplies for their respective districts.

The depot here will supply eight cantonments and the entire district from Roanoke, Va., to Camp Nevins, Mass., including cantonments as far west as Camp Custer, Mich., and Camp Sherman, Ohio.

This repair depot is built just as the others in this country and in France will be built, with standardization of buildings, shops, tool rooms, etc., so that a mechanic taken from Baltimore and placed at Atlanta, Ga., or at a depot in France, will know immediately where to look for his tools, his barracks, the officers, storage buildings, etc.

Capacity to Be Enlarged

The Baltimore depot, when complete, will have a capacity for 2000 soldiers and 100 officers, although at this time tentative plans are under consideration for an increase in additional building construction and acreage to provide for 3500 soldiers. The main repair shops here will employ 1163 men.

The barracks have been erected in rows of four, with each row sufficient for a company, and a separate mess hall and lavatory for each row, thus providing separate facilities for each company. The repairshops will probably be completed within 90 days.

Equipment has been ordered to be delivered on schedule, and will be ready for installation as soon as the buildings are finished. The site occupies 90 acres, but Col. Leisering, who is in charge of the depot, hopes to secure the purchase of a near-by distillery plant which has an additional 20 acres, and which he intends to convert into storage space.

More Than 60 Buildings

The building plans include four officers' quarters, thirty-two barracks, each 32 x 60 ft., eight mess halls, eight lavatories, one administration building, one post exchange, one medical building, one oven bake room, several minor buildings, one mechanical repairshop, 480 x 497 ft., one storage plant 720 x 136 ft., and another storage plant 554 x 140 ft.

Trucks are being shipped daily to the depot. An average of four trains per day of trucks, with each train carrying thirty trucks, are being received, two of the trains coming daily from Detroit and two from Rochester, N. Y. The Detroit trains, in addition to carrying the trucks, bring with each thirty trucks one roadster, one touring car, one tank car, and one light repair car. Each truck shipped is loaded with 2 to 3 tons of extra parts. There are at present about 700 trucks on hand. It is expected that, making allowance for the requisitions coming in daily for trucks, there will probably be 1200 on hand early next week.

Strategic Location Chosen

The location of the depot at Baltimore is particularly good. It is so situated that it is accessible directly by water and by the Baltimore & Ohio Railroad, which is building five switches through the grounds. It is within a few miles of the freight depots of the Western Maryland and Penn railroads. The trucks can be delivered overland. It is located on the Philadelphia highway, between Baltimore and Philadelphia, easily reached from the Lincoln highway, and therefore convenient for overland driveaways.

Every attention is being given to the comfort and health of the soldiers who will be stationed at these depots. A near-by river will supply fishing and swimming facilities. An extra plot of land has been set aside for a recreation hall, Y. M. C. A. branch, and Knights of Columbus building. Drinking water will be secured from artesian wells. Separate plots of ground have been set aside to be converted into small parks and baseball grounds.

Colonel Leisering has suggested that a truck company be established at this camp also for the purpose of making truck driveaways from the depot to the points of embarkation.

All Repair Work Standardized

The plan of repair work was outlined in these columns several weeks ago. It comprises a method which includes a shop manual arranged under the direction of George Randles of the Motor Transport Section of the Quartermaster Corps. The shop manual so strictly defines the necessary repairs and procedure that it practically eliminates all opportunity for careless repair work.

For example, the arrangement of all buildings will be the same, having all parts, tools, etc., in the same place in each. This will facilitate the transfer of workmen. The shop manual has been prepared after intensive study of the best methods of making every adjustment and repair that will ever be necessary.

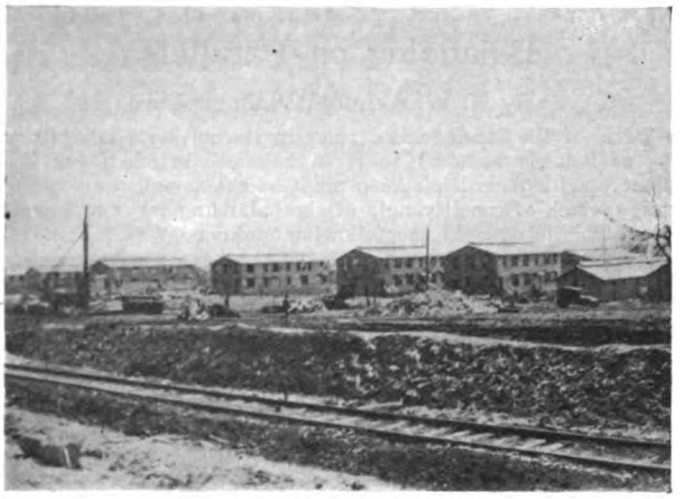
Workmen are not permitted to deviate from the instructions laid down in the manual. Thus, if a cylinder appears in need of regrinding, not even the foreman has authority to say whether it shall be done or not. The repair manual exactly defines when the work is necessary and tells how to do the job.

All tools are standardized, even those in individual kits, and such machines as lathes, shapers, drills, grinders, etc., also are of identical pattern.

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Views of the First Standardized Truck Repair Depot





These two views show part of the barracks which have been erected at the Baltimore standardized repair depot for the Quartermaster Mechanical Transport Unit. They will house 2000 soldiers and 100 officers

Seas of mud make necessary the laying of wooden tracks like those shown below in order that the trucks may be moved





Here is a small part of the stock of trucks which have been received at the depot. At present more than 600 are ready for storage or shipment overseas or to other points



Two trucks are loaded into each gondola car. For unloading there is a mammoth steam crane which picks the trucks up bodily and deposits them at one side



This shows how the trucks arrive in trains passing over a temporary roadbed into the depot. At present four such trains arrive daily

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The FORUM

Balancing on Parallels

By N. W. Akimoff, Philadelphia

ONE of the fundamental rules in the author's laboratory of balance is never to let a balanced article leave the place until a record has been made of the so-called *sluggishness* or lack of sensitiveness of the balancing ways or parallels. This is done in the following manner:

As soon as perfect static balance has been secured on the balancing machine, in rotation, the article is placed on the ways and a slight static unbalance purposely introduced, to the extent of being felt by the ways. Several positions are being tried and the average entered on records as *sluggishness* or *residual unbalance.*

While the rotary balancing machine leaves absolutely no room for any *personal equation,* as to whether static balance is fair, good or bad, the parallels necessarily must depend on the operator's temperament and other influences, entirely foreign to the problem itself of finding balance.

Such personal element accounts in marked degree for some of the apparent inconsistencies in the submitted table, which nevertheless establishes the fact that very considerable static unbalance can remain in a body, even if carefully balanced on the parallels; this fact is not at all a reflection on the ways, but only tends to establish the limits of their usefulness; those interested in this subject will find some data in the paper recently read by the writer before the A. S. M. E. (December, 1917).

Nature of article	Weight, lbs.	Bearings	Residual static unbalance or sluggishness, in inch-ounces
Crankshaft	68	2⅜"	1.18
"	100	2 7/16"	1.25
"	88	2⅛"	.92
Pulley	112	1⅞"	1.48
Flywheel	126	1⅞"	1.02
"	114	1⅞"	1.97
Crankshaft	63	2⅛"	1.83
"	70	2⅛"	1.56
"	91	2⅝"	1.64
"	30	1¼"	1.95
"	110	2⅛"	.93
"	94	2⅛"	2.12
"	86	2¼"	1.48

Most of the shafts are not over 0.002 in. out; if more, the usefulness of the ways is decreased further.

The permissible amount of residual unbalance of this kind, recommended by the writer is, 4 in.-oz. There is a double reason for bringing down sluggishness: First, static balance as such; and then its importance for securing dynamic balance, the very foundation of which is perfect static balance.

Advantages of Scavenging

By J. B. B.

SCAVENGING is a subject of considerable interest as well as of importance in these times of high-priced gasoline. The latter is frequently of an inferior grade, and the power developed with it is low enough without the fuel charge being diluted with from 25 to 30 per cent of the burnt gases.

Let us take a view of the interior of the combustion chamber when the motor is in action. We see the furnace condition, except when one gives the motor a few whirls with the starter sans spark, and then what a satisfactory decisive pull for a moment or two, until the burnt gas again asserts its influence.

When Otto conceived the idea of an intermediate stroke without firing, his purpose was to reduce the volume of these residual gases, and it was Otto who made the present form of motor good enough to get by with.

But the clearance volume is still full of these detrimental gases and, viewing the interior of the combustion chamber again, we note the new charge coming in and being split up into globules, streaks and eddies with the consequent slow propagation of flame and power. The combustion is also hindered, and none of us know the percentage that goes out through the exhaust without having performed any useful work.

Viewing the interior again, we note how the motor rebels at low speeds, when we are compelled to slow down, and the throttle is admitting just enough fuel to keep in action. Imagine the added flexibility if this small charge came in undiluted by the burnt gases. Also imagine how much less fuel would be required to perform the same service, and do the work better in every way.

Drive out this volume of burnt gas completely, which approximates 800 to 900 degrees Fahr., replace with a fresh pure gas at 70 to 80 degrees Fahr. and the heating of the motor will be diminished in a large degree and with a corresponding saving of lubricant, as it is unquestionably these burnt gases that burn the oil from the cylinder walls. The tendency of the scavenging motor to overheat will be considerably lessened even though the explosion temperature is higher.

The unadulterated gas not only adds power by reason of a greater charge entering the cylinders, but the purer, quicker-burning mixture will give a better torque at low speeds and at the same time speed up the motor and keep down the gas velocity, so that we get a range of flexibility and acceleration in a four-cylinder motor approaching a six of the conventional non-scavenging type.

In expelling all the burnt gases, and substituting a complete pure mixture, the compression temperature is lowered and a corresponding increase in compression would be quite safe as far as pre-ignition is concerned. Together with the spontaneous combustion, a steeper expansion curve in the pressure diagram results. Thus lower terminal pressures and temperatures are reached when the exhaust opens; in other words, the gas is used more expansively.

The unadulterated charge will result in a straight power curve up to very high speeds. This feature alone is a factor of inestimable value in aviation.

With an unadulterated charge, the piston displacement can be reduced by the volume of the original combustion space and then more power generated than previously.

The high temperature in the non-scavenging motor subjects the valves and all parts to undue strain, tends to warp them, and to cause scoring and seizing. Remove the evil influence of these burnt gases, substitute a cool, clean charge, and what improved conditions are obtained for continuous and satisfactory operation.

Furthermore, these burnt gases are a considerable factor in the formation of carbon, which is not the least of the evils occasioned by their presence, and this evil would be minimized by the expulsion of the burnt gases.

Development work on the internal combustion engine has made great strides, and engineers have accomplished wonders, not only in the structure itself, but in carburetion and ignition, but, singularly enough, they have lugged along these burnt gases until they have become a veritable Sinbad.

When scavenging comes into general use, the present non-scavenging motor will be regarded in the light of the original two-cycle motor, except that it is a step forward.

The demand and the necessity for a better and safer aviation motor, however, make scavenging imperative, and this improvement must, and will surely be the next stride forward in the march of internal combustion engine progress.

That the remnant gases cause a loss in efficiency is proved by the superior average performance of large stationary scavenging engines, in which these residues are largely driven

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out. The need now is for a mechanism to accomplish this much-to-be-desired purpose, that is simple, and will consume as little or even less power to operate than the present non-scavenging type.

We have not worked in this direction sufficiently. The demand for motors for automobiles has grown so quickly that the motor people have fitted themselves with patterns, forms, templets, jigs and tools for types that have been so much better than the original form that they have been reluctant to go into research work. But thanks to aviation, the time has now arrived when improvement must come, and it must be first on the lines of scavenging the burnt gases.

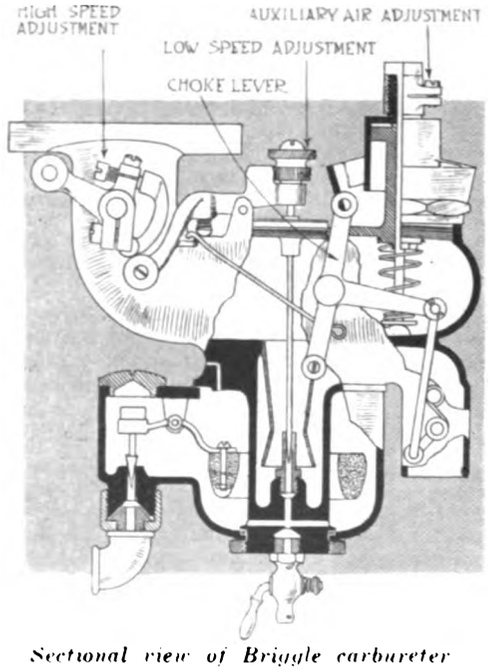
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Van Briggle Carbureter Has Three Adjustments

ONLY well tried principles are embodied in the Van Briggle carbureter manufactured by the Van Briggle Motor Device Co., 429 North Capital Avenue, Indianapolis, Ind. The device is of the type in which the float chamber is concentric with the mixing chamber. A needle valve is located in the mouth of the spray nozzle and the latter is surrounded by a Venturi tube. The needle valve in the spray nozzle can be adjusted as to height, and is raised more or less according to the position of the throttle valve, which acts upon it through the intermediary of an adjustable cam.

The outstanding feature of the Van Briggle is the thorough provisions made for insuring a rich mixture for starting. Not only are both the air inlets choked off, but the needle valve is lifted out of the spray nozzle so as to render the flow of gasoline as free as possible.

The same as the majority of modern carbureters, the Van Briggle has two air inlets, a primary and a secondary. Both are located on the same side of the carbureter, the primary below and the secondary above. In the primary air inlet there is a choke valve which connects to a three arm lever supported on the carbureter, from which connection can be made to a choking device which is preferably located on the steering post. Air entering the primary air inlet passes down a passage outside the Venturi tube and then up this tube, at the narrowest part of which it has the fuel mixed with it. At its upper end the Venturi tube debouches into a horizontal passage, at one end of which is located the supplementary air valve and at the other the throttle valve. The supplementary valve is of the poppet type and is provided with a dash pot to prevent fluttering. Adjustment of the supplementary air valve can be made by means of a thumb screw on top of the carbureter in a most accessible position, and when the adjustment has been made it can be locked by means of a machine screw. To increase the amount of supplementary air the adjusting nut is turned to the right, while to lessen it, the nut is turned to the left. Pivoted to the hub of the throttle lever is a cam which acts on a lever arm connecting to the gasoline needle valve. The cam can be adjusted by means of a set screw in a lug on the throttle lever hub, and this forms the high speed adjustment. To obtain more gasoline at high speed, the set screw is turned to the right, while to impoverish the mixture at high speed, the screw is turned to the left.



Sectional view of Briggle carbureter

Adjustment for low speed is made by means of a nut at the upper end of the needle valve. To reduce the amount of gasoline at low speed, this nut is turned to the right, while to increase the gasoline, the nut it turned to the left.

As may be seen from the sectional view, the float is of the cork type and acts on a needle valve located in a pocket at the side of the float chamber.

The choking valve, of course, is provided to facilitate starting in cold weather. By means of this device not only can the primary air inlet be entirely shut off, but at the same time the supplementary air valve is held against opening and the needle valve is lifted out of the spray nozzle, so that even though the cranking speed may be low the engine will receive an amount of fuel adequate for starting. When the engine is to be started the choke lever or rod must be pulled up and held tight. After the engine has turned over a few times and picked up its cycle, the choke is released a little, and as the engine warms up, it is completely released. The choke must not be held open too long, as this would result in flooding the carbureter.

The supplementary air valve, of course, is adjusted properly at the factory and the adjustment should not be disturbed unless the engine develops a tendency to "spitting" or backfiring through the carbureter, in which case it is well to adjust the air valve to admit less air.

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Book Review

AVIATION Engines, Their Design, Construction, Operation, and Repair. By Lieut. Victor W. Pagé, Aviation Section, F. C. U. F. R.; 576 pages and 253 illustrations. Published by the Norman W. Henley Publishing Co., New York. Price, $3.

Owing to the fact that thousands of young men are now being trained in operating and caring for airplanes and airplane engines, there has arisen a demand for a book explaining in simple language the construction and care of such engines. Mr. Pagé, in the book under review, has attempted to meet this demand. The subject-matter is covered in 12 chapters, of which the first two deal with the different classes of aircraft engines and the principles underlying their construction. Separate chapters are devoted to the fuel system, ignition and the lubricating systems. The remaining chapters deal with the practical operation of the engines and their installation on aircraft, while in the final chapter are given brief illustrated descriptions of a considerable number of prominent aircraft engines, both of the stationary and the rotary type. The book should prove useful to flying pupils, aircraft mechanics and others interested in aviation from a practical standpoint.

—

ACCORDING to the *Autocar*, an engine which is inclined to knock on the slightest provocation, can be cured by the use of a fuel composed of a mixture of gasoline and benzol. This is due to the fact that benzol has a higher temperature of ignition than gasoline, and mixing the benzol with the gasoline raises the ignition temperature of the latter.

—

IN a paper on "Friction Clutches," read recently before the Coventry branch of the Institution of Automobile Engineers, Herbert L. Towns gave the following figures for coefficients of friction based on his own laboratory tests: Bronze on bronze, .20; bronze on cast iron, .21; cast iron on cast iron, .15; leather on cast iron, .20; friction fabric on cast iron, .33; cork on cast iron, .30.

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Traction on Bad Roads or Land*

Second Installment

Four-Wheel Drive, Four-Wheel Steering and Four-Wheel Independent Drive Tractors—Classification of Track-Layer Type Tractors

By L. A. Legros

THE Superquad of the Walter Motor Truck Company, of New York, is an example of four-wheel drive and four-wheel steering. Each axle is fitted with an automatic locking differential of the Walter type, which remains automatically locked for normal running, but becomes unlocked when necessary, for example, in turning the car. The third differential gear on the main shaft, necessary in the case of ordinary differentials, is not required with this device, as either or both wheels on the axle which tends to overrun the other will become unlocked automatically, and will lock again as soon as the distribution of velocity becomes normal.

The vehicle is fitted with a pedal-operated transmission brake and a hand-lever operated back-wheel brake, both of which, owing to the fact that the main differential is either in gear or is locked, also act on all four wheels.

The Jeffery quad is a four-wheel driving and four-wheel steering vehicle. This vehicle is fitted with the M. and S. locking differential on each axle.

Four-wheel Independent Drive with Four-wheel Steering

The Couple-gear electric truck, and also the electric truck, on the same plate, of the Couple-gear Freight Wheel Company, of Grand Rapids, Mich., afford examples of four-wheel independent drive with four-wheel steering.

The wheel is of peculiar construction, having two large-diameter bevel wheels inclosing the motor which is placed out of square with the axle to a sufficient extent to allow both ends of the motor shaft to carry a driving bevel pinion. One of these pinions gears with the outer half of the wheel and the other with the inner half, so that the load on the motor shaft is balanced, a result further insured by the introduction of an "evener" or compensating gear. A channel frame carrying twin solid rubber tires is secured over the two bevel-carrying disks forming the wheel. The gear reduction from motor to wheel is 25 to 1. The motor is carried on a short hollow stub-axle keyed to a taper seat in the steering knuckle and secured by a nut; the wires are led to the motor through the stub-axle pin. The wheels run on roller bearings and are fitted with hand holes with removable doors to give access to the motors. There is one brake of the contracting type to each wheel, and also an electric emergency brake.

To enable the vehicle to be driven over roads which present uneven surface or very unequal resistance to traction a special form of control is arranged. Current is supplied to the motors of the four wheels through a controller of the street-car type modified to suit the conditions. This controller has five contact points, two of which (the third and fifth in the battery car, and the fourth and fifth in the gasoline-electric car) are arranged for what the makers term "parallel speeds," the motors being put in parallel when these contacts are made; thus, if one wheel slips it has no effect on the other three, or if two wheels slip there is no effect on the other two. The other three contacts are for what the makers term "building-up speeds"; on these points a sort of differential action is provided between the two groups of wheels taken diagonally on the car. The right front wheel and left back wheel form one group, and the left front and right back form the other group. When running on the third building-up speed a differential action occurs between the wheels of these groups, so that if one wheel of the group slips, its fellow will be left without power. If under these circumstances the slipping continues, and the driver of the vehicle moves the controller forward to the next contact, all the wheels are then put to work independently of each other.

It is stated that on a dry gravel road a tractive effort equal to 60 per cent of the total weight of the vehicle can be obtained before the wheels begin to slip. This figure depends, of course, on the character of the road surface.

The accumulator-driven type of tractor is only recommended in cases where charging facilities are obtainable and the total daily mileage does not exceed 40 miles. These vehicles are not only used as ordinary lorries, but in many instances are adapted with a pivotal carriage to take the front end of a trailer which may be a goods wagon, fire-escape, or electric-tramway tower wagon. In this application the vehicle is sometimes known as a semi-tractor. The Couple-gear driving system is also applied to two-wheel drive vehicles such as fire engines. Fire escapes are dealt with by two methods, either as a very long wheelbase vehicle or on the semi-tractor principle with a long trailing wagon.

Applications of Four-wheel Drive to Bad Roads or Land

In the mining and agricultural districts of North America vehicles are required to negotiate long stretches of sand or mud. They are required to work on desert land, through sagebrush and among sand dunes, and they may even be used to haul trains of tip-wagons on a light railway straddled by the tractor.

The limitations in all these cases are defined by the engine power, transmission efficiency, insistent load, wheel diameter, tire width, weight of vehicle, and, when a trailer is hauled, the drawbar pull. There is no satisfactory method at present known for estimating the resistance presented by land, sand or mud, so soft that the wheels can sink to a depth of several inches, though it is known that the resistance under such conditions may be as much as 15 per cent to 20 per cent of the load.

Comparative figures for the different types of vehicle, their horsepower, speeds, load, weight, wheelbase, track width, turning radius, and overall dimensions are given in the table.

Conclusions

For the transport of goods over bad roads on gradients, varying from 1 in 15 on roads in which the tires sink 2 in. to 3 in. in depth to 1 in 5 on hard roads with bad surface, and for speeds varying from 1.5 m.p.h. on grades to 12 m.p.h. on fairly level roads, the four-wheel drive tractor has great advantages over the ordinary two-wheel drive tractor.

In the author's opinion it may be expected to rank as an important factor in the development of districts overseas not far removed from railhead, but having only primitive roads.

Chain-Track Tractors

The invention of the endless track or self-laying railway dates to nearly a century and a half ago. The first mention of a scheme analogous to that now adopted in so many forms of tractors is the British invention of Richard Lovell Edgeworth (Feb. 15, 1770) for a "portable railway" or artificial road to move along with any carriage to which it is applied. Although no drawings can be traced of the invention, the

*Paper read before the Institution of Mechanical Engineers, on Friday, Jan. 18, 1918.

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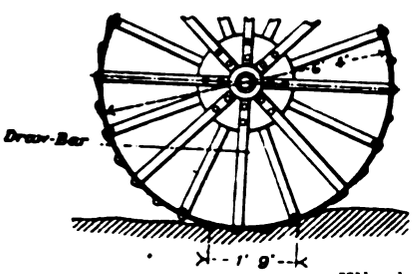
Table I

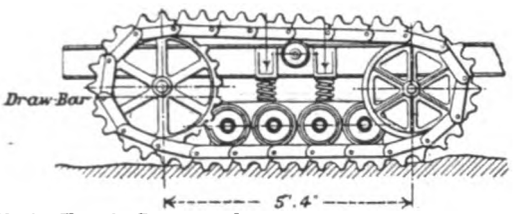
	Make and Description	Normal Load	Weight of Truck	Total Weight	Front and Back Wheels	Track	Wheelbase	Turning Radius	Width Overall	Length Overall	Platform Length	Chassis Width Outside	Clutch
	Four-Wheel Driven Vehicles				Diam.-Width	In.	In.	Ft.	In.	Ft.-In.	Ft.-In.	In.	
1	FWD 1½-ton Model G	3,000	.....	.....	36 4	56	124	46		16 8	11 4	36	Multiple disc
2	FWD 3-ton Model B, 1915	6,000	6,000	12,000	36 6	56	124	46	70	16 8	11 4	36	Multiple disc
3	FWD 5-6 ton	11,000	10,000	21,000	38 6 dual	72	148	34.5	88	21 8	13 0	..	Multiple disc
4	Jeffery Quad Model 4016	4,000	*5,000*	*9,000*	36 5	56	124	24	74	16 10½	10 0	38	Disc
5	Walter Super-quad 3-ton Model	6,000	*6,000*	*12,000*	40 6	64	132	15	82	18 6	11 6	38	Leather cone
6	Walter Super-quad 5-ton Model	10,000	*6,000*	*16,000*	40 7	64	156	17.5	82	20 6	15 0	38	Leather cone
7	Walter Super-quad Tractor	6,000	*6,000*	*12,000*	40 4 dual	64	108	12.5	79	16 6	9 0	38	Expansion cone
8	Couple-Gear 3½-ton Petrol-Electric HC	7,000	*9,000*	*16,000*	36 3½ dual	66	144	13.5	82	18 6	14 0	..	Electric
9	Couple-Gear 5-ton Petrol-Electric AC	10,000	*11,000*	*21,000*	36 4 dual	66	144	13.5	89	18 6	14 0	..	Electric
10	Couple-Gear Electric 5-ton Model A	10,000	*11,000*	*21,000*	36 4 dual	72	106	10	89	14 6	14 6	49	Electric
11	Couple-Gear Electric 3½-ton Model H	7,000	*9,000*	*16,000*	36 3½ dual	66	106	10	80½	14 6	14 6	43	Electric

Approximate and estimated figures are shown in italics.

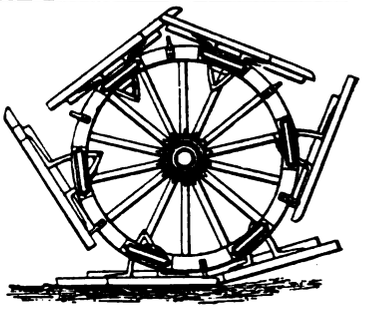
	Make and Description	H.P.	No. of Cylinders	Bore	Stroke	1st Speed	2nd Speed	3rd Speed	4th Speed	Reverse Speed	Foot-Brakes. No. Diam. Width	Emergency Brake. No. Diam. Width	Water, Gallons (Brit.)	Petrol, Gallons (Brit.)
	Engine				In.	Gear Ratio	Gear Ratio	Gear Ratio	Gear Ratio	Gear Ratio	No.-In.	No.-In.		
1	FWD 1½-ton Model G	28 9	4	4½	5	.....	.....	*	.....	.....	8x1¼	13¼x2	.....	.....
2	FWD 3-ton Model B	36 1	4	4¼	5½	35.6:1	17.8:1	8.9:1	.....	36.1:1	10x3½	15¼x2¾	6.6	21
3	FWD 5-6-ton	44 2	4	5¼	7	46:1	22.5:1	12.1:1	.....	55.3:1	10x4	15.9x4	....	21
4	Jeffery Quad Model 4016	28 9	4	4¼	5½	42.3:1	24.7:1	14.05:1	8.5:1	45:1	4x6¾x2½	1x8x2½	9.2	22
5	Walter Super-quad 3-ton Model	30 6	4	4½	6	67:1	27:1	13.6:1	8.4:1	51:1	2x12x4	1x10x3½	.....	25
6	Walter Super-quad 5-ton Model	30 6	4	4½	6	67:1	27:1	13.6:1	8.4:1	51:1	2x12x4	1x10x3½	.....	25
7	Walter Super-quad Tractor.	30 6	4	4½	6	67:1	27:1	13.6:1	8.4:1	51:1	2x12x4	1x10x3½	.....	21
8	Couple-Gear 3½-ton Model HC	40	4	5	5½	25:1	.....	.....	.....	25:1	4x17x2	Electric	.....	17
9	Couple-Gear 5-ton Model AC	40	4	5	6	25:1	.....	.....	.....	25:1	4x17x2	Electric	.....	17
10	Couple-Gear Electric 5-ton Model A	18-h.p. battery of 44 cells 33 plates ea				25:1	.....	.....	.....	25:1	4x17x2	Electric	.....	.....
11	Couple-Gear Electric 3½-ton Model H	9-h.p. battery of 44 cells 17 plates ea.				25:1	.....	.....	.....	25:1	4x17x2	Electric	..	....

*Geared to 16 m.p.h.





Wheel and Chain-Track Compared



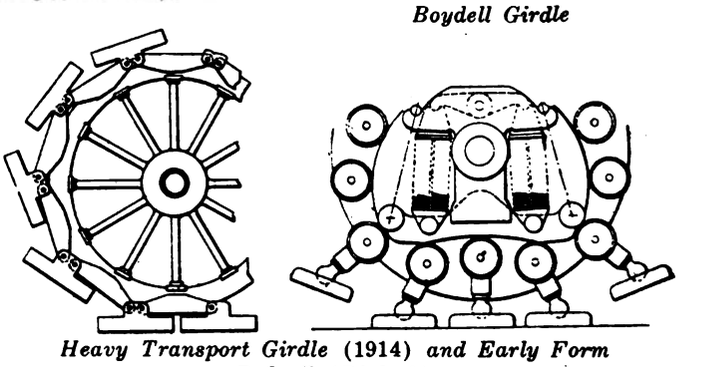
Boydell Girdle

description given is remarkably clear and precise; in fact, almost unaltered, it applies to the greater number of chain-track tractors of to-day.

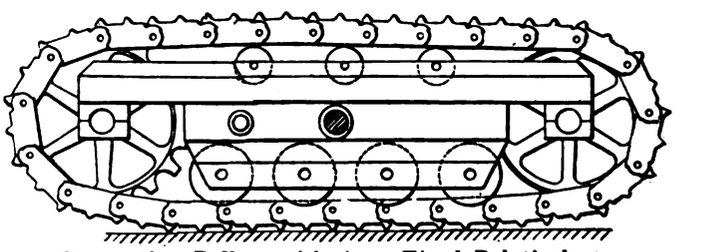
The Motor Car Acts of 1896 and 1903, while affecting the restrictions on light locomotives, had little, if any, direct influence on the development of chain-track tractors. This type of vehicle owes its development to the very great difficulties presented to wheeled tractors by bad surfaces of road or land.

The necessity for traveling over various kinds of land in moving from place to place has demonstrated the capacity of these vehicles for haulage across alkali and other deserts as well as over clay. To enable chain-track tractors to run on soft or swampy land the insistent weight has been reduced much below that imposed by a horse, which, carried on two feet as in walking, may exert a pressure on the ground of from 20 lb. to 25 lb. per square inch. In fact, many of these machines can be run safely over marsh in which a man would sink to his waist. The pressure exerted by a man when standing on the sole of one boot varies considerably, but may be taken as from 6 lb. to 7 lb. per square inch. Some of the chain-track tractors designed for soft ground have an insistent load of less than 4 lb. per square inch, while in others, specially designed for swampy country and fitted with tracks of abnormal width, this figure falls as low as 1.8 lb. per square inch.

(To be continued)



Heavy Transport Girdle (1914) and Early Form Pedrail (Diplock)



Supporting Rollers with Axes Fixed Relatively to Truck Frames (Creep-Grip)

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The AUTOMOBILE

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Methods of Kerosene Carburetion

THERE seem to be two schools of thought among the engineers engaged in the development of vaporizing systems for heavy fuels. One school advocates the application of so much heat to the fuel and air passing through the carbureter or vaporizing device that all of the fuel becomes completely vaporized, and to so arrange the inlet passages that there is no chance for it to recondense on its way to the cylinders. The other school objects to this method because it involves the use of such high temperatures that the charge entering the cylinders will be unduly expanded and the volumetric efficiency, in consequence, will be very low. For instance, to completely vaporize kerosene at normal atmospheric pressure requires a temperature of over 500 deg. Fahr., and when air is raised from 60 deg. to 500 deg. Fahr. it expands 80 per cent in volume. This alone would bring the volumetric efficiency down to 55 per cent, and the wire drawing in the inlet passages would decrease it considerably more. Of course, if the fuel is thus thoroughly vaporized there is no difficulty from unequal distribution of the charge and incomplete combustion. Trouble might be anticipated from preignition, since the mixture, already in the state of a dry gas when entering the cylinders, might be raised to the ignition temperature by the heat of compression. However, with low volumetric efficiency the compression, and hence the heat of compression, is also low, which reduces the danger of preignition.

Those who favor the use of a moderate amount of heat generally mix the fuel in the first place with only a fraction of the air required for its complete combustion. This over-rich mixture is heated to such a temperature as to completely gasify the fuel. Just previous to entering the cylinders the mixture is diluted by means of a stream of cold air, to obtain the proper proportion for complete combustion. Naturally, the admixture of the cold air tends to cause some of the fuel to recondense, but various experiments are resorted to in order to prevent precipitation of the fuel on the walls of the passages and thus prevent unequal distribution. The fuel charge does not enter the cylinder as a saturated gas, but evidently the heat of compression is depended on to revaporize any part of the fuel that may return to the liquid state upon the addition of the cold air.

There is no doubt that in this way a higher volumetric efficiency can be obtained than where the whole of the charge is heated to the temperature above the boiling point of the fuel before entering the cylinders. However, a high volumetric efficiency is not an absolute criterion of the results obtained. If the charge is not in such a state as to permit of its complete combustion the power may be low in spite of large fuel consumption.

It is too early to say which of the two plans of preparing combustible mixtures of heavy liquid fuel is the better one. Each has certain things in its favor and probably it will require extended practical experimentation to determine where the balance of advantages lies.

Canada's Boost of the Tractor

THE great need for farm tractors in the present crisis is aptly illustrated by the action of the Canadian government in removing the import tax from tractors selling at less than $1,400. Canada is a country of great agricultural possibilities, but its development has been retarded during the past few years by the scarcity of farm labor. The use of tractors, capable of plowing perhaps 10 acres per day each, instead of the 2 or 3 acres turned over in a day by a horse plow, permits of greatly increasing the tilled acreage with the available supply of labor. One of the provincial governments of the Dominion began last year to supply tractors to farmers at so much an acre. The inference is that a large number of Canadian farmers have not the necessary capital to purchase tractors. Practically all tractors have to come from the United States, and as a very considerable import tax and war tax have had to be paid on them, the cost of a tractor to a Canadian farmer has been very much more than the cost of the same machine in the United States. The removal

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of the tax will result in a material reduction of tractor prices in Canada and should induce many farmers to buy who formerly regarded a tractor beyond their means.

Curtailment Effect

FOR the first time since curtailment rumors began to spring up in the industry, manufacturers feel that they are on a sound business basis with the Government. They now know exactly to what extent output is to be reduced, and, happily enough, this reduction is about the same as that which would have come about automatically through the acceptance of government work and lack of shipping facilities.

In other words, had no agreement been reached reducing output 30 per cent, the manufacturers would have had to cut to that extent anyway, but they would have been uncertain regarding further restrictions, and, consequently, would have been in a panicky state of mind, rather than in a condition to survey the future with calm confidence.

It is, of course, certain that with reduced production and with an unabated demand, cars are going to be scarce during the coming summer. This condition will affect the dealer far more than the manufacturer, and dealers will have to turn to other lines to increase their income. Throughout the farming districts dealers already have turned to the handling of tractors. In the metropolitan district there has been increased activity in truck sales, and some far-sighted dealers have either added a truck to their line or abandoned passenger cars altogether to concentrate on the sale of trucks.

The effect of the curtailment agreement has been simply to clear the atmosphere. A reduction in manufacturing schedules had already been made and in a great many instances the reduction was appreciably greater than that required by the agreement.

Airplane Schedule

FROM an annual output of a few hundred units to a monthly output of several thousand is a big jump for any industry. When an industry requiring workmanship of the highest degree experiences such a growth in the course of a few months the event is epoch-making.

It is interesting to note what sources furnished the skilled labor necessary to perform the delicate operations so essential in turning out planes. Nowhere has it been possible to find a body of men better adapted to this sort of work than those engaged in the manufacture of high-class closed bodies. In addition to the thousands of men drawn from this field, many were gathered from the furniture and piano factories, cabinet makers' shops, etc.

America's resources in skilled man-power have never been shown more clearly than in this new work, which is the one branch of government activity fully up to, and in some cases ahead of, schedule. Production of the Liberty engine is going ahead rapidly and is keeping pace with wing and fuselage building. The last month has witnessed a turning point in the manufacture of these fighting machines. It is not permissible to publish figures regarding output, but in one mid-Western city alone there are seven plants turning out great quantities of airplane parts and materials. Of these seven not one was previously engaged in airplane manufacture, and three of the plants were not even in existence, but were put up specially to take care of this work.

The airplane schedule is up to date. The tool-designing period is almost over and production is under way in more places than seemed possible only 6 weeks ago. Liberty engine-equipped planes are already in France, and everything points to an unbroken stream of shipments in ever-increasing numbers from now on, providing the shipbuilding schedule can be adhered to.

Guidance for War Inventors

IT is notorious that inventors as a class are very impractical people and that of all the patents issued by the U. S. Government a very small proportion ever bring enough returns to their inventor to cover the patent office and attorney's fees. There is a certain glamour about the inventor's calling that seems to attract many people who do not possess sufficient mechanical ability and business sense to carry their ventures through successfully.

This lack of the practical spirit among inventors has been very conspicuous, we understand, in the suggestions and inventions submitted to the Naval Consulting Board. It was found that a great many of the suggestions made showed an utter lack of comprehension of the particular problem which it was intended to solve.

The war will offer many opportunities for gifted inventors, as the struggle is chiefly one of the most up-to-date means of transportation and fighting. Although production in the different branches cannot be interfered with, the Government is most anxious to fully consider any promising invention in connection with means for fighting the submarine menace, aircraft and aircraft engines, tanks and similar equipment.

Practically all of these devices are quite new and those who wish to share in their technical development should realize that unless they have had some practical experience in the particular line of work, they must first thoroughly familiarize themselves with the requirements of the problem, the historical development of the device to date and the scientific principles underlying its operation.

In connection with the problems of meeting the submarine peril, the Naval Consulting Board some time ago issued a pamphlet giving in very concise form the various aspects of the subject and outlining various possible solutions. It would not be a bad plan to issue similar pamphlets dealing with aircraft and tank problems in the same way, as it would keep inventors from wasting their energies in attempting the impossible and to guide them into the proper channels for effective work.

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Latest News of the

Wants Fuller Report on Trade

Export Committee of N. A. C. C. Asks Commerce Bureau for Its Co-operation

NEW YORK, March 8—A good active step by way of a scientific investigation into foreign trade and co-operation with the government in this work was started by the export committee of the National Automobile Chamber of Commerce at its meeting yesterday, when it was decided to ask the Bureau of Foreign and Domestic Commerce to secure fuller reports on trade conditions in foreign countries by American consuls and commercial attachés and published by the Bureau. A questionnaire is to be drawn up indicating the particular subjects on which information is most desired by the automobile industry.

Owing to confusion that exists over the licensing of exports of automobile parts containing certain percentages of metals and other articles on the conserved list, the committee decided to ask the War Trade Board to consider the waiving of restrictions on exports of parts, inasmuch as these contain a very small percentage of copper, brass, tin, etc. The exportation of parts for replacements is not an extension of new trade and it is essential to the maintenance of established trade relations that supplies of parts for repairs and replacements should be on hand wherever American cars are sold. The question of licenses on exports to Canada of both cars and parts is also to be taken up with the authorities in Washington so that the requirements will be more definitely understood.

Proposed Rim Standards

With a view to determining the feasibility of standardizing straight-side tires for export, a questionnaire was drafted by the Export Committee of the N. A. C. C. at a recent meeting, to be sent to the tire companies to ascertain to what extent automobile manufacturers can depend upon their customers in foreign countries obtaining straight-side tires in every place where American cars are used.

With the object of making export trade to foreign countries easier, and reduce sales resistance in Spanish-speaking countries, the chamber was directed to work out the details of a good roads' pamphlet with a view to publishing it in English and Spanish to be distributed in countries where highway improvement is in a backward state.

The chamber has already partly completed a table of equivalents of technical automobile terms in Spanish, French, German and Italian, to be used in the preparation of catalogs, instruction books and other trade literature.

Meetings of the export committee are to be held regularly in future at the time of general meetings of members.

The Board of Directors has authorized delegates to represent the N. A. C. C. at the fifth annual Foreign Trade Convention at Cincinnati, April 18-20, and to deliver an address dealing with ways in which the automobile industry is helping to win the war.

—

Ford to Build Light Tanks

DETROIT, March 11—The Ford Motor Co. is going to produce light tanks for the government. It is reported that if the first model, drafted less than 4 days ago and well under construction now, is accepted, the manufacture will be pushed with all speed and the first shipment will be ready within 60 days. It is also reported that the Ford "tank" is to be a comparatively light machine, carrying a driver and a machine gun operator, and will be driven by two gasoline engines of standard type. It will have the familiar creeper type of traction, and while not intended for the heavy work that has been done by the immense British and French tanks at the front, it is expected to be an effective fighting machine.

—

Washington Bureau for Milwaukee

MILWAUKEE, March 13—Milwaukee manufacturers, with the co-operation of the Milwaukee County Council of Defense, are raising a fund of $30,000 by popular subscription to finance the establishment and maintenance of a bureau of information at Washington. The main function will be to give Milwaukee manufacturers information enabling them to make bids on various Government contracts which otherwise might not be available. The bureau is planned as a permanent institution.

—

Roads Used by Government Military Highways

WASHINGTON, March 13—A bill before the Senate says all State roads used by the Government should be treated as military highways and the Government should assist in keeping them in repair. The bill was introduced by Senator J. W. Smith, who has investigated the deterioration of the Maryland highway system. The bill states the Government is not to contribute more than two-thirds of the money for repairs, nor more than $1,000 per mile. It has gone to the Senate Committee on Appropriation.

Flint Factories Pool Interests

Scheme Worked Out in Co-operation with Y. M. C. A.—All Plants Represented

DETROIT, March 11—Industrial districts in which there are two or more factories can often successfully pool their welfare interests with an increase in economy and more satisfactory results for the men. This method can be used to best advantage in non-competitive centers, that is, where the factories do not compete either in the local labor market or in the sale of their products.

Such an idea has been worked out in Flint. As will be noted, it has been worked out in co-operation with the local Y. M. C. A. This need not necessarily always be the case, but it has worked out to mutual advantage in this instance. The general secretary can be both secretary of the Y. M. C. A. and of the Industrial Fellowship League, as it is called in Flint. The chart is self-explanatory. The general secretary is the nominal manager of the entire enterprise. He receives his instructions in regard to policy from the industrial committee, which is composed of a board of trustees, comprising one member of the industrial committee and two members of the executive board.

The executive board is composed of one representative from each of the plants in the district, and this executive board co-operates with the industrial secretary, who represents the industrial committee in such work as the educational activities and shop benefits, as well as athletic and social events. The work of the industrial committee is divided into two parts, one being educational and the other recreational. The educational activities comprise the holding of evening classes, shop meetings, technical society meetings and lectures. The recreational activies are of an athletic and social nature, including the arrangement of community games and of city stadium games, supervision of athletic activities and the provision of recreation resorts.

Besides these two main divisions there are independent organizations which comprise various factory committees of a welfare nature, a committee of general supervision for welfare work, a committee of factory stores in which small articles are sold to employees, and a committee which has to do with the handling of a factory newspaper, which acts as an organ to further the work of the Fellowship League.

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Automotive Industries

Trucks Get Attention of N. A. C. C.

Organization Decides to Make Commercial Vehicle a Real Factor

NEW YORK, March 8—The motor truck seems to be coming into its own so far as the National Automobile Chamber of Commerce is concerned, after having been held in too much subjection by that organization since its inception. At its meeting held this week the chamber decided to put the motor truck on its feet as a real factor in the organization, and with this object in view two classes of membership, a truck division and a passenger car division, with two second vice-presidents in charge, Windsor T. White in charge of the truck classification and H. H. Rice in charge of passenger cars, were formed.

For several years there has been constant uneasiness among many truck makers due to the feeling that the chamber has not been giving that attention to the truck industry which it merited. Recently there have been truck meetings at which the subject of a national truck organization has been discussed and it is not surprising that a comprehensive truck program has been mapped out.

The motor truck show, which was opposed so consistently by the chamber and the ban put on it in New York and Chicago, has come in for recognition and while no definite announcement has been made, the subject was discussed in a preliminary way. Since the truck show was suppressed in New York and Chicago the truck show idea has been very successfully carried on in Boston, Minneapolis, Kansas City, Brooklyn and other cities.

Frequent regular meetings of representatives of the forty-five commercial vehicle manufacturing companies included in the membership of the National Automobile Chamber of Commerce were agreed upon at a meeting of this division of the chamber following the general meeting of members.

Many motor truck makers have been admitted as new members during the past year and one of the principal objects of the regular sessions is to promote greater personal acquaintance among them and afford opportunities for discussing their particular problems, such as have been enjoyed by most of the passenger car manufacturers in the chamber for many years. The meetings will be held in the afternoon of the same days as the general meetings.

A great deal of the activity of the chamber, and of committees representing it in Washington, centers around motor trucks and it is recognized that this branch of the industry has assumed much greater importance than heretofore and that it is confronted with problems all its own.

A resolution was passed calling upon the chairman to appoint a committee of three to investigate and report upon plans for selling motor trucks on the time-payment basis, the consignment of motor trucks to dealers and the consigning of parts to dealers.

—

Liberty Seaplane Passes All Tests

WASHINGTON, March 14—The first United States Navy fighting seaplane equipped with a Liberty engine has been tried and accepted, and a large number are now being delivered to the Naval Air Service. These will be used in submarine hunting.

The navy is also using what is called the Bristol model fighting plane, and another 2-seated flying boat. The naval Liberty planes are equipped with two Liberty engines, giving a total of 700 hp. This is greatly in excess of the power of British craft.

It has been announced that the last minor defect in the Liberty engine, which was in the lubrication, has been overcome.

—

More Power for American Tanks

WASHINGTON, March 11—An official report states that American supertanks now under construction are greater in power and destructive force than any British or French tanks. They will withstand the fire of small German artillery which damage the French and English tanks.

While gross tonnage of the big tanks being made here exceeds that of the English by only 2.8 per cent, ours have engines three times as powerful, and in addition to its crew can carry a force of 20 men to do trench work. It is said that the super-tanks can span 10-foot trenches. Armament will consist of small cannon and machine guns. A conning tower will permit the latter to shoot in any direction. Owing to the great weight the tanks will travel a maximum speed of 5 miles per hour.

—

100,000 Men for Ford Tractor Work

DETROIT, March 13—Henry Ford will eventually employ 100,000 men in the manufacture and distribution of his tractors. At the Dearborn plant, which is temporary, 2000 men are now working, but this number will soon be increased to 25,000. Following the building of a permanent $3,500,000 plant, the distributing shop will be used as one of the numerous assembling plants.

Civilian Control for Airplanes

Authority to Be Taken from Military Officials—Program Must Be Speeded Up

WASHINGTON, March 14—Control over airplane production will, within a few days, pass entirely or almost entirely out of the hands of General Squier, and will be put in the hands of civilian manufacturers. Details of the plan have not been worked out, but the whole subject will be investigated by a committee of three, with H. Snowden Marshall as chairman.

The appointment of this committee followed the disclosure to the Senate Military Committee that only one-tenth of the airplanes promised by this country for service on the Western front early this spring would be ready by April 1. The request for this investigation was made by Howard Coffin.

Gifford Acting Director

Coincident with this announcement Walter S. Gifford, Director of the Council of National Defense, has been appointed Acting Director of the Aircraft Board and will have charge of executive details in the absence of Mr. Coffin who will go with the committee of investigation to see for himself just what conditions are. Mr. Gifford will retain his directorship in the Council of National Defense but spend his time at the Aircraft Board for the present. Howard E. Coffin stated to-day that despite all rumors good production is now had on the eight-cylinder Liberty airplane, and a number of the fighting planes of the twelve-cylinder type have been completed and are flying. He added that the production of the fighting planes would be in the thousands within the next few months.

Appropriation for 22,000 Planes

Congress originally voted appropriation for 22,000 airplanes of which 7000 are to be the light training planes equipped with engines other than the Liberty, and the other 15,000 are to be divided in quantities using the eight-cylinder and twelve-cylinder Liberty engine types.

The Senate Military Affairs Committee's investigation of the airplane program and other outside pressure are said to have had some influence in bringing the Presidential announcement of the new committee.

The aircraft board at present has no power over contracts nor engineering, but is supposed to stimulate production.

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Curtailed Schedule Not Harmful

Has Clarified Industry by Allowing Factories to Make Definite Distribution Plans

DETROIT, March 11—The curtailed schedule which the National Automobile Chamber of Commerce has announced through its fuel committee and the War Industries Board, as reported in last week's issue of AUTOMOTIVE INDUSTRIES, has had a remarkably clarifying effect on the factories throughout the middle west.

The most tangible result which can be predicted by the factories here is a scarcity of cars during the summer. It is calculated that the output of the factories will not fill by 50 per cent the demand of buyers throughout the country for passenger automobiles.

The ruling made by the War Industries Board has had no internal effect on the factories, inasmuch as nearly all of them were working on a reduced schedule when the word of the definite curtailment order was received. Therefore, the only effect that the order had was to permit manufacturers to go ahead and outline their future policies with the dealers, in order to make as fair a distribution of their products as possible.

It can readily be predicted that the shortage in automobiles will begin to make itself keenly felt by the middle of May. March and April are bad for drive-aways because the roads through the factory districts are nearly all gravel, and a little sunshine and rain soon reduces them to a mass of mud.

With the embargo situation as it stands at present, although matters are somewhat easier than they were during the past months, it is difficult to obtain a small percentage of the freight cars needed to ship away the normal production of the factory. This contemplated shortage of freight cars and the difficulty in drive-aways make the car situation one without parallel in the history of the industry. It is certain that dealers who have not been foresighted sufficiently to lay in a stock of cars in advance are going to feel the pinch.

Far-seeing factory officials have noted that this will have a corresponding effect on the used car industry. As a result distributers in many cases have taken advantage of the lull in sales to fit up the used cars in presentable shape for spring and summer business. It has also been reported that syndicates in certain localities have been buying up used cars to create a modified corner on the market. Nothing definite, however, has been found out regarding this situation.

The automobile market is, of course, elastic in that purchasers do not require immediate delivery when they can keep on using their old cars after the time when they would ordinarily purchase a new one. The delay, however, only increases the coming market, as the potential demand is still there.

Some manufacturers believe that one of the possible effects of the curtailment order, coupled with the big demand which is sure to occur during the coming season, is that local assembling plants will spring up throughout the country, each attempting to fill the market immediately surrounding it.

The motor truck business is reported good everywhere. All the factories engaged in this business here are operating at top production.

Trucks are leaving singly and in trains from all points of Michigan to the South, East and West. Many go weekly by way of Toledo, and a plan is now being considered whereby all trucks bound for the seaboard will carry munitions. The plan is to load every truck to capacity with articles indicated by the government officials, and to deliver them at the seaboard. Then the truck will go to the eastern distributer who has ordered it. If carried out, this will relieve the railroad of thousands of tons of freight and will insure more prompt delivery of the truck than would be possible by freight car shipment.

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Ford Sub-Chaser to Be Ready This Summer

WASHINGTON, March 8—The first submarine destroyer built by Henry Ford for the United States Navy will be ready for its trial trip early this summer. Several boats have been contracted for, but they will not be in quantity production until the one now under construction has been tried out.

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Signal Truck Requires More Capital

DETROIT, March 13—The officers of the Signal Motor Truck Co. have notified stockholders that additional capital is required to carry the business forward successfully and profitably. It is stated in the notification that a proposition has been submitted by outside interests to supply credit up to $250,000 under the following general terms and conditions:

1. The par value of all common stock be decreased from $10 to $5 and that each stockholder be entitled to one share of the capital stock of the company so reduced in par value for each share now held by such stockholder; the balance thereof to be given as compensation for financial assistance offered.
2. The management and control of the company for the term of the agreement to be under the direct supervision of these interests which will receive 2½ per cent of the gross business transacted by the company as additional compensation.
3. The common stock of the company to be increased by 50,000 shares of $5 par value to be sold to these interests at their option at not less than par. Proceeds of such sale, if consummated, to be placed in the treasury of the company for the profit of all stockholders.
4. Preferred stockholders to agree to waive dividends and all rights thereto until Sept. 1, 1918.

As was recently reported in AUTOMOTIVE INDUSTRIES, the Paige-Detroit Motor Car Co. has made an offer to purchase the assets and business of the Signal Motor Truck Co. It is uncertain at the present time whether the stockholders of the Signal company will decide to continue the business for themselves, or will, on the other hand, sell out to the Paige company.

Studebaker Profits Decline

Drop of 60 Per Cent in 1917—Partly Due to War-Time Prices and Schedules

DETROIT, March 12—The report of the Studebaker Corp. and its subsidiary companies for 1917 shows total sales of $50,147,516, which is $11,841,078 or 24 per cent less than the 1916 amount. Net profits declined from $8,611,245 in 1916 to $3,500,741 last year, a drop of 59 per cent. The net earnings for 1917 amount to 9 per cent on the $30,000,000 common stock as compared with 26 per cent in 1916. Last August the dividend was cut from 10 to 4 per cent. A. R. Erskine, president of the company, attributes the heavy loss in gross business and profits partly to unsettled conditions after America's entrance into the war, and partly to the company's concentration of attention on government orders and shipments, with the result that the manufacturing schedule of motor vehicles was reduced, and the plant rearranged on a war basis. Cost of financing operations increased, and to carry the heavy surplus inventory investments, the company obtained bank loans which reached a maximum of $13,231,500, an increase of $7,000,000 over the average of 1916. Before the end of the year, this maximum was reduced to $7,400,000.

The net income account and consolidated balance sheet, as of Dec. 31, 1917, compare as follows:

	1917.	1916.	1915.
Net sales....	$50,147,516	$61,988,594	$56,539,006
Mfg.costs,etc.	45,788,099	53,467,867	47,443,574
Oper. prof.	$4,359,417	$8,520,727	$9,095,432
Other inc....	.....	90,518	152,943
Total inc..	$4,359,417	$8,611,245	$9,248,375
Interest, etc..	298,488	.....	180,950
War taxes....	560,188	.....	.....
Net prof...	*$3,500,741	$8,611,245	$9,067,425
Pr. divs.....	767,550	767,550	830,445
Com. divs....	2,100,000	3,000,000	1,396,580
Sur. for yr.	$633,190	$4,843,695	$6,840,400
Assets—	1917.	1916.	1915.
Plant, etc...	†$15,477,186	$13,437,983	$12,400,493
Goodwill, etc.	19,807,277	19,807,277	19,807,277
Cash	2,528,555	3,196,703	5,910,062
Investments.	847,672	1,142,044	1,570,099
Accts. & nts. receivable..	9,325,499	9,428,391	8,585,199
Inventories..	21,322,134	21,477,657	13,062,041
Fed. chgs....	358,684	235,493	161,445
Total	$69,667,007	$68,725,549	$61,496,617
Liabilities—			
Pr. stock....	$10,965,000	$10,965,000	$10,965,000
Com. stock...	30,000,000	30,000,000	30,000,000
Notes pay....	7,400,000	4,000,000	2,305,500
Acct. pay....	2,080,086	3,542,886	2,770,057
Advances ...	285,212	342,111	504,895
Fed. tax res..	588,589	.....	.....
Sundry cred.	543,389	1,964,694	1,890,095
Coutnl. res...	1,358,237	1,358,237	1,500,000
Spec'l surp...	2,548,654	2,548,654	2,548,654
Surplus	13,947,838	13,314,647	8,470,952
Total	$69,667,007	$68,725,549	$61,496,617

*After $767,550 preferred dividends there was a balance of $2,733,191 applicable to the $30,000,000 common stock, which was equal to $9.11 a share.
†Valuation after depreciation.

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Michigan Buys 1000 Tractors

Ford Machines Will Be Sold Under Restrictions to Farmers by State

DETROIT, March 11—The State of Michigan has purchased from Henry Ford & Son 1000 Ford tractors for delivery beginning April 1. At the same time through Henry Ford arrangements were started for the purchase of a large number of plows to be attached to the tractors. These plows are made by the Oliver Plow Co., South Bend, Ind., and Mr. Ford has personally guaranteed that the state will be able to obtain them. The tractors and plows will be sold to the farmers of the state through the War Preparedness Board, and it is hoped that their use will increase the acreage of Michigan farms for 1918 crops. The tractors and plows will be under control of the board at all time, and will be used practically as community implements. The farmer who buys the machinery is expected to plow his neighbor's field, and the state will see that he does so.

Plan Suggested by Ford

This plan has been adopted at the suggestion of Henry Ford himself. In fact, it is stated that the sale of tractors and plows hinges upon this agreement. The amount of money involved in the transaction amounts to practically $830,000. The tractors are to be paid for at the rate of $750 each, while the plows cost approximately $100 each. Delivery is promised beginning April 1 at the rate of twenty-five a day, which will take one-quarter of the output of Henry Ford & Son's factory at that time. It has been further agreed that if the 1000 tractors prove insufficient, Henry Ford & Son will allow the War Board to have another 1000 at the same price, provided their distribution and use are as planned in agreement above mentioned.

Devising Distribution Scheme

The secretary of the War Board at Lansing is at the present time devising a scheme for distributing the tractors and plows. This contemplates sales by county agents, for cash only, but when a farmer buys the twin implement he makes a contract to plow his neighbor's field within a certain radius. This work, and the price for which it will be done, will be directed by the agents of the War Board. In this way the board believes the entire acreage of the state can be plowed.

Dearborn Meeting Held

A meeting was held at the Dearborn plant on March 9 with members of the State War Board present, to go over the details. At that time Henry Ford said that the state must see to it that the tractors and the plows are kept going from spring until fall. It is aimed to have neither the tractor nor the plow idle any longer than necessary.

From an acreage standpoint it is believed that the use of these tractors on a community basis will greatly increase the output of the Michigan farms. With 1000 tractors each able to plow an acre an hour, it would mean the maximum attainable effort of 1000 acres per hour, or 10,000 acres per day. The amount which the state will allow per acre for plowing is said to be about $2.

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Detroit Valve and Detroit Brass Earn $348,424

DETROIT, March 11—The two units, Detroit Valve & Fittings Co. and Detroit Brass Works, operating as one corporation, earned $348,424.35 last year. Their gross sales amounted to $3,065,733, an increase of $411,554.56 over 1916, when the companies operated separately. After paying dividends amounting to $65,301.25 and setting aside $54,000 as reserve for federal income and excess profits taxes, the sum carried to surplus was $185,128.83. This increased the accumulated surplus to $295,200.78 on Jan. 1, 1918. The company's balance sheet shows:

Total resources	$1,710,846.28
Current assets	1,053,840.09
Working capital	838,744.59
Assets:	
Accounts receivable	322,216.40
Bills receivable	2,125.84
Cash on hand	31,255.61
Prepaid insurance	6,709.19
Inventory	691,533.95
Current liabilities:	
Accounts payable	60,095.50
Bills payable	155,000.00
Plant investment	657,005.29
Outstanding capital stock	1,146,550.00

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Boston Has $10,000,000 Sales Show

BOSTON, March 8—More than 225,000 visitors and 3500 New England dealers attended the Boston show, which closed last night. A new record was made for sales during the week. Between the dealers signed up and retail orders, the volume of business done amounted to at least $10,000,000. One of the most noticeable factors was the tendency of passenger car dealers to obtain truck agencies in conjunction with their regular line.

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Cleveland S. A. E. to Meet March 15

CLEVELAND, March 11—The next meeting of the Cleveland Section of the Society of Automotive Engineers will be held on Friday, March 15, at the Hotel Statler. Charles Tewksbury, of the Electric Tractor Co., will give a talk illustrated with slides and moving pictures on their creeper type of agricultural tractor.

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Tractors to Haul Boats

WASHINGTON, March 11—Tractors will probably be used to haul boats carrying coal over the Chesapeake and Ohio Canal from Cumberland, Md., to the capital. Army officials are now surveying the canal to determine the feasibility of this plan and terminal facilities.

England Revises Gas Restrictions

Latest Regulations Allow Only 10 Gallons a Month for Commercial Cars

LONDON, ENGLAND, Feb. 16—The latest regulations with regard to the use of gasoline in connection with gasoline licenses limits the amount as follows:

Passenger Cars—No fuel for ordinary purposes designated pleasure cars. For business purposes not exceeding 10 gals. per month.

Motor Cycles—not exceeding 2 gals. per month.

Physicians' Cars—Not exceeding 50 gals. per month.

Commercial Vehicles—The amount depends upon the load-carrying capacity and the monthly mileage. The scale, which is a general guide for allowances, is as follows:

Useful Load, Tons	Miles per Gal.	Miles per Month	Gals. per Month
1	13	1,200	85
1½	11	1,100	95
2	9½	1,000	105
2½	8	960	120
3	6	900	150
4	5¾	900	155
5	5⅓	850	165
6	4¾	800	176

Delivery Wagons—For light-capacity delivery wagons 24 to 30 gals. per month.

Taxicabs—Forty to 60 gals. per month, according to the size of the city or town.

Passenger Buses—Approximately 45 per cent of the estimated requirements in June, 1916.

Renting Automobiles—Approximately 20 to 30 gals. per car per month, the amount depending upon the number of cars owned by the applicant.

In connection with the sale of gasoline, the Board of Trade, under the Defense of the Realms regulations, which limit the retail prices of all motor fuels, has placed a profit on gasoline sold by retailers at 10 cents per gallon above the cost. This order also limits the price of kerosene to 8 cents per gallon above its cost to the retailers.

For some time the price of gasoline has been limited to 15 per cent by agreement between the importers and the Motor Trade Assn., which is an organization of motor interests. The new order gives legal sanction to the price and also places the maximum profit at 10 cents per gallon.

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Michigan Roads Meeting Postponed

DETROIT, March 11—The postponed annual meeting of the Michigan State Good Roads Assn. will be held here in September. The Michigan State Highway Department and the Highway Engineering Department of the State University will promote instructive features. The completion of the good roads system in Michigan will be considered and a tour of the highways of Wayne County will be a feature of the meeting.

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England Trying to Evolve Suitable Tractors

Comprehensive Research Work Needed—Board of Agriculture Has Scheme for Establishing Institute of Mechanism

LONDON, ENGLAND, Jan. 15—The present tractor situation is creating a fairly widespread feeling in Great Britain to the effect that a great deal of comprehensive research work is needed in order to evolve tractors absolutely suited for use in the British Isles. The Board of Agriculture is busy with a scheme for founding an Institute of Agricultural Mechanism for the conduct of researches. It is conceivable that tractor manufacturers will also form a Research Association, with financial help from the Government. There is no branch of the motor industry in which a study of local conditions and the establishment of principles based upon those conditions is so necessary, and many machines which no doubt do admirable work in the districts for which they were primarily designed have secured by no means enviable reputations on British farms.

With regard to the question of whether farm tractors ought also to be suitable for road haulage, the general trend of opinion appears to be in favor of designing for field work only. A good deal depends on the modifications that may be made in British law as applied to road vehicles. At present springing of front and back axle is essential. This is probably also desirable from a mechanical standpoint, because the roads are hard and an unsprung machine shakes itself to bits very rapidly.

Tires and Rims Regulated

There are also stringent regulations, the operation of which is only temporarily suspended, as to the design of tires and rims. A tractor intended for general purpose work in Great Britain should be so designed that the spuds or other fittings can be very rapidly applied or removed. For road haulage, something nearly approaching a smooth tire must be provided. There must also be two independent systems of brakes, each adequate in itself to hold the tractor and its loaded trailer on a steep gradient upon a hard road.

Small fields are so common that there is much of the time wasted in turning at headlands, and a strong feeling is growing up in favor of the introduction of what might be called a double-ended tractor, running at equal speeds in either direction and working in connection with balanced plows.

It is too early as yet to attempt to indicate the degree of success attending the British Government's scheme for extensive ploughing by tractor, but one or two points of interest and importance are gradually emerging from a position that has been somewhat chaotic. It will be remembered that, following upon the demonstrations of agricultural tractors which took place in Scotland in October last, the Committee of Observers emphasized in its report the strong desirability of securing light tractors of ample engine power. It was stipulated that the ideal general purpose tractor for use in Scotland should develop not less than 20 B.h.p. and should weigh not more than 30 cwt. Many manufacturers on both sides of the Atlantic have adhered to the view that weight cannot advantageously be reduced to anything much below 2 cwt. per horsepower. It has been contended that, under many circumstances, any excess of power could not be utilized, but practical results appear to be going against this conclusion.

Must Be a Compromise

If we admit that the ideal arrangement would be to design one type of tractor for light land and another for heavy land, we are faced with the fact that both classes of land are not infrequently found in the same field. Therefore we must compromise, or else, when heavy land is encountered, we must use a plough with fewer breasts. The best compromise appears to be found in the light and powerful tractor, the wheels of which are fitted with a large number of spuds, fairly sharp and long but not very wide, and arranged in diagonal sets so that some are always getting a good grip. Blunt attachments waste power in compressing the soil, and spuds ranging from side to side of the rim are apt to get clogged up and to become inefficient.

Opinion generally is turning in favor of using a type of tractor suited to run with one driving wheel in the furrow. Under these circumstances it is felt that the lateral movement of spuds through the ground has generally a beneficial sub-soiling effect. Also that this position brings the wheel generally on to firmer and drier ground.

It is very difficult to get a reliable indication of the official view held in Great Britain on such points as those mentioned, but the writer is strongly of the opinion that the great majority of experts who have been concerned with the Government scheme of ploughing favor the light powerful tractor running with one wheel in the furrow.

On the subject of chain tracks and kindred devices opinions differ. The Committee of the Scottish Trials was not favorable to this method of propulsion, emphasizing the probability of rapid wear and tear and apparently failing to see any compensating advantage in improved foothold or reduced compression of the soil. Others equally qualified to judge regard the chain track as giving the best grip on a loose or slippery surface and as affording at least a fairly satisfactory means of avoiding the bad results of compression when heavy soil is moist or wet. Such soil, under these conditions, when subjected to compression form a paste from which a good seed-bed cannot be obtained and which may take years to eradicate. Such considerations are forcing us to a realization of the desirability of making fuller use of the speed capacities of farm tractors. This in turn means the employment of specially designed tractor ploughs in place of the old horse ploughs, the work of which is often very bad if they are hauled at more than 2 miles per hour. The great point is, of course, to make use of the adherent advantage of the tractor that it can, if given the chance, do its work very rapidly when weather conditions are such that the texture of the soil is just right.

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Detroit-Pontiac Truck Line

DETROIT, March 12—Pontiac is connected with this city by a motor truck line operated and owned by the General Storage & Cartage Co., Inc., of Detroit. The present service is intended for bulk tonnage, but package service will be installed soon. Five motor trucks of from 5- to 10-ton capacity have been assigned to the service. The trip between the cities can be made in two hours, and the charge for service, in cents per hundred pounds, ranges from 9 cents for fifth class to 18.8 cents for first class deliveries.

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2 New C. M. Lamps

DETROIT, March 12—The C. M. Lamp Co. is working on two new lamps—one for seaplanes and the other an acetylene lamp for tractors. The company reports its March business will be 100 per cent more than last month, and the February business was double that of January. An $800,000 government order for booster jackets was placed with the Kenosha plant and a smaller order was given the Detroit plant. The company states it has enough steel at both plants to last six months.

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10 Munitions Districts for U. S.

WASHINGTON, March 13—To bring about decentralization, and closer contact with munitions manufacturers, the Ordnance Department has divided the country into munitions districts with headquarters for the different zones at Pittsburgh, Cleveland, Rochester, Boston, New Haven, Detroit, Cincinnati, Chicago, New York and Philadelphia. A district chief of production will be located in each of these cities.

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Airplane Mail Service Delayed

WASHINGTON, March 12—The start of the airplane mail service between Washington, Philadelphia and New York will probably be delayed until May 15, because landing fields have not yet been found at Philadelphia and New York. It was originally planned to begin the service April 15, with army aviators as pilots and a daily trip between the cities each way. It is stated that the League Island field at Philadelphia was not found available, and a committee of army fliers and postal officials will begin investigation of other Philadelphia sites.

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New York sites will be inspected after that. At present the airplanes require starting and landing fields 2000 ft. square, but the Post Office Department is experimenting with devices to allow starting and landing of airplanes on smaller fields and possibly on the roofs of large buildings.

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Truck Supply Service Postponed

WASHINGTON, March 13—The proposed automobile supply service by motor truck between the Quartermaster Depot at Philadelphia and the Marine Camp at Quantico, Va., via Washington and Baltimore, has been postponed because of the bad road conditions between Quantico and Washington. It is possible this service may be established early in May.

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Electric Storage Battery Earns 14 Per Cent

PHILADELPHIA, March 13—In a preliminary report of the Electric Storage Battery Co. for the fiscal year ended Dec. 31, 1917, net profits of $1,207,061 for the first half, or 14 per cent per annum on the common stock, are shown. Although the rate for the second half may not have been as high, and deductions for taxes may modify the final figures, the 1917 earnings are far beyond those of any other year. In 1916 this amounted to 9.7 per cent, in 1915 8.4 per cent, and before this averaged 7 per cent. Most of the company's expansion is represented largely by government contracts.

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Overland Price Increase in April

TOLEDO, March 9—The Willys-Overland Co. has sent out a telegram to all dealers stating that all orders made after March 1 will be shipped and driven away during March if possible. After April 1 prices are scheduled for an increase, although no announcement is made regarding when the new prices go into effect or what the increase will be. C. A. Earl, vice-president of the Willys-Overland Co., has informed representatives of Automotive Industries that a price increase is certain after that date.

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United States Truck Prices Raised

CINCINNATI, March 8—The United States Motor Truck Co. has increased its prices, to take effect on and after April 15. The prices follow:

Model	New Price	Old Price
E, 2½-ton chain drive..	$2,800	$2,650
H, 2½-ton worm drive..	3,250	2,950
D, 3½-ton chain drive..	3,500	3,350
J, 3½-ton worm drive..	3,950	3,650
K, 5-ton worm drive....	4,850	4,550

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Vocational Training Outlined

WASHINGTON, March 12—The Federal Board for Vocational Education has issued Bulletin No. 7, which gives outlines and suggestions for a course designed to qualify men as skilled chauffeurs or motor truck drivers. The bulletin covers the complete course which is to be used in the various Army training schools.

Peerless Profits Are $1,065,869

Equal to 10.6 Per Cent on Common—Sales Aggregate $18,924,451, 39 Per Cent More Than 1916

NEW YORK, March 12—The annual report of the Peerless Truck & Motor Corp. shows net sales of $18,924,451, exclusive of munitions contracts, an increase of $5,399,428 over 1916. Profits, after the deduction of interest and reserve for depreciation, losses and taxes, amount to $1,065,869, or 10.6 per cent of the $10,000,000 outstanding common stock, as compared with $1,356,358, or 13 per cent, in 1916.

The consolidated balance sheet, as of Dec. 31, 1917, follows:

ASSETS

Land, Plant, Buildings and Equipment, Less Depreciation:		
Balance at Jan. 1, 1917.....	$4,891,680.43	
Net reduction during year...	713,518.10	
	$4,178,162.33	
Less: Amount charged off for depreciation for year.....	291,848.68	
Balance at Dec. 31, 1917.....		$3,886,313.65
Patents, franchises and good will, including cost of acquisition of stocks of subsidiary companies		3,710,520.00
Current assets:		
Cash in banks and on hand..		2,869,569.48
Marketable securities at current quotations		192,980.00
Inventories of finished product, work in process, raw materials and supplies valued at cost or market, whichever is lower		5,318,743.29
General Vehicle Co., Ltd., London, investment and current account, less reserve		63,412.68
Sundry debtors		111,298.69
Accounts and notes receivable, less reserves, including documentary drafts in process of collection, per contra		2,098,204.83
Total current assets		$10,654,208.97
Bankers' Trust Company, Trustee:		
Cash deposited under trust agreement to acquire balance of stock outstanding of The Peerless Motor Car Company		29,190.00
Deferred assets:		
Prepaid expenses and insurance		43,676.31
		$18,323,908.93

LIABILITIES

Capital		$4,898,110.20
Representing consideration received in cash for the following capital stock issued as full paid and non-assessable in terms of financial plans filed in accordance with the Statutes of Virginia:		
Capital stock authorized:		
400,000 shares of $50 each..		20,000,000.00
Whereof issued and outstanding:		
200,000 shares of $50 each..		10,000,000.00
The Peerless Motor Car Company:		
7 per cent cumulative preferred stock, outstanding in hands of public, 278 shares of $100 each.....		27,800.00
Funded debt:		
Peerless Truck and Motor Corporation Ten Year 6 per cent secured convertible gold notes		5,000,000.00
Subsidiary companies		280,000.00
		$5,280,000.00
Current liabilities:		
Accounts payable		1,264,413.81
Documentary drafts discounted, per contra..... ...		1,044,891.56
Sundry creditors and reserves, including reserves for Federal taxes.....		716,859.36
Total current liabilities ...		3,026,164.73
Special reserve for contingencies*		719,915.84
Surplus:		
Current surplus:		
Balance at Jan. 1, 1917 (whereof accrued prior to Nov. 10, 1915, $1,018,858.77)		2,575,595.87
Add: Net profit for the year, as per profit and loss account, after provision for estimated requirements for Federal excess profits tax and income tax, year 1917.....		949,483.27
		$3,525,078.64
Deduct: Dividends on preferred stock of The Peerless Motor Car Company in hands of public.....		1,946.00
Balance, Dec. 31, 1917.....		$3,523,132.64
Surplus capital, General Vehicle Co., Inc.:		
Balance at Jan. 1, 1917.....		848,785.52
Total surplus, Dec. 31, 1917.		4,371,918.16
		$18,323,908.93

The consolidated profit and loss account for 1917 follows:

Net sales, excluding munitions and special contracts of the the General Vehicle Co., Inc...	$18,924,451.88
Deduct: Cost of sales, including plant maintenance and repairs and depreciation of plant.....	17,621,833.55
Net income from sales	$1,302,618.33
Other income, including profit on special contracts of the General Vehicle Co., Inc., and interest earned	405,013.44
Total income	$1,707,631.77
Deduct: Interest on two year 6 per cent convertible gold notes	300,000.00
Depreciation in market value of investments and losses on investments sold	34,962.51
Federal excess profits and income taxes	306,799.39
Total deductions	$641,761.90
Balance	$1,065,869.87
Special reserve for contingencies	$116,386.60
Net profit for year carried to balance sheet	$949,483.27

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To Drive 40 Marmons

INDIANAPOLIS, March 14—The first large driveaway ever held by the Nordyke & Marmon Co. will leave here Sunday for New York. Forty cars will be in line and will go via Columbus, Pittsburgh and Philadelphia over the Lincoln Highway. Last year the New York agency drove 15 or 20 cars, but got most of what it wanted by rail. This winter it secured a few by rail but now has been compelled to resort to the driveaway. Drivers are difficult to secure.

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Marshall on Industrial Committee

WASHINGTON, March 12—In line with the general policy of the Secretary of War to keep thoroughly advised of the detail workings of the various departments of the Government and with the industrial conditions involved in the consummation of the various war programs, announcement is made of the appointment of a committee consisting of Snowden Marshall of New York, Edward Wells of the Babcock & Wilcox Co., and a third whose name will be announced later. This committee will make a broad survey of the Government's aeronautical program with particular relation to the industrial phases of the work.

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Sell 3000 Overlands in South America

Argentine Sales Held Back by Labor Troubles and the Railroad Strike—Import Duties to Be Increased

NEW YORK CITY, March 8—Approximately 3000 Willys-Overland cars were marketed in the South American countries during the 1917 calendar year, according to Edward Rochette, South American representative of Willys-Overland, with headquarters in Buenos Aires, who has just completed a business trip in this country. Although Argentina has just harvested one of its best crops, as compared with the poor crop in 1916, the last automobile selling season, beginning in November and extending to the present, has generally been a disappointment to all Argentine dealers. The added buying value of the good crops has been offset by unsettled conditions due to labor troubles. There has been the additional problem of the relationship between Argentina and the Allies with regard to the purchase of the crop. The purchasing agreement was not settled until January, 1918, the middle of the selling season. Up to this point farmers did not know what they were going to realize from their crops and held back buying.

Railroad Strike Hurts Sales

The unfortunate railroad strike, which lasted more than 6 weeks, injured sales. It was not possible for distributers in Buenos Aires to drive automobiles overland to different parts of the country as it is possible in this country. Labor leaders would not allow specially hired chauffeurs to drive machines overland. It was possible only for the owner or his private chauffeur to do such work. Others attempting it were mobbed.

There was one bright side to the strike situation, namely, that sales increased in Buenos Aires so that business men could get out of the city to look after their affairs. Some of these men paid as much as $160 to be driven from Buenos Aires to the port of Bahia Blanca, a distance of 375 miles.

Import Duties to Be Increased

Cable dispatches from Buenos Aires, according to Mr. Rochette, indicate that the import duty on automobiles and parts will soon be increased 20 per cent. Up to the present the import on automobiles has approximated 12 per cent and that on parts approximated 45 per cent. The increased custom duties will increase sales resistance.

Argentina has not been suffering severely from lack of shipping facilities, and ocean rates were not as high as they were 2 years ago. The majority of cars pay 67½c. per cu. ft. A few were imported at a maximum rate of $1.15. Occasionally the rate was as high as 80 or 90c. per cu. ft. At present Willys-Overland is shipping cars via New Orleans, which costs approximately $5 per car more than via New York.

The question of the 56-in. tread in Argentina is far from being a settled factor, notwithstanding the ruling of American manufacturers that they would only supply this width of tread for South American countries. Road conditions in the Argentine camp or country have not improved in the last 2 years and the demand for the 60-in. tread is as great as ever. During the 1917 year Ford was generally supplying 60-in. treads, and so was Studebaker. They were apparently using up stocks of axles that were on hand previous to the agreement among American manufacturers. Overland is now obtaining what amounts to a 60-in. tread by use of a special design of wire wheel which places the tread of the tire 2 in. further out on each side. As the majority of American motor cars are sold in the country, the problem of the 60-in. tread is important.

A strong demand still exists throughout Argentina for magneto ignition, and Willys-Overland cars sold are so equipped. Studebaker is also providing a magneto. The demand for the magneto is due to the fact that, in country travel, cars frequently have to cross small streams, and the owner believes magnetos suffer less than batteries from the water.

Mr. Rochette is convinced that electric starting and lighting are essential and are wanted throughout South America. Troubles due to battery service are not retarding the sale of cars at present. Most of the battery service and repair work for Argentina is handled in Buenos Aires. P. A. Hardcastle, Willys-Overland distributer, who also has the agency for the U. S. L. batteries, has all repair work done at his depot.

Seven-Passenger Car Popular

The 7-passenger car continues to be the great seller in Argentina and Brazil. There is also a good demand for 5-passenger cars, but it is believed if every car offered for sale accommodated 7 passengers it would be in greater demand. Mr. Hardcastle at present has 120 dealers throughout Argentina, but these must not be thought of as dealers pursuing intensified selling methods like those of North American dealers. The Argentine dealer does not pay deposits on cars when they are ordered, but rather the distributer in Buenos Aires consigns the cars to them, and generally has to wait some time for his remittance after the cars are sold.

In the accessory field, American tire makers have the majority of the business, although such European tires as Michelin, Pirelli, Dunlop and the North British Clincher are selling well. The American trade is headed by Goodyear, followed by United States, Fisk, Goodrich, Firestone and Republic. Tire prices are considerably higher in Argentina than in the United States, a 34 x 4 casing retailing in Buenos Aires at $40 U. S. A. currency. As yet there is small demand for cord types.

Gasoline is now retailing at 55 cents U. S. A. money, per standard gallon. Due to the activities of the Bowser Co., the curb-side gasoline pump, which was introduced into Buenos Aires 2 years ago, has been making good progress.

Mr. Rochette reports that retail sales in Rio de Janeiro, Brazil, have been increasing in the past year and that the general condition of the city as a selling market is improving. This is due to the fact that 2 to 5 years ago Rio dealers were heavily stocked with European cars, which they were compelled to sell on long time payments. Many of these payments are now completed and American cars are now taking the place of the European models. The selling field in Sao Paulo, which is a better Brazilian field than Rio, continues good. Sao Paulo is on the edge of the great coffee belt, a night's ride by railroad from Rio, and this city as well as the fertile coffee land is also good. On the other hand conditions in Rio are different in that the city is surrounded by a mountainous area, and all sales are practically limited to the city and its immediate suburbs.

In a few of the leading South American cities, such as Buenos Aires, Montevideo, Rio and Sao Paulo, there is a slightly increasing demand for the sedan type of car for city use. This type, however, is too heavy for the country roads, and has not met with any appreciable demand.

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Boone Tire Condition Satisfactory

CHIPPEWA FALLS, WIS., March 11—The Boone Tire & Rubber Co. is in an altogether satisfactory financial condition, despite reports published in local newspapers to the contrary. These reports were circulated by a disgruntled employee, and are disproved by the financial statement of the company. On Jan. 1, 1918, total fixed and current assets amounted to $259,275.18 as compared with total current liabilities of $77,655.09. Since the first of the year the assets have been increased by the additional sale of $50,000 of capital stock.

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Illinois License Fee Increased

CHICAGO, March 9—Motor vehicle license fees in Illinois have been increased from 50 to 100 per cent for 1918, and a further increase will take place in 1920. License fee costs follow:

Vehicle	1917	1918	1920
Motor cycles	$2.00	$3.00	$4.00
10 H.P.	3.00	4.50	6.00
10-25 H.P.	4.00	6.00	8.00
25-35 H.P.	6.00	9.00	12.00
35-50 H.P.	8.00	16.00	20.00
Over 50 H.P.	10.00	20.00	25.00
Electric, under 2 tons	5.00	10.00	12.00
Electric, over 2 tons	10.00	20.00	25.00
Dealers	6.00	10.00	12.00

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No Duty on War Supply Material

WASHINGTON, March 11—Raw materials, parts of equipment necessary to production of war supplies on which an import duty is now imposed will be admitted free during the war if an amendment offered by Senator Martin of Vir-

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ginia to the deficiency appropriation bill is accepted. The amendment reads:

"During the present emergency, upon request made by the Secretary of War to the Secretary of the Treasury and under regulations to be prescribed by the Secretary of the Treasury, there may be imported into the United States without payment of duty thereon, raw materials, parts, or partly fabricated parts of equipment or finished equipment required to hasten the production of munitions or machinery of war or other necessary war supplies whenever such duty would otherwise be payable directly or indirectly from appropriations for support of the army."

Western Insurance Rates Changed

CHICAGO, March 9—New insurance rates and rules for motor cars on liability, property damage and collision policies, have been sent out to agents in the territory of the Western Underwriters' Conference, which includes the Central States. Hereafter there will be two policies offered for property damage, one giving the complete coverage without any deduction, for which a much higher rate will be charged than at present, and the other will be under a $100 deductible form, with a lower rate than for the present $25 deductible form.

The full coverage form, under the new ruling, does not have the $200 fire loss exclusion nor the old road bed exclusion, but covers every legitimate collision loss. The old form used to exclude loss by fire up to $200, and also exclude property damage caused by "collision with the road bed." There is no longer any differential collision rate between commercial cars and private passenger cars. Livery cars and other public cars, as well as demonstrators, will carry higher rates.

Washington Hangars for Liberty Planes

WASHINGTON, March 11—Hangars now being constructed in Potomac Park to accommodate two airplanes will house two Liberty airplanes, according to report. These airplanes, it is said, will make flights over Washington within the next few weeks to demonstrate their real ability.

U. S. Chamber of Commerce Meeting in April

WASHINGTON, March 8—More than 500,000 business men will be represented at the sixth annual meeting of the United States Chamber of Commerce, to be held in Chicago April 10, 11 and 12. The questions of financing the war, the railroad situation, centralized control of industry and the shipping problem will be discussed both from the point of view of filling the government's needs and that of causing a minimum disturbance in private industry.

Navy Agent Arrives in France

WASHINGTON, March 9—Lieutenant Commander Benj. Briscoe, United States Navy, has arrived in France, where he will have charge of specified construction for the navy.

4,500 British Trucks Run on Gas

Only 4 Per Cent Is Supplied to Passenger Cars—Remainder for Business Purposes

LONDON, ENG., Feb. 14—At present, 4500 motor trucks are running on gas carried in large rubber gas bags, instead of using gasoline, and orders are on hand for gas containers for 2500 motor trucks which have not been able to obtain them up to this time. These figures indicate that gas will be used to a very large extent, not only because of its economy, but because the production of excess quantities of gas is inevitable from the process for the production of benzol from soft coal, which benzol will be then used as well as gasoline.

The production of gas is also certain because of coke manufacture, the coke being used in heavy commercial vehicles. This increased use of benzol and gas appeals to the motorist, in that it makes him independent of imported fuels, which is a consideration in days when ocean tonnage is at such a premium.

There has been some misunderstanding as to the use of gas, in that many people have concluded that it is being used by passenger cars to which the use of gasoline has been denied. The fact that only 4 per cent of the total deliveries of gas apparatus to date has been to owners of private cars indicates that the use of gas has been taken up by the business man for his motor trucks. Further orders of gas apparatus for passenger cars cannot be accepted, as the use of gas for cars is practically subject to the same restrictions as gasoline.

It is estimated that the saving of gasoline for business vehicles alone amounts to 3,000,000 Imperial gallons a year due to the use of gas.

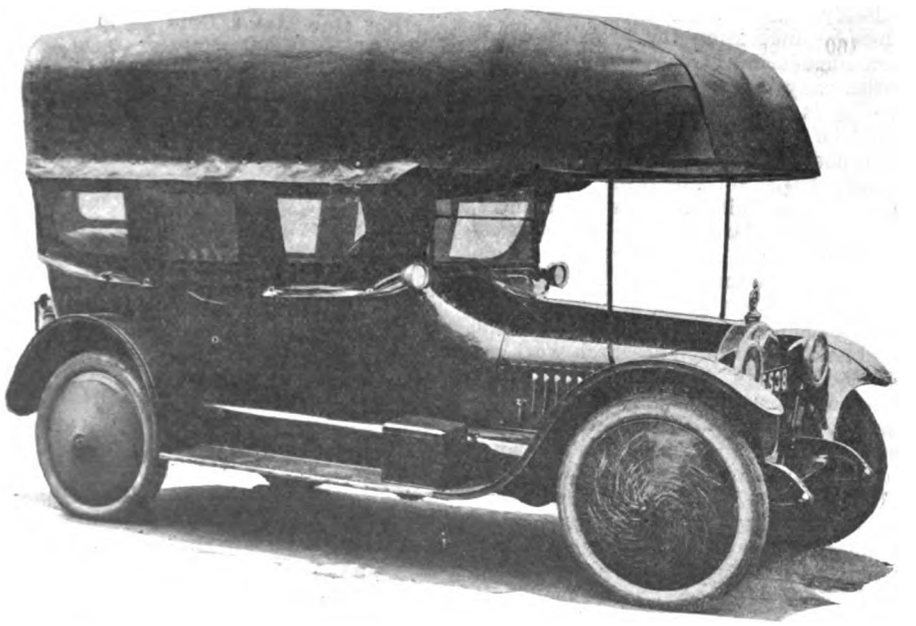
Recently a gas traction committee was formed by the government to consider what further rules are necessary with regard to gas as a fuel. This committee will issue a report in a few weeks containing recommendations for the use of gas and flexible containers at atmospheric pressure, and will also indicate the limits of approved use under limited pressure in semi-rigid containers. The committee will also outline the necessary restrictions for the use of compressed gas at high pressures after the war.

Purchasing Agents Form Toledo Branch

TOLEDO, March 12—A branch of the National Assn. of Purchasing Agents has been established here as a result of an organization meeting and dinner. The charter of membership was signed up at the first meeting, and it is expected that this will be increased to 150 representing the largest industries in the city. F. J. Solon of the Owens Bottle Machine Co. is president. Other officers are: First vice-president, Mark Kuehn of the National Malleable Castings Co.; second vice-president, W. L. Flaherty of the Toledo Scale Co.; treasurer, R. H. Bradley of the Walding, Kinnan & Marvin Co., and secretary, R. A. Luedtke of the National Malleable Castings Co. Meetings of the new organization will be held twice a month. The national association has branches in the larger cities.

Flyers Study Ignition

CHICAGO, March 9—Several aviators are being sent to Chicago from the government aviation school to study magnetos. Squads of 8 student aviators are spending 2 weeks in intensive study at the Chicago branch of the Bosch Magneto Co. A third squad from the aviation school at San Antonio, Texas, is just completing its course, and it is expected that squads from the other flying camps will also receive this training.



British passenger cars operating with gas as a fuel have a large gas container bag attached to the top

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Standard Gearing for Tractors

Minneapolis Section of S. A. E. Told of Necessity for This in Farm Work

MINNEAPOLIS, March 11—Laying emphasis upon the tremendous strain under which the gearing in a farm tractor is required to do its work, A. W. Scarratt, of the Minneapolis Steel & Machinery Co., stated in a paper read before the Minneapolis section of the Society of Engineers that a tractor transmission must do the work in one year that a passenger car transmission would do in 20 years. The title of the paper was Tractor Gear Teeth and Materials.

Mr. Scarratt deplored the lack of real engineering data as to gear teeth which would aid in conserving valuable material. Materials for gears are of a wide range, each of which has some advantage, and each tooth shape has some favorable point. In choosing a material it must have proper strength for the loads, proper hardness for service and proper dynamic qualities against impact and fatigue, and it is on the last point that there is a lack of information as well as on the strength of gear teeth.

The speaker suggested experiments for data on the relation of surface pressures and the degree of surface hardness necessary to produce a given service. Because of the various shapes of teeth no common rule can be employed to figure their strength. The most commonly used formula for these particular types of teeth is the Wilfred Lewis, but several large manufacturers do not adhere to the Lewis recommendations for allowable stress, because, considering the ability of chrome vanadium steel to resist impact forces as against cast iron, for instance, it is foolish to class them accordingly.

Besides increasing the pressure angle when considering strength of gear teeth another way of increasing load carrying capacity is to shorten the tooth. There should be a standard stub 20-deg. tooth which does not have definitely fixed proportions based on the pitch. The Fellows system fails in some instances, necessitating a larger pitch. In the present system there is no convenient or accurate formula for figuring the strength of these stub teeth. The speaker said there is room for great improvement and enlightenment through research work.

F. McDonough discussed a new form of hydro-automotive transmission as patented by Joseph Rosche, a device for the commercial realization of hydraulic transmission as applied to motor vehicles. It is a step toward eliminating weaknesses in principle which are native to the present system generally utilized on automobiles and trucks, and which is saved from failure by finest materials, workmanship and detailed engineering design.

Solution of the problem of an efficient and flexible transmission for motor-driven vehicles seems to have been reached in the perfection of a hydraulic transmission. Driving and driven cylinder pistons are stationary when both are rotating at the same speed. It has no revolving surfaces coming in contact, all cylinders being integral in one casting.

—

Motor Products Earnings $537,527 in First Year

DETROIT, March 14—The Motor Products Corp., Detroit, made during 1917 net profits of $537,527, of which $233,333 has already been paid in dividends. This is the end of the first full fiscal year ending Dec. 31, 1917. The corporation has no liabilities except its current monthly accounts. Assets in the nature of cash, sound accounts receivable and land contracts amount to $2,919,967.

The corporation's sales for the year have amounted to $9,633,082, which is an increase over the previous period of 48.6 per cent. This increase does not include any Government or war orders and covers a term in which the corporation's affairs were consolidated by the bringing of four of its manufacturing plants into the newly acquired Lozier plant.

No provision has been made in the above earnings for federal taxes, and it is estimated that they will be $80,000 or $100,000. Government business for the future has been obtained to the amount of $5,500,000. Orders have also been obtained for new business to the amount of $2,000,000.

The balance sheet shows assets of $5,049,072, of which $2,725,390 are current and $2,520,720 are fixed. The company has a main factory at Detroit and branches at Ann Arbor, Mich., and Walkerville, Ont.

—

How One Maker Gets Freight Cars

DETROIT, March 9—As a corollary to the freight car shortage and the problems which it has brought about, it is reported that one Detroit manufacturer of cars has been given permission by the government to use a certain number of freight cars with the understanding that they are to be sent into the grain belt. Thus the empties can be used for sending foodstuffs back East.

—

Car Equipment Company Bankrupt

DETROIT, March 9—The Universal Car Equipment Co., maker of body and top equipment, such as fenders, tire holders, radiators, shields, etc., has been adjudicated bankrupt, and its equipment will be sold at auction on March 11 in Detroit. Creditors have been notified that they should be prepared to close up their business with the bankrupt corporation on March 12. The property for sale at auction is valued at $2,953.50. The sale has been called by Lee E. Joslyn, referee in bankruptcy.

Bureau at Capital Proposed

But Plans of N. A. C. C. and M. A. M. A. Are Immature Yet—Production Census

WASHINGTON, March 12—At this time and until the meeting of the Motor & Accessory Manufacturers' Association this coming Friday, plans both of Hugh Chalmers and A. W. Copland, members of the Automobile Industries Committee, recently dissolved, are uncertain. Mr. Chalmers has a number of matters to be cleared up that concern the committee, and Mr. Copland does not yet know whether his committee will be continued with him in charge or not.

Reports have it that the committee will in all likelihood continue to represent the M. A. M. A. here. Mr. Chalmers stated to-day that he will endeavor to organize a sort of clearing house and bureau of information for the automobile and truck manufacturers.

As the offices of both organizations are now located jointly in two buildings, the Ouray Building and the Second National Bank Building, action will have to be taken at the coming meeting to decide which offices will be occupied by each.

The National Automobile Chamber of Commerce is sending to each manufacturer of automobiles a blank statement to be filled in and returned to the National Automobile Chamber of Commerce, showing the number of cars produced since the beginning of the fiscal year, materials on hand, commitments, and what production would be without curtailment and what it will be with a 30 per cent curtailment arranged between the Fuel Committee of the industry and the Fuel Administration.

The Chamber will file these reports with the War Industries Board, which, where they are not sworn to, will retain the right to order special investigations of any company or companies.

—

Jones Prices Increased

WICHITA, KAN., March 11—The factory prices of Jones passenger cars will be increased on March 15 as follows:

Model	New Price	Old Price	Increase
7-passenger touring 26B—(Lewis engine)	$1,775	$1,675	$100
5-passenger roadster 26A—(Lewis engine)	1,775	1,675	100
4-passenger sport type 26C—(Lewis engine)	1,775	1,675	100
7-passenger touring 27A—(Continental engine)	1,875	1,675	200
4-passenger roadster 27A—(Continental engine)	1,875	1,675	200
4-passenger sport type 27C—(Continental engine)	1,875	1,675	200

—

Oakland Models Increased $60

PONTIAC, MICH., March 12—An increase of $60 in the price of all Oakland models went into effect March 1. The prices follow:

Model	New Price	Old Price
Town car	$2,000	$1,940
Unit body sedan	1,550	1,490
Convertible sedan	1,250	1,190
Roadster coupe	1,210	1,150
5-passenger touring	1,050	990
3-passenger roadster	1,050	990

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Transport Committee Urges Extensive Work

WASHINGTON, March 13 — Indications point to an unprecedented development of highway traffic in 1918, as a result of the nation-wide effort that will be made to keep roads open every day in the year. Last year storms frequently killed travel over urgently needed roads, isolated many farms and struck a severe blow at the nation's war preparations. Short-haul freight which could not be handled by already over-taxed railroads, but which could have been diverted to clear highways, was piled up in immense quantities.

The foregoing facts are given by the Highway Transport Committee as a few of the arguments why it is a patriotic duty to keep all roads open at this time. State, municipal, county and township organizations should be concentrating on plans to safeguard traffic against all of the interruptions that were met last winter. Sufficient machinery and horses are on hand to do this, the main difficulty being to get a quick start.

—

10 Per Cent Dividend Paid by Alter Motor

DETROIT, March 11 — The Detroit Trust Co., trustee for the Alter Motor Car Co., Plymouth, Mich., is distributing an initial dividend of 10 per cent to creditors, realized on the sale of the property. Liabilities were $25,000, and it is expected the creditors will receive not more than 25 per cent.

—

Demand for Automobile Body Lumber

ST. LOUIS, March 13—Hardwood lumber manufacturers here, who sell largely to automobile body-builders, say that more orders are being received now than for several months past. Large buyers are convinced that sap gum will not answer for body building, and that manufacturers are returning to ash, and to maple for cheaper bodies. Prices of maple and thick ash have been advanced, the former because of an insufficient supply, and the latter as a result of the heavy use in airplanes and vehicles. Automobile body ash, less than 2-in. in thickness, is quoted at $80 for first and seconds, and $64 for No. 1, as compared with $58 and $35 a year ago.

—

Liberty Planes En Route to Washington

LAKE CHARLES, LA., March 13—Two Liberty airplanes have been shipped from here and are en route to Washington, where they will receive flying tests.

—

2200 Scripps on Order

DETROIT, March 12 — The Scripps-Booth Co. has on its books unfilled orders for 2200 cars of its new model. The company puts out 20 cars a day, half of which are of the old four-cylinder model.

—

Kelly-Springfield Reduces Stock

CLEVELAND, March 13—At the annual meeting of the Kelly-Springfield Tire Co. it was voted to reduce the 6 per cent cumulative first preferred stock to the extent of $248,900 in accordance with the plan described in a recent number of AUTOMOTIVE INDUSTRIES. The retiring directors of the company were re-elected at the meeting.

—

Jacobson Machine Now Warren Products

WARREN, PA., March 13—The Jacobson Machine Mfg. Co. will hereafter be styled Warren Machine Products Co. Formerly the company concentrated on the manufacture of gas engines, but this has become a minor activity, and the style was changed so that it would suggest the main products.

Plan Tractor Demonstration in Vicinity of Wilmington

DOVER, DEL., March 13—The Kent County Farm Bureau, the official link between the Government and the farmers of the central county of the State, has arranged for a tractor demonstration to take place in this vicinity for 3 days during the week of April 15. It is hoped that this will attract not only Kent County farmers, but those in the other two counties of the State. Demonstrations in plowing, fitting and preparing the land will take place each afternoon, the mornings being allowed for examining the machines. An invitation has been extended to all tractor manufacturers with agencies here to take part in the demonstration. Seven have responded and each, it is expected, will exhibit several different types of machine.

—

International Harvester Tractor Schools

GRAND RAPIDS, MICH., March 13—The International Harvester Co. of America has established three tractor schools in this state to educate operators in handling tractors more efficiently. More than 90 per cent of tractor troubles are caused by lack of knowledge on the part of the operator and can be avoided if the operator learns the general construction of an internal combustion engine.

—

Army Laundry on Trailer

WASHINGTON, March 11—The first portable army laundry built to accompany an army and wash clothes for soldiers in the field arrived here yesterday. The plant, invented by J. F. Broadbent, consists of a steam tractor and standard laundry equipment mounted on a trailer.

Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co.	51	54	—1
*J. I. Case T. M. Co. pfd.	84	85	—1
Chalmers Motor Co. com.	4	6	—2
Chalmers Motor Co. pfd.	30	40	..
*Chandler Motor Co.	87	88½	— ½
Chevrolet Motor Co.	120	123	+3
*Fisher Body Corp. com.	30	35	+2
*Fisher Body Corp. pfd.	80	87	..
Fisk Rubber Co. com.	50	53	..
Fisk Rubber Co. 1st pfd.	98	103	..
Fisk Rubber Co. 2nd pfd.	70	75	..
Firestone Tire & Rubber Co. com.	96	98	..
Firestone Tire & Rubber Co. pfd.	98	99	—1
*General Motors Co. com.	124½	126	+8
*General Motors Co. pfd.	81	83	+2
*B. F. Goodrich Co. com.	44	45	— ½
*B. F. Goodrich Co. pfd.	94	100	..
Goodyear Tire & Rubber Co. com.	139	142	+3
Goodyear Tire & Rubber Co. pfd.	99	100	..
Grant Motor Car Corp.	2	3	..
Hupp Motor Car Corp. com.	3	3½	+ ¼
Hupp Motor Car Corp. pfd.	78	83	..
International Motor Co. com.	16	20	+1
International Motor Co. 1st pfd.	40	60	+15
International Motor Co., 2nd pfd.	12	22	+2
*Kelly-Springfield Tire Co. com.	45	46	—1
*Kelly-Springfield Tire Co. 1st pfd.	75	85	..
*Lee Rubber & Tire Corp.	14	16	..
*Maxwell Motor Co., Inc., com.	29	30	+1
*Maxwell Motor Co., Inc., 1st pfd.	58	61	—2
*Maxwell Motor Co., Inc., 2nd pfd.	22	24	..
Miller Rubber Co. com.	133	137	..
Miller Rubber Co. pfd.	94	97	—1
Packard Motor Car Co. com.	95	100	—2
Packard Motor Car Co. pfd.	90	93	—2
Paige-Detroit Motor Car Co.	18	20	—1
Peerless Truck & Motor Corp.	16½	17½	—1
Portage Rubber Co. com.	110	112	—1
Reo Motor Car Co.	17	19	..
*Saxon Motor Car Corp.	8½	10	— ½
Standard Motor Construction Co.	11	12	—1
Standard Parts	71	74	—4½
*Stewart-Warner Speed. Corp.	55	56	— ½
*Studebaker Corp. com.	46	47	—1½
*Studebaker Corp. pfd.	91	94	—2
Swinehart Tire & Rubber Co.	..	35	..
United Motors Corp.	26⅞	27	—1½
*U. S. Rubber Co. com.	55½	57	—1½
*U. S. Rubber Co. pfd.	100	102	—1
*White Motor Co.	44	46	—2½
*Willys-Overland Co. com.	18	19	..
*Willys-Overland Co. pfd.	80	82	..

*At close March 9, 1918. Listed N. Y. Stock Exchange.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS	Bid	Asked	Net change
Auto Body Co.	7	..	..
Bower Roller Bearing Co.	18	18¾	..
Chevrolet Motor Co.	120	123	+1
Commerce Motor Car Co.	10½	11	+3¼
Continental Motor Co. com.	5⅞	6⅛	+ ¼
Continental Motor Co. pfd.	..	..	..
Edmunds & Jones com.	..	..	..
Edmunds & Jones pfd.	..	..	..
Ford Motor Co. of Canada	212	..	—4
Hall Lamp Co.	13½	..	..
Michigan Stamping Co. com.	12¾	14⅛	— ¼
Motor Products	..	..	..
Packard Motor Car Co. com.	93	..	..
Packard Motor Car Co. pfd.	..	92	..
Paige-Detroit Motor Car Co.	18⅜	19½	—1
Prudden Wheel Co.	..	14½	..
Reo Motor Car Co.	18	18½	+ ¼
INACTIVE STOCKS			
Atlas Drop Forge	..	27¼	..
Kelsey Wheel Co.	86	93	+3
Regal Motor Car Co.	..	26½	..

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Men of the Industry

Changes in Personnel and Position

Elgin Motor Elects Rieman as President

CHICAGO, March 11—C. S. Rieman has been elected president and general manager of the Elgin Motor Car Corp., which he founded 2 years ago. He has been vice-president and general manager of the company since its organization.

—

Donald W. Whittaker has been appointed advertising manager of the Acason Motor Truck Co., Detroit. Formerly he was assistant advertising manager of the Federal Motor Truck Co. and sales manager of the Detroit Truck Co.

—

H. J. Montgomery, superintendent of production for the Advance-Rumely Co., Laporte, Ind., has resigned.

—

H. O. Bernhardt, formerly production manager of the Harroun Motors Corp., Wayne, Mich., has received the commission of major in the Ordnance Department. He will be connected with the central bureau supervision section.

—

Joseph W. Gardham, formerly technical representative of the Chalmers Motor Co., is now in charge of tests of motor trucks for the Militor Corp., Jersey City, N. J.

—

E. R. Jacobi has resigned as chief inspector of the Reo Motor Car Co. and has joined the Mitchell Motors Co., Inc., Racine, Wis.

—

N. W. Barton, formerly manager of the Chicago branch and assistant general sales manager of the Olds Motor Works, has been promoted to the position of eastern division sales manager. His headquarters will be in Lansing.

—

G. D. Yeager has been elected president and general manager of the Wagner Axle Co., Anderson, Ind., to succeed H. P. Harding, who resigned.

—

G. A. Freeman has resigned as vice-president of the J. C. Wilson Co., Detroit, and has joined the airplane body division of the C. R. Wilson Body Co., Bay City, Mich.

—

Andrew Lehr, formerly with the Studebaker Corp. of America, has been elected vice-president of the J. C. Wilson Co., Detroit.

—

Horace T. Thomas, chief engineer of the Reo Motor Car Co. since its organization, has been appointed a member of the committee which will design and perfect the new standardized ¾-ton government truck. He will work at Washington, and take his place among the "dollar-a-year" men. The Reo company has ordered that his title and salary be continued through the war.

—

Clarence S. Walker has been appointed patent counsel of the Wire Wheel Corp. of America, Buffalo. He formerly held a similar position with the Packard Motor Car Co.

—

G. G. Germaine has been appointed district representative in New England for the Standard Parts Co., with headquarters in Boston. He was formerly associated with the Kawneer Mfg. Co.

—

F. J. Bury, service expert of the Packard Motor Car Co., Detroit, who has been connected with the St. Louis Packard company for some time, has resumed work at the plant.

—

C. W. Inches has resigned as assistant purchasing agent of the Briscoe Motor Corp., Jackson, Mich., to become purchasing agent of the Trego Motors Corp., New Haven, Conn.

—

W. Whitney Slaght has been appointed experimental engineer of the Pierce-Arrow Co., Buffalo.

—

Raymond V. Morris has been appointed general manager of the Savage Tire Co., San Diego, Cal. He was formerly connected with the Curtiss Aeroplane & Motors Corp.

—

N. J. Fitch has been appointed manager of the Detroit branch of the Bearing Service Co., succeeding E. G. Volker, who has been promoted to the position of manager of the New York branch.

—

E. W. Dobson has been appointed factory manager of the Standard Motor Truck Co., Detroit. He was formerly in charge of the truck department of the Packard Motor Car Co. and later was with the Continental Motor Co. and the Hercules Motor Co.

—

H. L. Innes, factory manager of the Chevrolet Motor Co. for the past year, has been transferred to General Motors headquarters in New York. Thomas Houghton, formerly with the Durant-Dort Co., the Dominion Carriage Co. of Toronto and the Tarrytown plant of the Chevrolet, will succeed him in the Chevrolet plant at Flint.

—

Frank A. Hayes, formerly engineer with the Willys-Overland Co., Toledo, has been appointed chief engineer of the Willys-Overland, Ltd., Toronto, Ont.

—

Henry C. Limbach, former production manager of the Zenith Carburetor Co., is now equipment engineer of the Strong, Carlisle & Hammond Co., Detroit.

—

E. R. Parker, formerly vice-president of the J. R. Holland Automobile Co., has been appointed southwestern district sales manager of the Saxon Motor Car Co., Detroit.

New Companies Formed

Latest additions to ranks of Automotive Industries

Truss Type Inner Tubes Coming from Cincinnati

CINCINNATI, March 9—The Ross-Lambert Rubber Co. has been organized, with an authorized capital of $3,000,000, to manufacture inner tubes of a new model styled the truss type, and other rubber accessories. The company is negotiating for a site near Cincinnati, and the directors hope to have a plant in operation in 2 months. It is reported that a large order from the British Government has been received. Officers are: Charles E. Ross, Columbus, president and general manager; C. H. Lambert, Hartwell, Ohio, vice-president and secretary, and A. B. Lambert, treasurer.

—

Automotive Engineering Corp. Formed

BUFFALO, March 12—The Automotive Engineering Corp. has been incorporated here with a capital stock of $125,000 to manufacture carbureters and engines. H. R. Richards, E. McM. Mills and M. C. Spratt are the incorporators, and will have offices for the present in the Fidelity Trust Building.

—

To Make Converters for Fords

YOUNGSTOWN, O., March 11—The Lauton Truck Co. has been organized here by A. W. Lau to make converters for Fords and other light cars, and Cadillacs to make them into 1 and 2-ton trucks. The company plans a production of from 7500 to 10,000 units the first year. The first shipment of these was sent East last week. Associated with A. W. Lau are W. R. Kirby, of the W. B. Pollock Co., and J. W. Riddle. M. D. Davidson will be sales manager.

—

Johnson Wheel Co. in South Bend

SOUTH BEND, IND., March 9—The Johnson Motor Wheel Co., recently organized with $100,000 capital, will have its plant and principal office here. The company will manufacture gas engines.

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Johnstone Tire Ready for Production

SOUTH BEND, IND., March 9—The Johnstone Tire & Rubber Co., organized under the laws of this state, has almost finished equipping its building at Laporte, Ind., and will begin the manufacture of semi-solid and solid truck tires before the end of the month. C. W. Mussey, formerly treasurer of the company, was elected president. E. G. Bird was re-elected secretary and B. R. Blackwelder vice-president. A. A. Peterson will be factory manager and superintendent.

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A. A. A. Control for Racing

Contest Board Has Again Taken Hold of Competitions—Status Same as Last November

NEW YORK, March 9—The Contest Board of the American Automobile Association has again taken hold of motor-car contests, and will immediately resume its control of contests, as it has done for years past.

In November the Contest Board decided not to sanction any more contests during the period of war exigency, due to the insistent demands of the government for skilled mechanics well qualified as motor experts for aviation and other services. The action at that time was taken because of an official letter from the government on the subject.

It has developed that the government department has not the power to stop the sport, as was anticipated, although such power may be forthcoming in the future. It was rumored that gasoline would not be allowed for racing purposes, but the Fuel Administration has no power to enforce any such rule were it promulgated. It was also rumored that the Railroad Administrator would not allow racing motor cars to be shipped on railroads, but even that action would not stop racing, as the cars could be driven overland from one speedway to another.

The present action of the Contest Board in again taking up the control and sanctioning of races came from race promoters, who asked for such protection. Some of the leading promoters soon realized how valuable and necessary it is to have an impartial controlling body such as the Contest Board. It is a great protection to the promoter both as regards his arrangements with drivers and with entrants. As a result of this, as well as because of the Washington situation, it was voted at a meeting of the Contest Board, held to-day, to immediately resume control. This means that everything is back just where it was previous to the action taken last November, when it was decided not to sanction contests during the war period.

Already a complete schedule of races for several speedways has been prepared by the speedway interests, and these will be sanctioned and handled under the regular rules. The Contest Board offices have been reopened in the Bankers Trust Building, corner of Fifth Avenue and Forty-second Street, and Chairman Richard Kennerdell is in charge, with the same board assisting him as formerly.

William L. Wellman, race promoter, has a complete schedule of races, extending from early in May until October, and embracing such speedways as Sheepshead Bay, Chicago, Uniontown, Providence, Cincinnati, and perhaps Philadelphia. The schedule is not complete, but embraces the following definite dates:

Uniontown, Pa.	May 16
New York	May 30
Uniontown	Aug. 3
Providence	Aug. 17
New York	Aug. 17
Uniontown	Sept. 2
New York	Sept. 21

Other speedways with which arrangements are not yet completed are expected to take in other important dates not included in this schedule.

There seems to be nothing definite with regard to the Philadelphia speedway, and it is questionable if it will be completed in time for any racing. Lumber that was intended for the construction of it has been taken by the government, and to date none of the lumber construction work has been started. The necessary grading for the construction work has largely been completed.

The three big meetings selected for the summer are May 30, Aug. 17 and Sept. 21, all in New York. The Harkness cup race on Sept. 21 will be the closing event of the year. New York also has the Decoration Day race, which heretofore has gone to Indianapolis.

There will not be any racing on the pioneer Indianapolis speedway, as Carl G. Fisher, president, as well as James Allison, F. H. Wheeler and A. C. Newby, the stockholders of it, announced last year that they were out of racing for the period of the war, and that none of their racing cars would enter in any contests. The only contests Indianapolis would stage would be benefit races, where all of the receipts would go for war benefits.

—

Sutphen President of Engine and Boat Association

NEW YORK, March 11—Henry R. Sutphen, president of the Electric Boat Co., was elected president of the National Assn. of Engine and Boat Manufacturers at the March meeting of the executive committee. He will succeed John J. Amory, who had been president of the association since its organization in 1904. The following officers were also chosen for 1918: John J. Amory, president of the Gas Engine & Power Co. and Chas. L. Seabury, Consolidated, first vice-president; Percy C. Jones, of the S. M. Jones Co., Toledo, second vice-president; Charles A. Criqui, president of the Sterling Engine Co., Buffalo, third vice-president; James Craig, owner of the James Craig Engine & Machine Works, treasurer, and Ira Hand, secretary.

—

Dearborn Urged as Residence Section

DEARBORN, MICH., March 12—Members of the Board of Commerce here are urging Ford tractor employees to build their homes in Dearborn instead of commuting from Detroit and points in this vicinity. The plant of Henry Ford & Son is constantly employing an additional number of men and its assured permanency is given as the main reason for urging employees to reside in this vicinity. The village of Dearborn is growing rapidly and is becoming a permanent industrial center.

Tractor Competition for England

Food Production Department Plans Sectional and National Contests

LONDON, ENGLAND, Feb. 15—A comprehensive schedule of tractor-plowing competitions which are largely sporting competitive affairs has been started in England. This is the result of an experiment tried in several districts by the Food Production Department to increase the acreage plowed by tractors to the maximum.

The scheme as now outlined for the entire country consists of a series of sectional and national competitions as follows: First for units; second for counties; third for the whole of England and Wales.

Each competition will continue for 1 month. The first competition begins Feb. 9, the second on March 9, and the third on April 6.

This schedule means that there will be three monthly competitions for each unit. There will be three for each county and three national ones. Additional men and machines will be admitted to the competition so that they may be added to the nation's agricultural tractor power during the spring plowing season.

The details of this threefold competition are:

1. For each unit—A distinctive flag to be carried on the tractor will be awarded to the tractor team in each unit which plows the greatest number of acres during each period of 4 weeks. This flag will be presented each month by the tractor representative of the county.

2. For each county—A championship flag will be awarded to the tractor team in each county which plows the greatest number of acres during each period of 4 weeks. A distinctive badge will also be worn by each member of the winning team. The flag and badges will be presented each month by the chairman of the county executive committee.

3. For England and Wales—A championship shield to be carried on the tractor will be awarded to the tractor team which plows the greatest number of acres in England and Wales during each period of 4 weeks. A small silver replica of this shield will also be given to each member of the winning team. The shield and replicas will be presented personally by the Director-General to the winning team, which will be invited to London for the purposes of the presentation.

Each trophy will be held for 4 weeks only, unless it is won again by the same team.

The complete scheme of competition not only awards those doing the most plowing but gives a national significance to the movement which results in increased plowing at a time when a national stimulant is imperative.

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Commerce Motor Car Co. Ready to Start Production

DETROIT, March 11—The Commerce Motor Car Co. will start production immediately on its $2,000,000 government contract for 1-ton trucks. All material required has been purchased or contracted for at prices which insure a satisfactory profit. The directors have authorized the sale of $100,000 of treasury stock at $10 par, and one of these will be offered to each shareholder for each three held by him. The entire amount has been underwritten by Walter E. Parker, president of the company.

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Assembling Plant for Continental Motors

MUSKEGON, MICH., March 9—The Continental Motors Corp. is erecting a new building for assembling and block testing, which will be ready May 1. The Detroit plant reports an increase of 10 per cent in production during the last 2 weeks.

—

Eagle Tractors Shipped to Italy

APPLETON, WIS., March 9—The Eagle Mfg. Co. last week made its first shipment of one carload of farm tractors to Italy on a large order from the Italian Government. The company is now finishing its new factory, which will be devoted exclusively to tractor manufacture. The original plant will be used for gas engines and other farm machinery.

—

Bearings Service Co. to Move

DETROIT, March 9—The Bearings Service Co. will move soon into new and larger offices at Cass and Willis Avenues. The Detroit service branch of the company will be located in the same building.

—

Westinghouse to Sell Frankel Connectors

PITTSBURGH, March 13 — The Westinghouse Electric & Mfg. Co. has obtained the exclusive sales agency for all of the United States for Frankel solderless connectors, used for joining wires and cables. The Frankel Connector Co. has increased its facilities to care for the new business which will be obtained through the Westinghouse sales organization. The latter will also distribute Frankel testing clips.

—

Cleveland Westinghouse Branch Moves

CLEVELAND, March 11—The district sales office of the Westinghouse Electric & Mfg. Co. here is now located in new quarters at 1900 Euclid Avenue.

—

Liberty Drive Outboard Motor Marketed

DETROIT, March 13—The Caille Perfection Motor Co. is putting on the market a new little outboard motor for rowboats. It will be called "Liberty Drive," and will retail for $48. Power is transmitted direct from the crankshaft to the engine, and the latter is mounted on a swivel so that the boat can pass over an obstruction without causing damage to the propellor blades.

Current News of Factories

Notes of New Plants—Old Ones Enlarged

—

Canadian Electric to Sell Defender Lock

DETROIT, March 11—The Canadian General Electric Co. has been appointed sole distributer of Defender Auto-Lock Co. products in Canada. On April 1 the retail price of the Defender auto-lock will be raised to $4 in the United States and $5 in Canada.

—

Hotz Foundry to Double Production

FREMONT, OHIO, March 9 — The Hotz Foundry & Mfg. Co. has erected an addition to its factory and installed extra machinery and equipment. Present production will be doubled.

—

90 Factories Making Liberty Truck Parts

WASHINGTON, March 12—Ninety factories are working to capacity on the standardized parts for Liberty trucks, according to reports received this week by the motor transport division of the War Department. The entire schedule will have been completed before Aug. 1.

—

Capital Increase

DETROIT, March 5 — The Acason Motor Truck Co. has increased its capital stock from $50,000 to $200,000.

—

Dividends Declared

PHILADELPHIA, March 9—The Electric Storage Battery Co. has declared a dividend of $1 a share on common and preferred stock, payable April 1 to stockholders of record March 18.

—

TOLEDO, March 9—The Willys-Overland Co. has declared a regular quarterly dividend of $1.75 a share on preferred stock, payable April 1 to stock of record March 20.

—

The International Harvester Co. of New Jersey has declared a regular quarterly dividend of 1¾ per cent on the common stock, payable April 15 to stock of record March 25. Prior to this time the stock has been on a 5 per cent per annum basis.

—

Paige Ultimatum to Signal

DETROIT, March 14—The Paige-Detroit Motor Car Co. has sent the Signal Motor Truck Co. an ultimatum, asking for an immediate answer on its offer to purchase the Signal plant. A reply is expected before Saturday.

New Engine Made By Golden, Belknap & Swartz

DETROIT, March 13 — Golden, Belknap & Swartz Co. is working on a new heavy duty type engine for trucks and tractors. It is expected that the model will be ready within two weeks. The cylinders are cast singly and have overhead valves, and the engine has the forced feed oil system. The retail price will be approximately $300. The company expects to produce 5000 of the old model engines during the balance of the year.

—

New York Office for Bourne

NEW YORK, March 12—The Bourne Magnetic Truck Co. has removed its factory and offices to Fifth Avenue and 142d Street, New York.

—

Lozier Making 5 Cars Daily

DETROIT, March 14—The Lozier Motor Car Co. is still making cars on order, and production, according to reports, is five a day. The company has orders for 6 months.

—

Jenkins Spring Offices Moved

ST. LOUIS, March 10—The general offices of the Jenkins Vulcan Spring Co. were moved from here to Richmond, Ind.

—

Lawson Aircraft to Move

GREEN BAY, WIS., March 12—The plant of the Lawson Aircraft Corp. will in all probability be moved from here to Milwaukee. This was practically decided at a conferene held in Milwaukee last week between representatives of banks, the Assn. of Commerce, the County Council of Defense and officers of the company. The Lawson company was organized 8 months ago, and recently moved into a new plant. This second change of location is necessitated by need for greater facilities and capital.

—

D. W. Burke Buys Auto Electric Service

DETROIT, March 11—D. W. Burke has bought out and will operate the Auto Electric Service Corp., the official representative and service station for the Bijur, Auto-Lite, Dyneto, Westinghouse, Eclipse, Bendix, Tillotson Carbureter, Heinze-Springfield Ford Starter, Atwater-Kent, Berling, Connecticut, K-W ignition, Philbrin and Norma Bearing companies. Burke was formerly superintendent of automobile service of the Westinghouse Electric & Mfg. Co., Pittsburgh, and president of the Automotive Equipment Service Assn.

—

Must File Bijur Claims April 15

NEW YORK, March 13—The receivers of the Bijur Motor Lighting Co. have given notice to all creditors of the company to assert their claims on or before April 15 in written form with proper verification. These must be filed with the receivers at the office of White & Case, 14 Wall Street.

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Industrial Review of the Week

A Summary of Major Developments in Other Fields

Good Weather Eases General Coal Situation

Prevailing good weather has brought about a general easing up of the coal situation. The worst of the domestic distress is now over, and there is practically no suffering. New England, however, is still facing the problem of procuring an adequate coal supply—a problem that will not be solved till more ships are pressed into service. The shipping now available totals about 216,000 tons, as against the 351,000 tons considered necessary to meet the normal needs of this territory.

Though showing progressive improvement from week to week, the supply of cars to the mines is still not what it should be, and operators are unable to produce at maximum capacity. The bituminous mines in the central Pennsylvania district are the greatest sufferers from this lack of cars, the miners in that region working only part time. The loaded coal cars that figured in the recent rail congestion are now being returned from tidewater, and the near future should show a decided increase in the number of empties sent to the mines.

Anthracite Deliveries Improve

Deliveries of anthracite by rail continue to pick up, though river shipments are little better than the February average, and receipts at tidewater are about normal. There is an active demand for steam sizes, with no free coal to be had from the large operators. The western markets are insistent in their plea for every pound of hard coal, as the government has intimated that after April 1 these markets will be asked to use bituminous coal from nearby regions.

Owing principally to the shortage of cars, the supply of bituminous coal continues to be unequal to the demand. True, there is a slight increase in production over previous weeks, but every ton is being quickly swallowed by a hungry market. Dealers are unable to accumulate reserve stocks as in former years, and it is hard to say when the shortage in soft coal will be overcome.

Plans for Distribution

Much speculation exists regarding the many plans for zoning and distribution. The government's new price schedule is also awaited anxiously by the operators; and as for the dealers, they are marking time and wondering what will be in store for them after April 1, the government having shown that it is actually in control of both the wholesale and retail branches of the business.

There is practically no contracting for the new year, which begins April 1. Consumers, of course, are eager to provide for their next winter's requirements, but government regulations are against contracts unless the operators are willing to sign up at the present Federal prices. Furthermore, another hindrance to the making of contracts is the fact that they are subject to cancellation if the authorities desire to confiscate the coal for government purposes.—*Coal Age.*

A New Service

Herewith AUTOMOTIVE INDUSTRIES *supplies for the benefit of its readers a general summary of important developments in other fields of business. This is rendered possible by the editorial co-operation of leading industrial publications which are recognized authorities.*

By compressing the general industrial situation into this form we hope to give our readers a clear and comprehensive idea of up-to-the-minute developments which they could otherwise secure only with considerable expenditure of time and effort.

To Fix Steel Prices at Washington March 20

The naming of Wednesday, March 20, as the day for the price conference at Washington between the steel manufacturers and the War Industries Board is bringing to a head the issues raised by various producers. The diverse interests of the small producers, who must have a high price, and of the largest integrated companies, who can go on on the present basis, are more sharply accented.

The crux of the situation as it will come before the price conference next week is the country's ability to produce sufficient pig iron. A higher price is being urged by smaller furnace companies. On the other hand, some buyers of pig iron ask that the price be reduced, particularly on Southern iron.

A prime factor in all calculations as to steel for the second half of the year, which has not had sufficient emphasis thus far, is ability to increase the shipbuilding program.

The 30 per cent "curtailment" in passenger automobile production agreed on by manufacturers and the War Industries Board means little change in fact from the recent scale of operations due to falling demand. Only two large makers are named as likely to cut down present output. The sentiment is growing in some Washington quarters that a considerable part of the alloy steel now going to the automobile industry should be conserved for war uses. Heavy orders have gone to the mills in the last two weeks for ship material.—*Iron Age.*

4,941,276 Cars and Trucks in the United States

(*Continued from page* 538)

mont, which showed 24 per cent in 1916 and 30 per cent in 1917.

The total number of new registrations in New England showed a heavy falling off in 1917 as compared with 1916. In 1916 the increase in registrations was 86,421, whereas in 1917 the increase in registrations dropped to 58,239, a decrease of 28,182.

The record of holding the greatest number of automobile and truck registrations in relation to population is enjoyed by the agricultural states, with Iowa in the position of leadership with a ratio of one car for every eight persons in the state. Iowa has occupied this position of leadership for several years. In the calendar year of 1915 it had one automobile for every sixteen persons. In 1916 this ratio of cars was increased to one car for every thirteen. In the 1917 year a new record was placed at one for every eight.

Iowa has not much margin of leadership in this registration ratio, and again one of the great agricultural states is a close contender, Nebraska having one automobile for every nine of population. Nebraska has made rapid gains in the last three years. In 1915 the ratio was one car to every twenty-one persons. In 1916 it was cut to thirteen persons, and for 1917 it was placed at nine.

Iowa and Nebraska have a good lead on the other states, and following them are other agricultural states, with South Dakota one machine for every eleven, which figure is shared with Montana. Then come Kansas, North Dakota, Minnesota and California all on even terms, with a car for every twelve of population.

Indiana, Ohio, Wisconsin and Oregon, all grain states, have a ratio of one automobile to every sixteen persons. In the western mining states, where population is sparse and distances great, there is a high ratio of cars to population. Nevada has a one-to-sixteen ratio. Wyoming has one to fifteen. Montana has one to eleven. Idaho has one to eighteen. Arizona has one to thirteen, and Colorado has one to fifteen.

The ratio of automobiles to population in the South is relatively high, notwithstanding the big percentage increases made in all of the Southern States in 1917, as compared with 1916. Florida, although showing a percentage increase of 174, has a ratio of twenty-three to one. North Carolina has sixty-four to one. Georgia has forty-one to one. It will be some time before the ratio in the South approaches the figures of the agricultural states in the Mississippi Valley.

The car population ratio in New England generally ranges at twenty-four to one, with the single exception of Connecticut, which has the record for the group, with a ratio of one car for every seventeen population.

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Reorganize Directorate of National Carbon Co.

CLEVELAND, March 12—The board of directors of the National Carbon Co. has been reorganized by election of directors so as to represent Union Carbide interests. The new directors are: M. J. Carney, W. J. Knapp and G. Ricks, and will fill the vacancies created by the resignation of J. S. Bartlett, Boston; M. J. Degnon, New York; W. Cameron Forbes, Boston; J. L. Severance, Cleveland; W. P. Schmuck and F. C. Walsott, New York. Officers of the National Carbon Co. were re-elected for the Union Carbide.

The Union Carbide & Carbon Co. was formed in October, 1917, as a holding company in the merger of the Presto-Lite Co., the National Carbon Co., the Union Carbide Co. and the Linde Air Products Co. Since that time the Air Reduction Co., the Electro-Metallurgical Co., the Michigan Northern Power Co., the Union Carbide of Canada, Ltd., the Electric Furnace Products Co., Ltd., and the Oxweld-Acetylene Co. have been consolidated.

—

Signal Corps Conducts Cadillac School

DETROIT, March 11—The technical and repair school operated at the service station of the Cadillac Motor Car Co. has now been taken over by the Signal Corps and is being operated as a mechanical aeronautical school. Most of the students come from the government ground school at Kelly Field, San Antonio, Tex. Every 30 days a group of 20 enlisted men is sent to Detroit from Kelly Field. The course covers 30 days and each day there are 2 hours of lectures and 6 hours of practical shop work.

—

23,229 Trucks Made in Detroit

DETROIT, March 11—Detroit plants produced 23,229 trucks in 1917 at an approximate market value of $45,462,000. The total production of Detroit and Flint, Lansing and Alma aggregated an approximate market value of $60,962,000.

—

Motor Parcels Post Route in Texas

TYLER, TEXAS, March 4—The second motor parcels post route to be established by the Post Office Department will be between Tyler and Dallas, a distance of 110 miles. The motor truck that will be used will also carry mail. The road between this city and Dallas was inspected and approved by government officials before sanction for the motor route was given. About nine hours will be required for the trip each way.

—

Heads Non-Ferrous Department

WASHINGTON, March 9—The Non-Ferrous Department of the raw materials division of the War Industries Board has been placed in charge of Pope Yeatman, succeeding Eugene Meyer, Jr. Meyer remains a member of the raw materials division, but at present is engaged in special work for the Secretary of War. Yeatman was formerly a consulting engineer of New York.

—

Canada Tractor Demonstration Next Fall

MONTREAL, March 9—The extensive farm tractor demonstration for eastern Canada has been scheduled to take place here Sept. 17, 18 and 19. It is expected that the recent removal of import duties from tractors will increase the number of foreign exhibits.

—

Motor Freight Line in Utah

SALT LAKE CITY, UTAH, March 9—Operation of a motor freight service between this city and Ogden will be started at once by the Motor Freight Service Co., Salt Lake City. The state highway will be used, and the rates charged will be the same as those of the railroad.

War Service Committee Appointed by N. A. D. A.

ST. LOUIS, March 11—A War Service Committee for the National Automobile Dealers' Association has been appointed by President Fred W. A. Vesper. It will co-operate with the Government's Commercial Economy Board in harmonizing the activities of the government with those of the dealers of the United States.

Various plans are in prospect. The members of the committee are:

F. W. A. Vesper, chairman.
Earl C. Anthony, Los Angeles Motor Car Dealers' Association, Los Angeles.
Charles Collier, Brown County Auto Trades Ass'n, Green Bay, Wis.
A. E. Mitzell, Ohio Auto Trades Ass'n, Canton, Ohio.
A. E. Maltby, Philadelphia Auto Trades Ass'n, Philadelphia, Pa.
F. E. Murphy, Minneapolis Auto Trades Ass'n, Minneapolis, Minn.
George W. Browne, Milwaukee Auto Dealers' Ass'n, Milwaukee, Wis.
Dayton Keith, Chicago Auto Trades Ass'n, Chicago, Ill.
J. H. McAlman, Boston Auto Trades Ass'n, Boston, Mass.
George D. McCutcheon, Atlanta Auto Trades Ass'n, Atlanta, Ga.
O. P. Tyler, Worcester Auto Trades Ass'n, Worcester, Mass.
Fred J. Caley, Cleveland Auto Trades Ass'n, Cleveland, Ohio.
Charles W. Browne, New York Dealers' Ass'n, New York City.
Finley L. MacFarland, Rocky Mountain Automobile Ass'n, Denver, Col.

—

Couzens No Longer Police Commissioner

DETROIT, March 9—James Couzens, police commissioner here, and formerly vice-president of the Ford Motor Co., was dismissed last week by Acting Mayor Walsh during the absence of Mayor Marx. The council demanded his dismissal 2 weeks ago, but the Mayor refused.

Calendar

ASSOCIATIONS

April 15-19—Little Rock, Ark., United States Good Roads Assn. Sixth Annual Session.
June 5-12—Hot Springs, Va., National Assn. Automobile & Accessory Jobbers.
June 17-19—Dayton, O., Society Automotive Engineers, Annual Midsummer Session.

SHOWS

Mar. 1-15—Lyons, France, Third Sample Fair.
Mar. 11-16—Cedar Rapids, Ia., Cedar Rapids Auto Trade Assn., Auditorium.
Mar. 11-16—St. Louis, Mo. Used Car Show. St. Louis Auto. Manufacturers and Dealers' Assn. Exhibit Bldg.
Mar. 12-15—Fargo, N. D., Gate City Auto. Show Co., Auditorium. J. W. Murphy, Mgr.
Mar. 13-16—Raleigh, N. C., Auditorium. John Kelley, Mgr.
Mar. 13-16—Warren, Pa., Warren Automobile Dealers' Assn., Russell Garage.
Mar. 13-16—Peoria, Ill., Peoria Auto. Accessories Dealers' Assn. W. O. Ireland, Mgr.
Mar. 15-20—Great Falls, Mont., Montana Automobile Distributors' Association. Lexington Garage. A. J. Breitenstein, Mgr.
Mar. 19-23—Vancouver, B. C., Western Canada Automobile Show Assn., Horse Show Bldg. D. A. Hamilton, Mgr.
Mar. 20-22—Houlton, Me., Second Annual, Houlton, Motor Car Dealers' Assn., Bangor St. Exhibition Hall. J. D. Luther, Mgr.
Mar. 20-23 — Holdredge, Neb., Second Annual of Southwest Nebraska.
Mar. 20-23—Greensboro, N. C. First Annual. John Kelly, Mgr.
Mar. 20-23 — Trenton, N. J., Trenton Auto Trade Assn., Second Regiment Armory. John L. Brock, Mgr.
Mar. 25-30—Rochester, N. Y., Tenth Annual. Rochester Auto. Trades Assn., Exposition Park. C. A. Simmons, Mgr.
Mar. 25-30 — Bridgeport, Conn., Fourth Regiment Conn. Home Guard State Armory and Casino. B. B. Steiber, Mgr.
Mar. 27-29—Fort Fairfield, Me., Reed's Garage. R. F. Reed, Mgr.
Mar. 30-April 6—Hartford, Conn., Eleventh Annual, Hartford Automobile Dealers' Assn., Inc. State Armory. B. F. Smith, Mgr.
Mar. 30-Apr. 6 — Atlantic City, N. J., Second Annual, Garden Pier. S. W. Megill, Mgr.
Mar. 30-Apr. 6—Chicago, Ill. Second Annual Chicago Used Show. Chicago Auto. Trade Assn. Coliseum.
Apr. 1-6—York, Pa., York Auto Dealers' Assn. T. F. Feiffer, Mgr.
Apr. 6-8 — Green Bay, Wis., Brown County Automobile Trade Assn.
Apr. 6-13 — Red Bank, N. J., Monmouth County Auto. Dealers' Assn., Armory, E. C. Von Kattengell, Mgr
Apr. 8-13—Reading, Pa., Reading Automobile Trade Assn.
Apr. 9-13—Stockton, Cal., Third Annual San Joaquin Auto Trade Assn. Samuel S. Cohn, Mgr.
Apr. 16-20—Deadwood, S. D. City Auditorium.
Apr. 17-19—Davis, Cal., Tractor Demonstration. University of California.
Apr. 17-20—Calumet, Mich., Upper Peninsular Show, Copper County Automobile Dealers & Garage Owners' Assn., Coliseum.
May 3-7 — Lima, Ohio. Ohio State Automobile Asn.
Sept. 23-28 — Chicago, National Accessory Show for Fords, Coliseum.

ENGINEERING

June 19-22 — Berlin, N. H. American Institute of Chemical Engineers.
June 26-28 — Buffalo, N. Y. American Society of Heating and Ventilating Engineers.
Sept. 2—Cripple Creek, Colo. American Institute of Mining Engineers.

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The Waltham Automobile Clock

Over 250,000 Now in Use as Standard Equipment



The Waltham standard of precision and accuracy has brought the leading nations of five continents to Waltham for their official watches.

The same standard is maintained in the manufacture of the Waltham Automobile Clock—constructed to keep perfect time despite rough roads and changeable temperature.

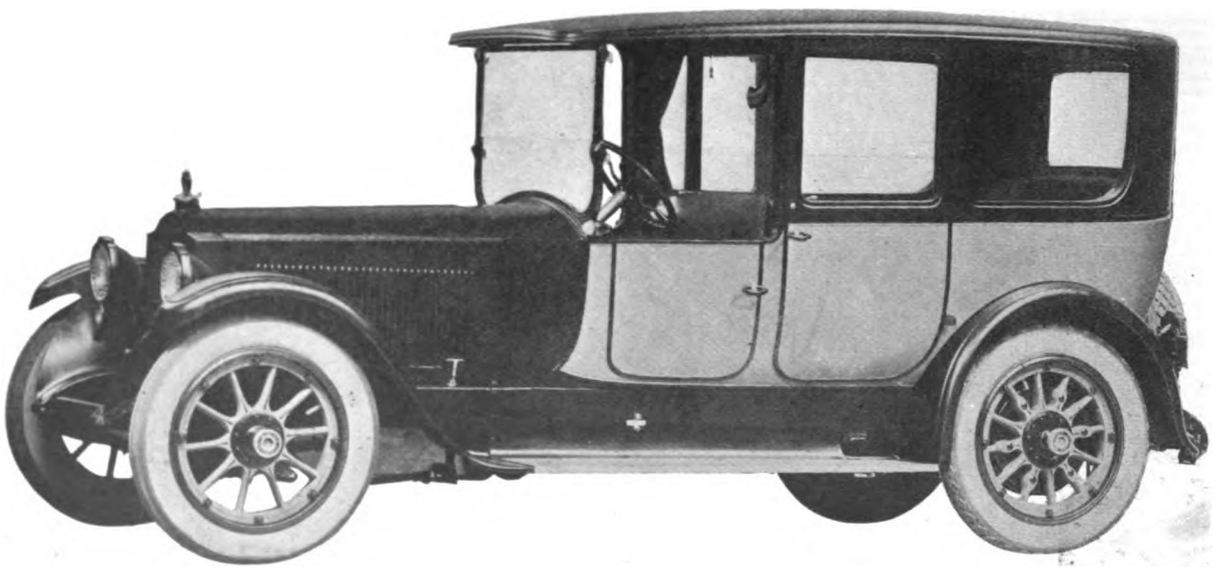
Has two mainsprings, a red signal on the dial to indicate when it needs winding—and conforms in appearance to the exquisite fittings of the luxurious cars for which it serves as equipment.

Cars Equipped with the Waltham Automobile Clock

Anderson 6-40	Kissel
Apperson	Locomobile
Brewster	Marmon
Cadillac	Mercer
Chalmers	Murray
Cole	Owen-Magnetic
Crane	Packard
Cunningham	Pierce-Arrow
Detroit-Electric	Rauch & Lang
Doble	Rolls-Royce
Fergus	Simplex
Franklin	Stearns
Haynes	Studebaker
Hal	Willys-Overland
Hudson Super-Six	Winton
Jordon	

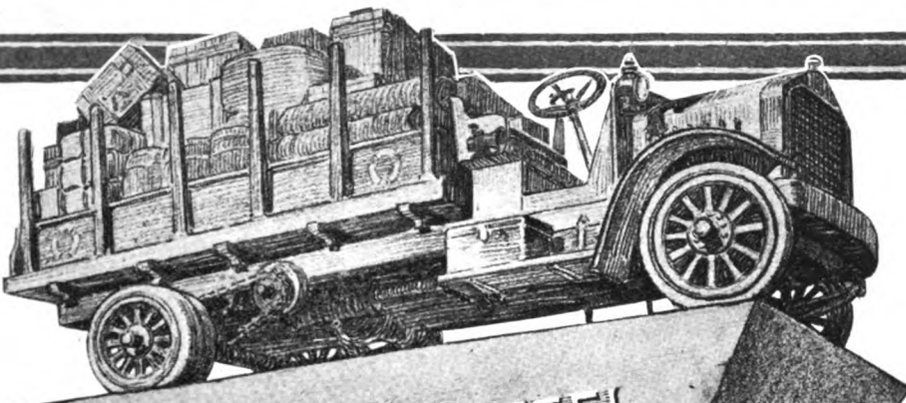
WALTHAM WATCH COMPANY, WALTHAM, MASS.

Seven Passenger Packard Limousine Equipped with the Waltham Automobile Clock

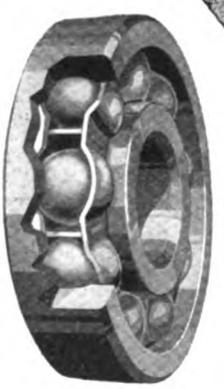


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Burden Bearers

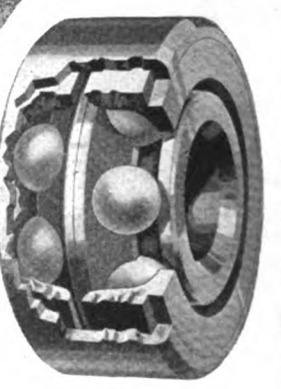


A ONE INCH STEEL BALL WILL SUPPORT -WITHOUT BEING DAMAGED- 40 000 POUNDS



New Departure Single Row Type

A highly perfected anti-friction ball bearing for use where strictly radial loads are to be provided for and not more than a 10 per cent thrust stress. Whether the loads are heavy or light, they are carried easiest on ball bearings.



New Departure Double Row Type

A single, self-contained fool-proof unit carrying all the loads and stresses simultaneously from whatever direction they may come, with equal efficiency, and reducing friction evils to the vanishing point.

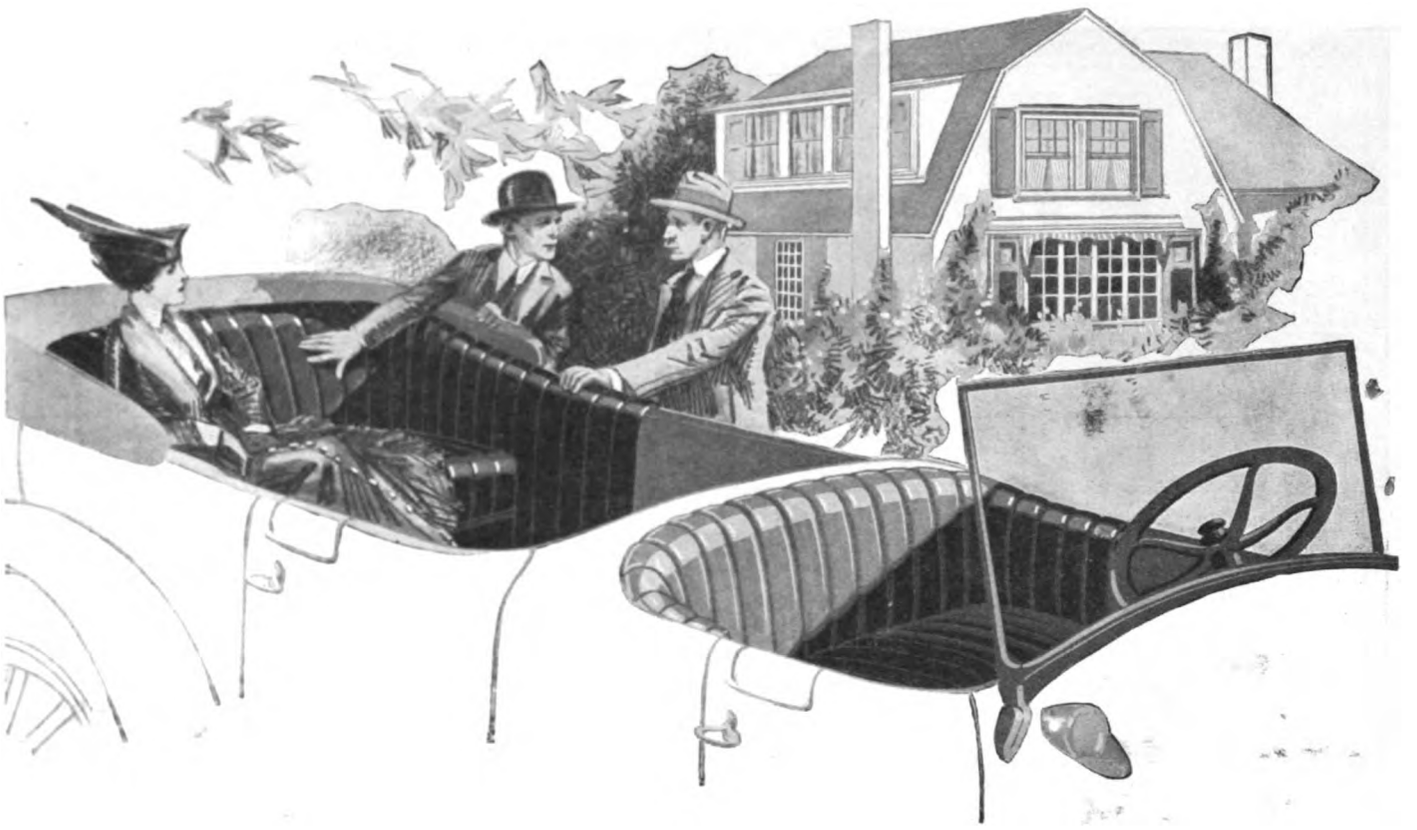
NEW DEPARTURE BALL BEARINGS

CONQUERORS OF FRICTION — GIANTS OF STRENGTH

New Departure Manufacturing Company, Bristol, Conn., U. S. A.

Conrad Patent Licensee

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Your Car

YOUR car may have an engine that climbs the steepest hill without a flinch; it may have a body beautiful as a picture, but if it lacks comfort there is no joy in it for you.

And your car will lack comfort unless it is upholstered with Wilson's Curled Hair.

No other material will give you anywhere near the same comfort, durability and all 'round satisfaction, because it is the only material that meets to the exact nicety every requirement of automobile upholstery.

THE process used in its manufacture firmly imbeds the curled hair into a fabric base, which prevents shifting, bunchiness and matting down, yet does not impair the resilience in the slightest degree.

Many automobile manufacturers are sending us blue-prints of their seats and backs, and are having Wilson's Woven Curled Hair cut to fit exactly. We also make a specialty of cutting plaits, or pipe-fillers.

Write us today, stating your requirements, or send blue prints, and we will furnish you with samples and prices.

"This mark WILSON & CO. your guarantee"

41st and Ashland Avenue, Chicago

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The Height of Lens Development

THE Dillon Multi-Vision Lens marks a new era in lens performance. Not only is it a radical departure in design, but it is evolutionary in results.

The central bull's-eye, for instance, is an exclusive advantage of the Dillon. This bull's-eye has an important function—that of concentrating and magnifying the light on the road. This light is made glareless by the light from a carefully determined proportion of clear glass above the bull's-eye. The clear glass at the bottom provides the necessary front and side lighting.

The Dillon is the only lens made that gives you TWICE the lighted area, by projecting a SQUARE path of light. It is also the only lens made that projects entirely beyond the rim.

In no respect is the Dillon excelled and any of its chief features alone make it supreme in its field.

Write for literature, or send cash, check or money order, together with make and model of your car if you cannot obtain Dillon Lenses.

National Distributing Co.

Exclusive Distributors for the Dillon Multi-Vision Lens

Oliver Building,
Pittsburgh, Pa.

Dealers—

Get in touch with your jobber or write us at once. Liberal proposition, exclusive talking points, selling co-operation, national advertising—everything you need for success.

DILLON MULTI VISION LENS

$3.50 per pair

Any Size—Anywhere in U.S.A.

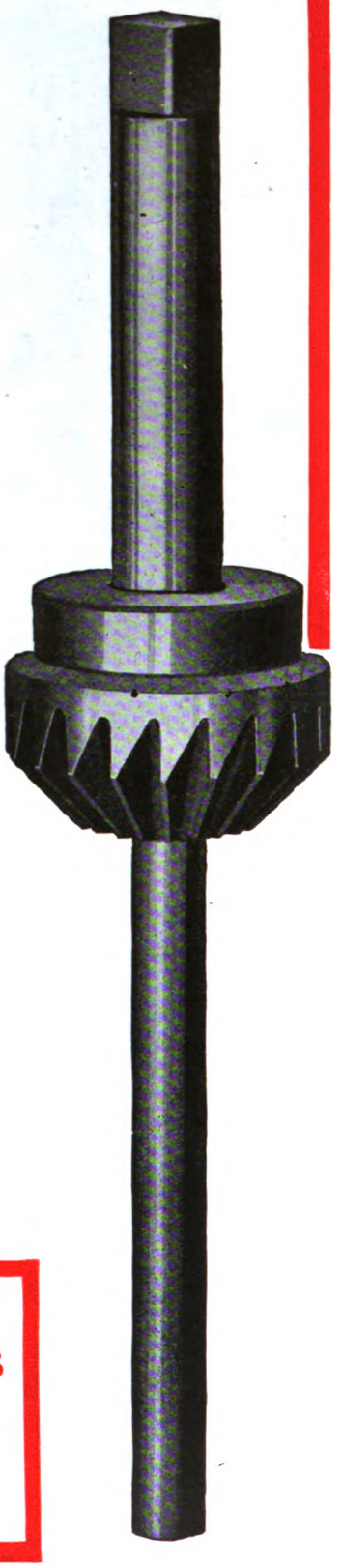
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SERVICE We Keep Sioux Tools Always Sharp--No Charge

Keen cutting edges and accurate angles are absolutely necessary in valve reseating tools. A variation of a hair's breadth in the angle of a valve seat reamer would make it impossible to seat a valve perfectly.

Sioux
Valve Seat Reamers

are not only accurately ground before they leave the factory, but we keep them in perfect condition free of charge—the owner paying only the transportation charges. This insures satisfactory results at all times.



The Sioux Refacing Tool

is also delicately adjusted. Great care must be used to keep the angle exact, when sharpening. Our expert service cares for any Sioux tool that may require sharpening.

Sioux tools are superior in working principle, material and workmanship. Each one a time and labor-saver. The livest jobber in your town is the man for you to see—today.

Liberal Discount to Dealers

Manufactured by

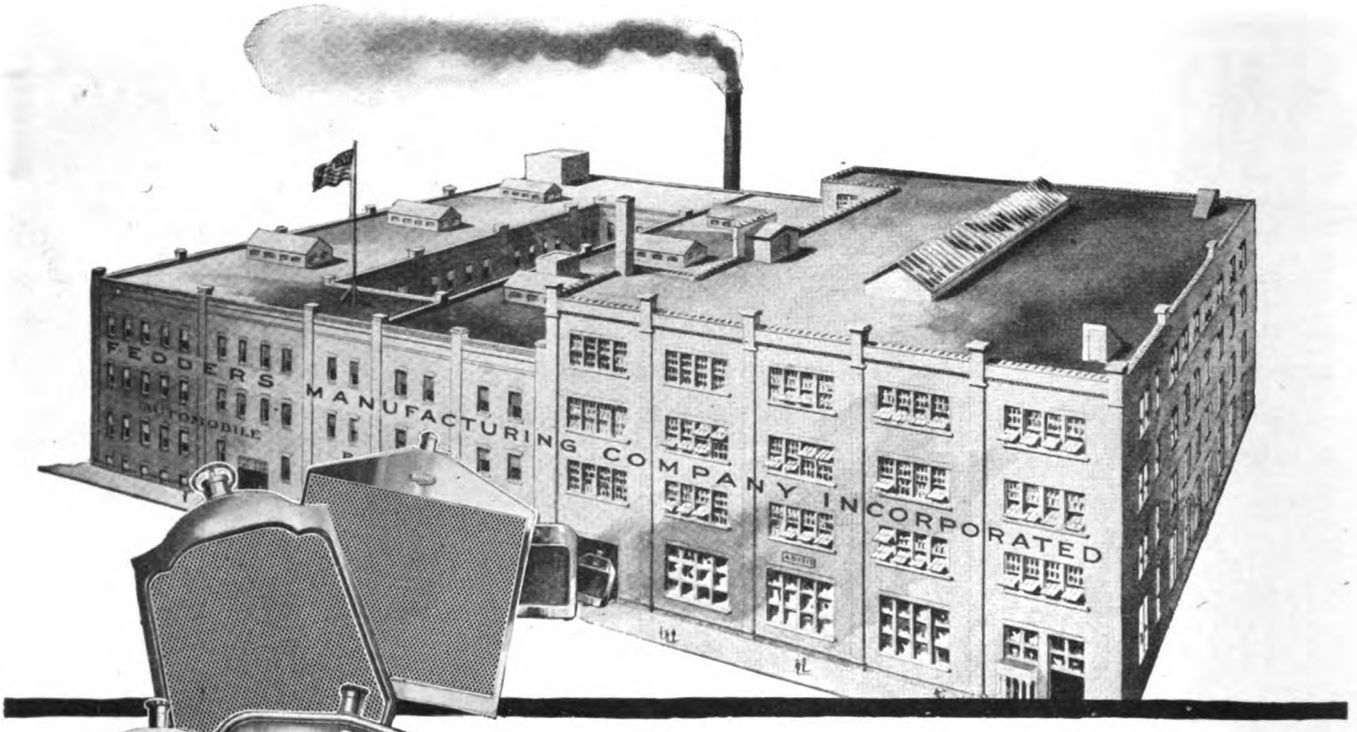
Albertson & Company

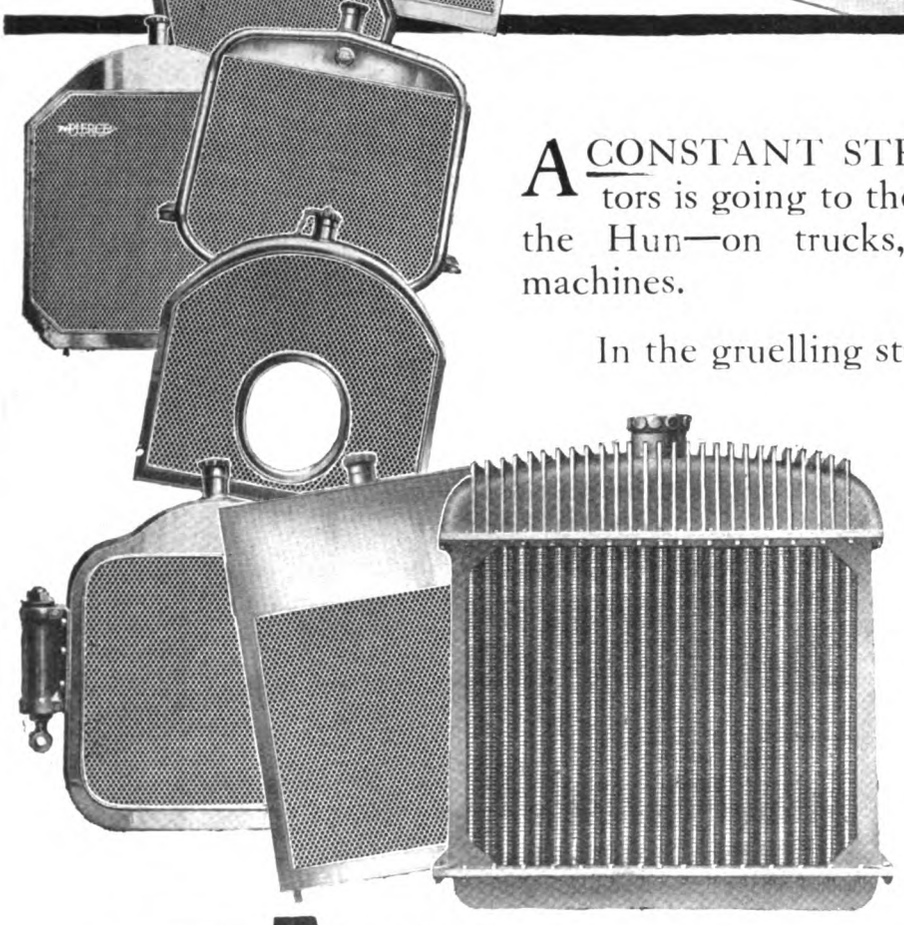
Sioux City, Iowa

The SIOUX Way

"Bigger Profits *Through* Better Tools"

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A CONSTANT STREAM of Fedders Radiators is going to the battle front to help beat the Hun—on trucks, airplanes and military machines.

In the gruelling strains of War, just as in the steady service of Peace, Fedders Radiators are always found on a great majority of the recognized Leaders.

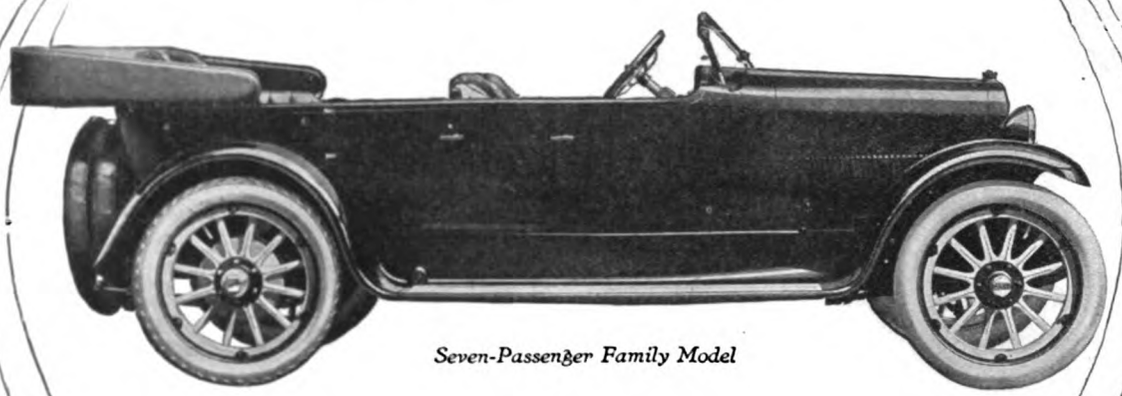
Let Fedders help solve your radiator problems.

FEDDERS MFG. COMPANY, Inc.
BUFFALO, N. Y.

FEDDERS RADIATORS

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CASE SIX



Seven-Passenger Family Model

Only Proven Features

Those Recognized as Best

IN the New Case Six, the "All-Feature Car," one finds only famous, tested parts. It is stripped of every experiment, every useless attachment. There is nothing freakish.

Men insist on this sort of a car nowadays. Men want a proven engine like the Case-Continental. Men know and appreciate Westinghouse Electrical Equipment, a Borg & Beck Clutch, Grant Lees Transmission, Columbia Axles, Jacox Steering Gear.

Such well known features as these stand for stability and performance. Men can count on them.

People want handsome cars, too. No car on the road is more beautiful than the New Case Six. It is the beauty of simplicity, such as conservative, knowing people always choose.

All men insist on economy both in upkeep and operation. The New Case combines all the proven principles of construction.

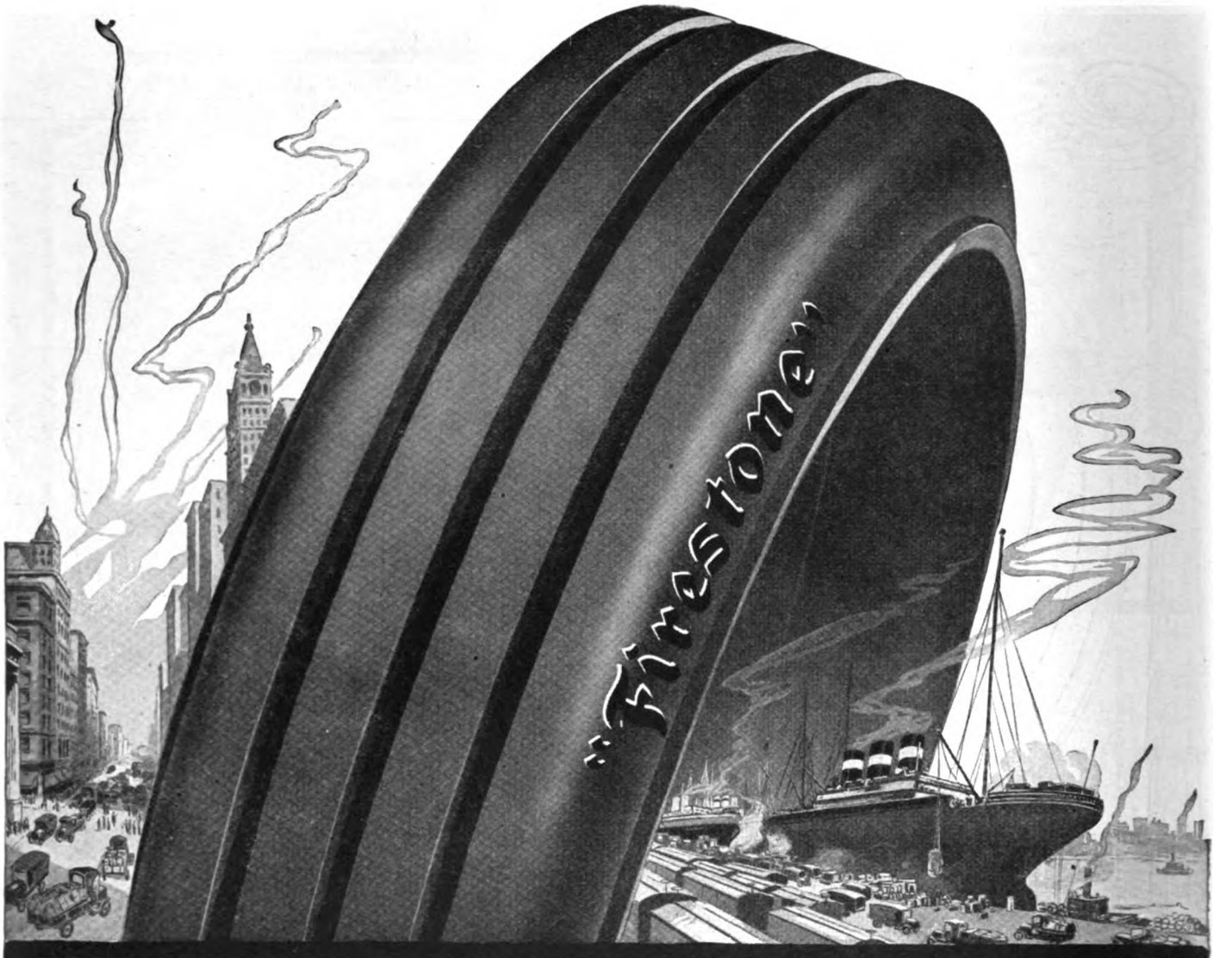
A car with all the Case superiorities would have to be built in exactly the same manner as the New Case Six. To depart from these standards is to leave the field of admitted successes.

No man can afford to buy a car without becoming acquainted with the New Case Six. In this one car we know you will find all the features which have attracted you in different cars, but were never combined before.

Family Model for 7 or 5 people, color dark blue, $1875; All-Seasons Model, Springfield Type, for 7 or 5 people, color dark blue, $2375; Sport Model for 4 people, color periscope green, $1075.

J. I. CASE T. M. COMPANY, Inc. *Founded 1842* **238 Liberty Street, Racine, Wis.**

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A Transportation "Giant"

THE full value of the motor truck is now being universally felt. From bridging the gaps of transportation due to unusual demands on railroads, it has established itself as an organized system of distribution, running from city to city on definite schedule. Since the builders of

Firestone Tires

originated this Giant truck tire, three years ago, there have been practically no restrictions to motor transportation. Equipped with these massive tires, *with the grooved treads,* trucks get through snow, mud and over ice, connecting the commercial centers with the outside world, independent of track or congested thoroughfare.

These Firestone Giant truck tires make tremendous loads possible because all the rubber is under all the load all the time, regardless of irregularities in the road. This great bulk of resilient rubber in one body, grooved to give play and grip, accounts for the remarkable traction of this tire, the fuel it saves, the unusual protection it affords the truck, and the net result of Most Miles per Dollar.

Sizes: 8, 10, 12 and 14 inch widths for medium and heavy duty. There are many other types of Firestone Truck Tires, one for every load, road and condition. Consult the Firestone man.

FIRESTONE TIRE AND RUBBER COMPANY
AKRON, OHIO BRANCHES AND DEALERS EVERYWHERE

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ATWATER KENT
SCIENTIFIC IGNITION

And the PEERLESS Two-Power Range Eight

FROM the slowest motor speeds to maximum, Atwater Kent Scientific Ignition supplies a big, hot, dynamic spark. For this reason, the Peerless Eight and thirty other manufacturers of first-class cars, trucks, motors and tractors have adopted it as standard equipment.

There is a steadily growing business for aggressive dealers in the replacement of magnetos with Atwater Kent Scientific Ignition.

Be the Atwater Kent dealer in your locality

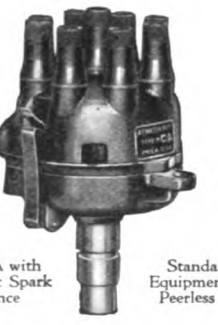
The "Loafing" Range

TO PURR along in the consciousness of tremendous reserve force—

To be able to loaf smoothly behind retarded traffic and yet be able to dash ahead the instant there is an opening—smoothly — without hesitation—and quickly reach any permissible city speed.

That is the charm of the Peerless Eight in its "loafing" range.

To have in reserve rugged resistless power *at no expense until you use it*—that is the economy of the Two Power-Range Peerless Eight



Type CA with Automatic Spark Advance

Standard Equipment on Peerless "8"

The "Sporting" Range

TO TAKE a new lease on life and climb on with renewed courage when you would expect her to falter at so long and steep a grade—

To speed faster and yet faster after you thought she had delivered her final spurt—

That is thoroughbred performance — the kind that the "sporting" range of power makes possible in the Peerless Two - Power - Range Eight.

When you call upon the Peerless for feats of prowess of which few cars are capable you get instant, willing, able response

ATWATER KENT MFG. WORKS *Philadelphia*

WRITE FOR INFORMATION TO 4938 STENTON AVENUE

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A Dependable Source of Supply

A company is known by the customers it keeps.

The great majority of representative manufacturers of motor cars, motor trucks and other finished products of the automotive industries are our steady patrons.

All the resources of an extensive and efficient organization, including:
Large Manufacturing capacity
Well grounded engineering
Thorough laboratory work
Ample capital and
The economies of large buying power
Advantages of expert traffic management

Standard Parts For Motor Cars, The Famous

Axles
Axles (dead rear)
Axles, trailer
Bock Bearings
Hubs
Perfection Springs
(regular and thin leaf)
Perfection Heaters

Rims—clincher, detachable and demountable for single and dual equipment
Clincher Rims
Detachable Rims for Wire Wheels, special
Millimeter Rims, all types
Rim Tools
Flanges and Fittings Solid Tire Demountable Equipment
Tire Bases in Demountable and Pressed on Channels

We also manufacture parts for Airplanes, Tractors, Motorcycles,

The Standard Parts Company,

Digitized by Google



for the Automotive Industries

Pleasant sales relations, and Both length and breadth of experience, are placed at their disposal.

Standard Parts products have contributed to the growth of many manufacturing enterprises. Similarly, these have contributed to the growth of the Standard Parts Company.

The same resources, the same efficiency and service are offered to all alike.

Our vast operations and the strategic location of our numerous factories merit the producer's confidence in our institution as a dependable, economical, efficient source of supply.

Trucks and Other Vehicles

Stanweld Products Including:

Brake Rod Assemblies, complete
Starting Cranks
Electric Welding of Parts
Exhaust Tubes
Forgings for Convertible Trucks
Bands S. A. E.
Formed Tubing
Ignition Wiring Tubes
Lamp Brackets
Mast Sleeves
Oil Tubes
Radiator Rods
Starting Gear Rings and **Boxes**
Straight Steel Tubing
Steering Gear Tubing
Tail Pipes
Torsion Tubes
Truss Rods
Tubing
(straight and formed)

Bicycles, Fire Arms, Carriages, Wagons and other vehicles

Executive Offices, Cleveland, Ohio

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AN AUTHORITY ON BUYING *says—*

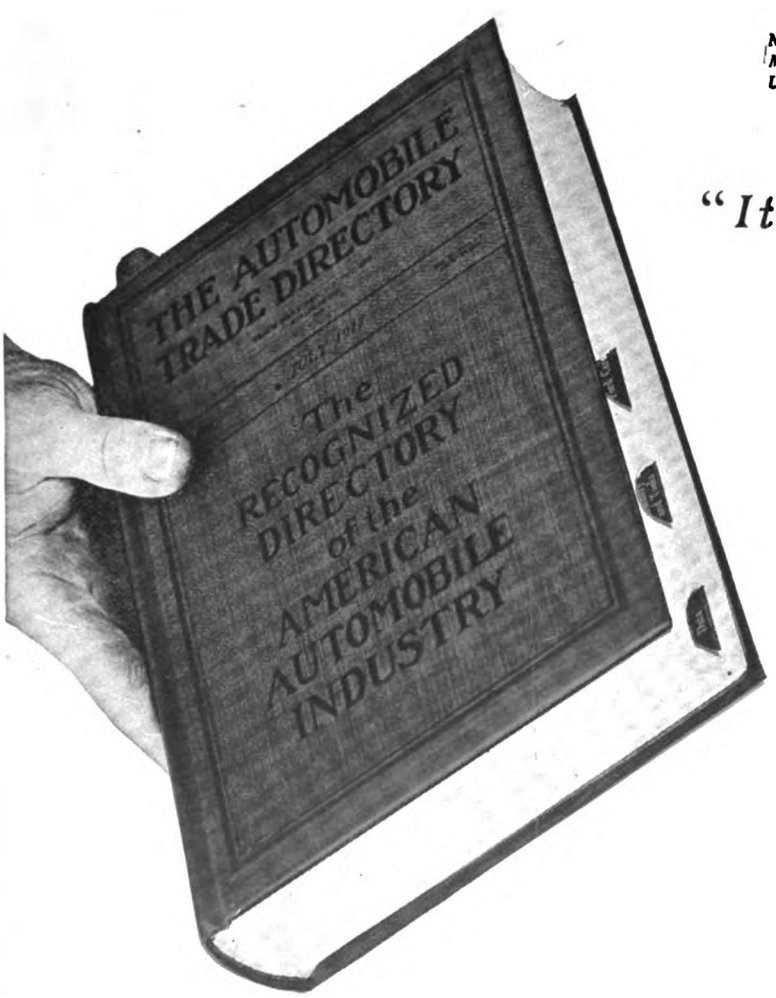
"The Automobile Trade Directory has always been of great help to me in my work of purchasing parts and equipment. I refer to it many times a day to locate manufacturers and for other buying information."



Guy Morgan.

FORMERLY PURCHASING AGENT
MITCHELL-LEWIS MOTORS CO.

NOW SUPERVISOR WORK IN PROCESS
MOTOR TRANSPORT SECTION. O.Q.M.G.
UNITED STATES ARMY, WASHINGTON, D. C.



"It Hangs Everywhere"

A THOUSAND CATALOGS IN ONE

You can locate the manufacturers of any article used in the automobile industry—just as Mr. Morgan does—by consulting The Automobile Trade Directory.

No matter what the article is—if it's used in the automobile industry—you'll find the manufacturer listed in the "Red Directory."

THE AUTOMOBILE TRADE DIRECTORY
ROBERT WOLFERS, President
243 WEST 39th STREET, NEW YORK CITY

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Probably the dealer had accepted the statement of a salesman regarding some new, fancy plug. He had not investigated the quality. The result is shown above—a dissatisfied customer.



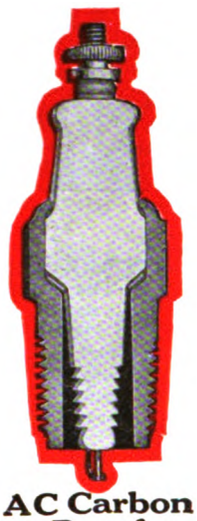
⅞ in. Regular AC Titan

After strenuous tests the manufacturers listed decided on A C. Can *you* afford to disregard their judgment?

Albert Champion means

AC SPARK PLUGS

The Standard Spark Plug of America



AC Carbon Proof
For Fords Overlands and Studebakers

LOOK FOR AC ON THE PORCELAIN
They Are Made For All Types of Motors

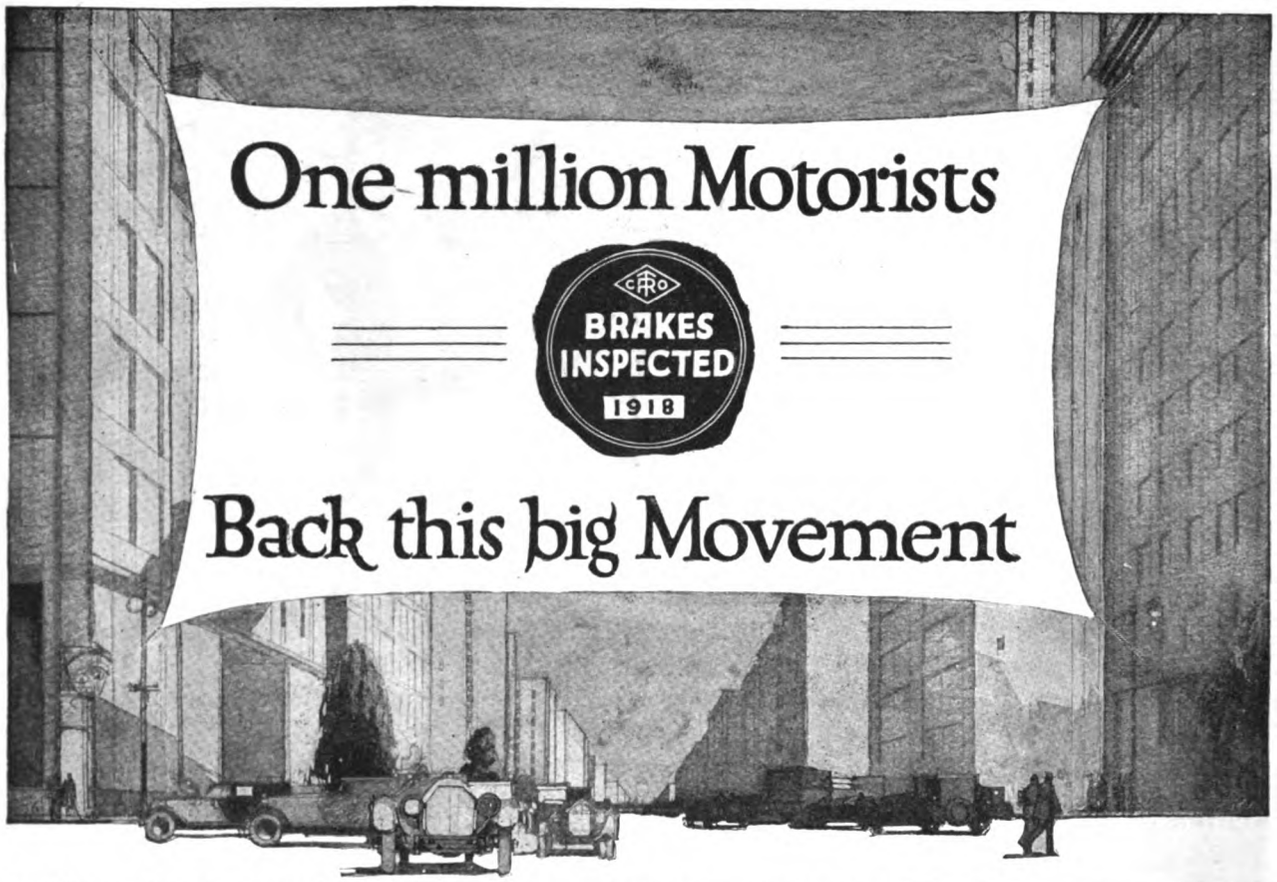
Ford, Overland and Studebaker owners, how often must you clean your plugs? This new AC is exactly what its name implies—*Carbon Proof*. Progressive dealers owe it to their trade to advise AC equipment exclusively.

CHAMPION IGNITION COMPANY
SOLE MANUFACTURERS, FLINT, MICHIGAN

These Manufacturers Use AC as Standard Equipment

Cadillac	Pilot	Lexington-Howard	Dorris	Gabriel Trucks	Stewart Trucks
Pierce-Arrow	Buick	Scripps-Booth	McLaughlin (Canada)	Moreland Trucks	Wisconsin Motors
Packard	Oakland	Crane-Simplex	American-La France	Wilcox Trux	La Crosse Tractor
Marmon	Oldsmobile	Stearns-Knight	Davis	Sterling Trucks	Advance-Rumely
Hudson	Nash	Saxon	Sanford	Republic Trucks	Tractor
Chalmers	Kissel Kar	Stutz	Hatfield	Diamond T Trucks	Buffalo Motors
Hupp	Premier	National	Maytag	F-W-D Trucks	Continental Motors
Chandler	White	Stephens	Duesenberg Motors	G. M. C. Trucks	Deere Tractors
Haynes	Delco-Light	Jackson	Dodge Brothers	Sandow Trucks	Northway Motors
Chevrolet	Murray	Apperson	Old Reliable Trucks	Signal Trucks	Rutenber Motors
Dort	J. I. Case	Anderson	Titan Truck	Brockway Trucks	Sterling Motors
Cole	Jordan	Locomobile	Ford Tractors	Samson Tractor	Smith Motor Wheel
Reo	Liberty	Daniels	Acme Trucks	Menominee Trucks	Van Blerck Motors
Paige	McFarlan	Westcott	Netco Trucks	Federal Trucks	Wallis Tractors
Peerless	Paterson	Singer	Gramm-Bernstein Trucks	Riker Trucks	Waukesha Motors

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THE new Brake Inspection Movement has obtained the unqualified endorsement of motorists all over the country. Police Commissioners, Presidents of automobile clubs and other prominent officials and motorists have assisted in giving the movement the most widespread publicity.

The car owners in your vicinity are interested in this new movement for the periodical inspection of brakes on motor vehicles, because it means greater safety to themselves and to their cars. This interest can be turned into profit for you. Tie up your business with this movement. It offers a wonderful opportunity for you to obtain general overhauling jobs before the touring season opens. Don't let a motorist go past your window without reminding him of it, at least by a sign.

Scientific tests prove Thermoid superiority

When your customers come in for brake lining give them the best. Thermoid Brake Lining is superior to any other brake lining on the market for three reasons.

More material, greater service

1. There is 40% more material and 60% more labor used in the manufacture of Thermoid Hydraulic Compressed Brake Lining than in any woven brake lining. This abundance of material and labor means longer wear.

Grapnalized

2. Thermoid Hydraulic Compressed Brake Lining is Grapnalized, an exclusive process which resists moisture, oil and gasoline. Moisture causes brake lining to swell, making it grab or slip.

Hydraulic compressed, uniform throughout

3. Every square inch of Thermoid is hydraulic compressed at a pressure of 2000 pounds. Thermoid is uniform all the way through. It cannot compress in service. There are no soft spots to wear out quickly. It will give uniform service until worn cardboard-thin.

Endorsed by automobile manufacturers

The engineers of fifty-one leading car manufacturers, ten of the most prominent axle-makers, all leading jobbers and thousands of dealers have selected Thermoid Brake Lining because of its dependability.

We are co-operating with jobbers and dealers to make this season the biggest ever, not only in Thermoid Brake Lining but in all branches of their business.

Advertising campaign in your city

Our new book, "The Brake Inspection Movement and What it Means to Dealers" tells in detail how we have planned to advertise your store direct to the car owners of your city, over your name. It is jammed with interesting and profitable ideas for increasing your business.

If you have not received your copy of this book write for it today.

Our guarantee: Thermoid will make good or—WE WILL.

Thermoid Rubber Company

Factory and Main Offices: Trenton, N. J.

Branches

New York Chicago San Francisco Indianapolis Detroit Los Angeles Philadelphia Pittsburgh Boston London Paris Turin

Canadian Distributors

The Canadian Fairbanks-Morse Company, Limited, Montreal

Branches in all principal Canadian cities

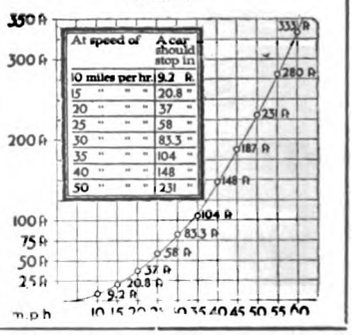
$\frac{V^2}{10.8}$ **Will your car do this?**

Automobile engineers have proved that when brake mechanism is right and road conditions average, any car should stop at distances and speeds given by the chart.

V^2 means the square of the velocity or speed of your car. 10.8 is the proved factor of retardation under average road conditions. This factor decreases on smooth, slippery roads to 6.7 and increases as high as 17.4 on rough, worn roads. The chart represents the average condition, and other conditions can readily be figured by changing the factor within the given limits.

Remember that your brake mechanism is not "right" unless its brake lining has the ideal co-efficient of friction. The better the brake lining the quicker your stop.

Thermoid Brake Inspection Chart



At speed of	A car should stop in
10 miles per hr.	9.2 ft.
15 " " "	20.8 "
20 " " "	37 "
25 " " "	58 "
30 " " "	83.3 "
35 " " "	104 "
40 " " "	148 "
50 " " "	231 "







© Thermoid Rubber Co., 1918 ***Makers of "Thermoid Crolide Compound Casings" and "Thermoid Garden Hose"***

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The Peerless Dealer's Big Advantage

PEERLESS

Two-Power-Range Eight

Ready to Romp

An effortless, light-hearted frolic!

That's what the Peerless Eight makes of the ordinary day's work of utility driving.

The soft, easy flow of eighty-horsepower makes it a romp.

Would you crawl at a snail's pace behind retarded traffic? You may do so with utter smoothness.

Does the traffic open up? The advantage is yours for you have the "pick-up" to leave the cars about you as though they were stalled.

And the limit of speed for the open streets is a romp for your eighty horsepower.

And you waste not at all.

For all this is done in your "loafing" range of power—on half rations.

Many a lesser powered six—even many a four—would starve on the fuel that carries your Peerless romping through the day's work.

"Loafing" Range

ECONOMY

Ready to Race

But not every day is a work day.

With your Peerless you sacrifice none of the holiday joys—you are equally as ready to race as to romp—you have your "sporting" range.

You may master the road whatever the adverse conditions; you may make Time laugh at Distance.

You have only to open your throttle wider to release her double poppets and utterly change the character of her performance.

Gone now the soft flow of eighty horsepower "loafing"—as you reach her "sporting" range there comes a deep growl of brute power, all conquering.

In her "sporting" range she is as mighty as she was gentle in her "loafing" range.

The Peerless dealer has a big advantage because he can demonstrate the joy of these startling contrasts in performance—and the practical economy gained without sacrifice.

"Sporting" Range

POWER



Seven Passenger Touring

$2340

Roadster $2340
Sporting Roadster $2490
Coupe $2850
Sedan $2990
Limousine $3690

All prices f.o.b. Cleveland—Subject to change without notice

The Peerless Motor Car Company, Cleveland, Ohio

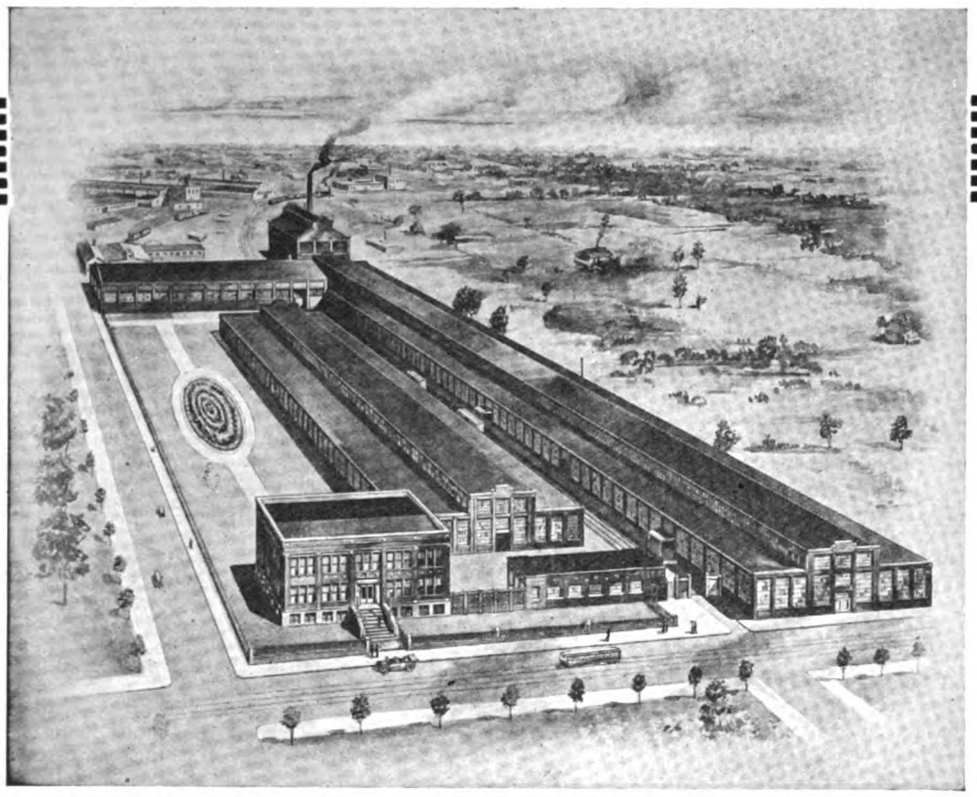
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The Factory that Serves You Better

The

PARISH & BINGHAM CO.

CLEVELAND, OHIO



An unusual plant thoroughly equipped for the manufacturing of trucks and pleasure car frames and the making of brake drums and large steel stampings of every kind.

The best modern shop practice, complete co-ordination in every part and a prevailing spirit of co-operation—these features make possible a certainty of the maximum of quality and service.

Our Engineering Force is at your disposal.

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KisselKar

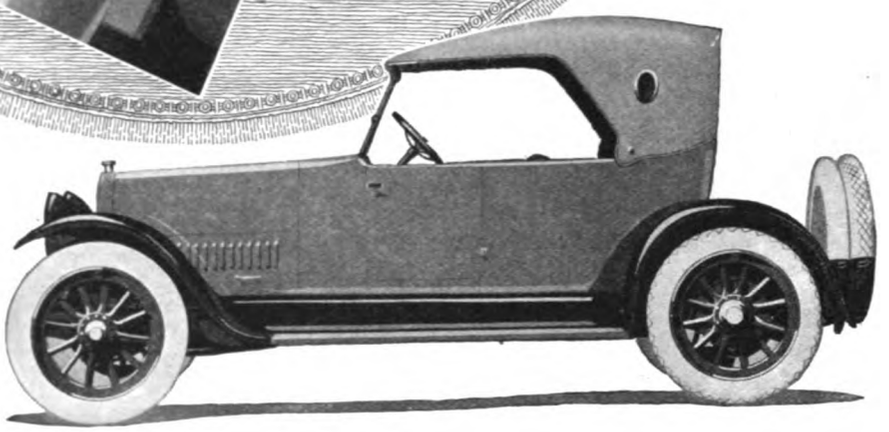
The ALL-YEAR Car



4 Passenger

Sedané

Roomy Enough for Every Feminine Use



PLENTY of leg and elbow space that makes shopping, calling, city driving or country touring in the ***Sedané*** a pleasure. Its exclusive construction features, created by Kissel, fulfil three functions—a closed coach for winter, a semi-open car by dropping all side windows, a roofless touring car for summer.

The ALL-YEAR Top is **built-in,** not on; no visible fastenings, no rattles or draughts, entirely removable.



With ALL-YEAR Top—windows raised or lowered at will.



Windows up—complete protection in bad weather.

The Hundred Point Six

Its proven Hundred Quality Features give mechanical efficiency, brilliant road performance, economy, quietness.

DEALERS—We will be glad to send dealers' agency details on request.

KISSEL MOTOR CAR CO., HARTFORD, WIS., U. S. A.

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"—and that stream of a thousand sparks a second keeps the plugs as clean as a whistle."



FOUL plugs hinder satisfactory ignition—no doubt about that. But even the best motor will develop some carbon, and carbon attacks the spark plugs first.

The Philbrin High Frequency Ignition System burns the carbon from your plugs and keeps the electrodes as clean as new. Instead of removing the plugs and cleaning each separately, you merely turn the Philbrin switch to "H" (High Frequency) and the resulting stream of hot, intense sparks does the rest, without the least injury to the spark plugs.

That is but one of the many advantages of this system. It is equally effective in overcoming poor fuel, a bad mixture or carbonization resulting from inferior oil and leaky piston rings.

The Philbrin Single Spark System, on the other hand, operates to minimize carbon deposit, first by making it possible to utilize a much leaner mixture and, second, by exploding every charge of gas that enters the cylinders more completely.

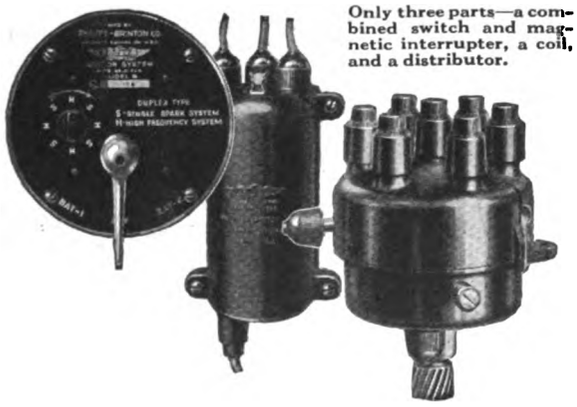
The result is greater economy and more power, because it is a well-known fact that a lean mixture though more difficult to ignite is more powerful when fired.

The efficiency of Philbrin Single Spark Ignition is due in large part to the patented Contact Maker and Condenser which provide for thorough saturation of the coil, followed by an instantaneous break—assuring a full-bodied spark of great intensity that fires the mixture instantly.

Together these two systems of ignition offer the assurance of greater gasoline mileage; increased and more flexible power, and an "antidote" for every emergency that threatens effective ignition. Obviously the dependability of two complete and different systems of motor ignition is greater than any single system alone could offer, particularly since each system individually has been developed to the highest point of efficiency.

Made in models for all cars with special mountings for magneto replacement when required. Write for catalogue.

Our proposition to jobbers and dealers is unusually attractive. Write at once for unassigned territories.



Only three parts—a combined switch and magnetic interrupter, a coil, and a distributor.

PHILIPS-BRINTON CO.
501 So. Broad Street - Kennett Square, Pa.

PHILBRIN
DUPLEX IGNITION
—with a second system to spur the motor to super-service.

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Inherent Speed and Power

Duesenberg

The Power of the Hour

Airplane Automobile Marine Engines

THE Duesenberg Factory, the Duesenberg Equipment and the Duesenberg Organization were peculiarly fitted to take over a certain highly specialized and important work for the United States Government.

This being the case, the entire resources of the Duesenberg Organization were concentrated on the prompt and efficient completion of this contract.

All commercial models of the Duesenberg Engine have been withdrawn from the market.

We Will Be At Your Service After The War Is Won

DUESENBERG MOTORS CORPORATION, 120 BROADWAY, NEW YORK CITY

Contractors to the United States Government

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Compare the Oldsmobile and what it does



with other cars of like price, or even more. And the more carefully, the more closely you analyze, the more firmly will this great car establish itself in your confidence.

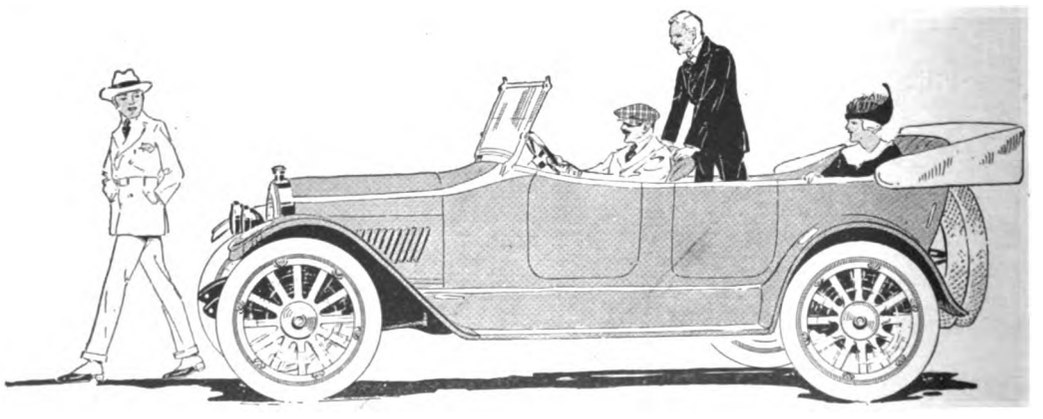
A demonstration of its power capabilities will convince you of its claim to distinction as the real performer in its price class—and *the* light weight Eight at a moderate price.

Take it out on the highway and watch the ease with which it accelerates on the meanest hills, watch its remarkable speed on the straight-away, watch its staunch, faithful going over roughest roads in sand, mud or snow.

Take it into congested traffic. Note the ease with which it throttles down to a walking pace. Step out of the car and stroll beside it. Then note the lightning get-away at the traffic signal.

With a car of this character is it any wonder it is represented by the livest and best selected dealer organization in the country? There are still some open memberships. Write or wire for the details.

OLDS MOTOR WORKS
LANSING MICHIGAN



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Tested Steel Stock

FOR
Motor Valves
Spring Shackle Bolts
King Bolts
Chassis Bolts
Coupling Bolts
Connecting Rod Bolts
Push Rods or Valve Tappets
Drag Links
Brake Rod Assemblies
Starting Cranks
Lamp Brackets
Tank Straps
Propeller Tubes
U. S. S. Head Cap Screws
Piston Pins





OUR STOCKROOMS contain literally hundreds of tons of specially selected steel that we hold here awaiting orders for your valves, bolts and other parts.

Included are thousands of pounds of alloy steels of all kinds—Nickel, Chrome-Nickel, Tungsten and other special automobile steels.

Careful chemical analysis and physical tests enable us to MAKE SURE that the steel of which we make your parts is the one most suitable for them.

No element of chance enters into our stockroom system. Each lot of steel, before put into process of manufacture, is analyzed—tested—KNOWN.

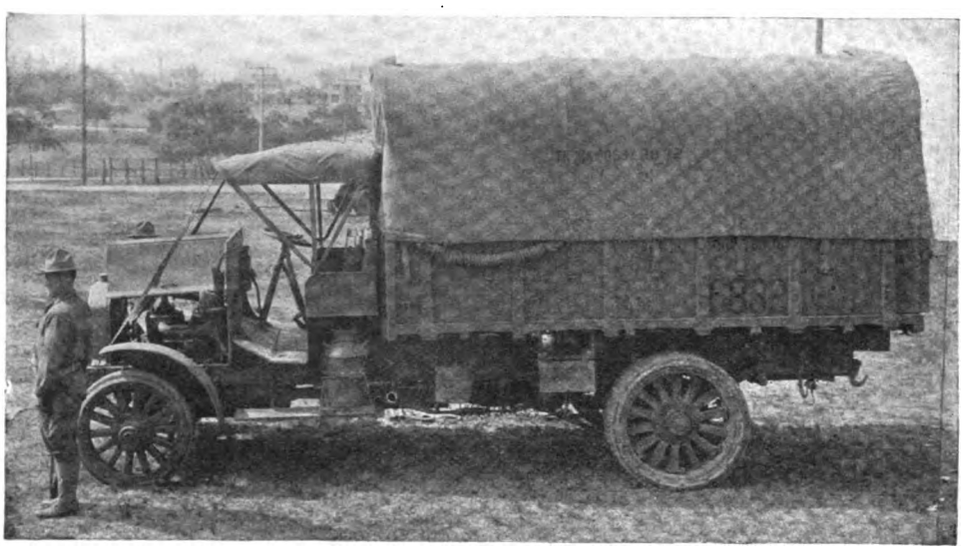
The Steel Products Co.

Michigan Plant
Detroit, Mich.

Main Plant
Cleveland, O.

Metals Welding Plant
Cleveland, O.

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"Prepare for Inspection"

This command, which strikes almost terror to every untrained "rookie's" heart, in fear of some essential requirement overlooked, brings no misgivings to the seasoned, disciplined soldier.

Proudly and straight he stands at attention with the confidence born of assurance that in every point his equipment meets the requirements and will pass the closest scrutiny of the cold, penetrating eye of the Inspection Officer.

So it is with the truck manufacturer, whose truck is built of

VANADIUM STEEL
IN ALL THE VITAL PARTS

He, too, has no fear of the closest inspection. His is the calm confidence and satisfaction born of the knowledge that he has fully met the government's rigid requirements of the "best quality" steel.

AMERICAN VANADIUM COMPANY
NEW YORK PITTSBURGH LONDON

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JOHNSON CARBURETOR

Unusually Light Weight Due to Constructional Simplicity and Fewness of Parts — Features Appreciated by the Modern Car Manufacturer.



JOHNSON COMPANY

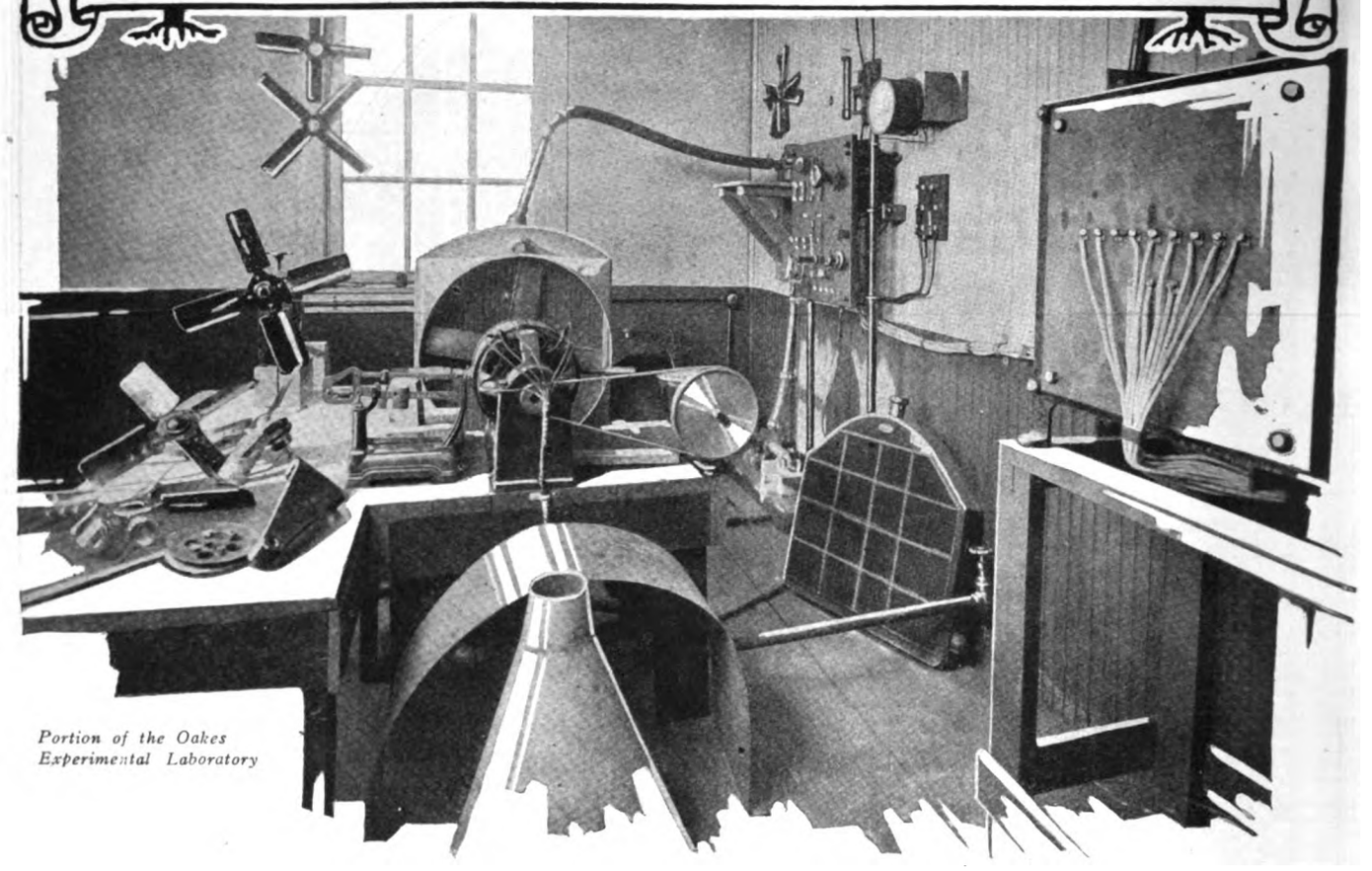
Makers of Superfine Instruments of Carburetion

DETROIT MICHIGAN

BUSINESS SOLICITED FROM MANUFACTURERS ONLY

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OAKES Efficient Cooling FANS

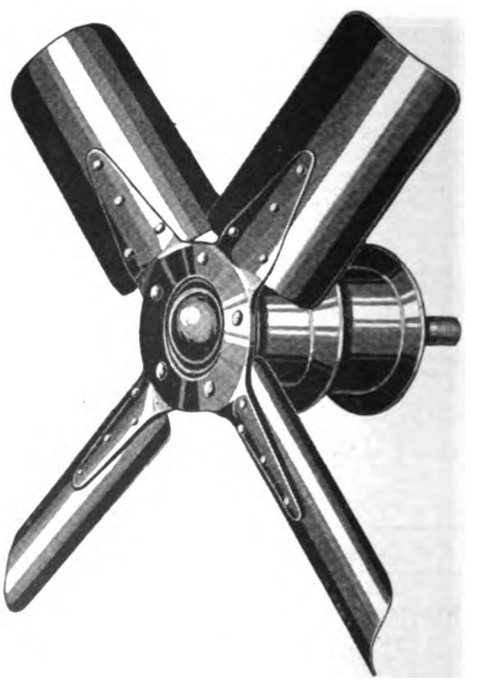


Portion of the Oakes Experimental Laboratory

We prove their efficiency *first*—

An experimental laboratory is a "go-between" link—which closely draws together the designing and producing heads of any great organization. Upon this co-ordination of effort between the engineering staff and the production department depends largely the efficiency of any product.

In the Oakes laboratory exhaustive tests are conducted on cooling systems, with the sole purpose in mind of designing and producing fans of greatest cooling efficiency and mechanical perfection —especially adapted to operating conditions.



We make all kinds of metal stampings.
Send blue-prints, and we'll gladly submit quotations.

Indianapolis, Indiana, U. S. A.

The Oakes Company

Chicago Office,
Theo. D. Dodd, Mgr.
80 E. Jackson Blvd.

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How Much Can You Trade It In For?

The test of automobile value is the price you can get for a used car; and that price is increased or decreased according to the condition of the engine, bearings, gears, and other moving parts.

Are you protecting those parts?

Figure how the yearly cost of the machine's operation, repairs or depreciation may vary.

Compare it with the slight yearly cost of scientific lubrication. Scientific lubrication does more than protect the service of your car; it protects the price you get when you trade it in.

The next time you buy oil or grease for your motor car, remember the actual saving you will make by insisting on scientific lubricants.

Automobile owners, manufacturers, machinery owners: this is the time of all times to consider operating costs and how they might be reduced by scientific lubrication.

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Booklets on
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Automobile Division

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It follows the gears continuously, leaving no spot where metal can touch metal. Gearese insures against wear, reduces friction and insures a silent, smooth-running car. Gearese maintains its lubricating consistency under all temperatures—does not cake on the walls in coldest weather, nor break down and run out, under heat.

Gearese should be packed into your gear case and differential about once a year.

☐ **CUPESE**—A special quality cup grease, produced by the exclusive Acaloric Process. It is made in all densities, from very light to extra heavy. Its uniform functioning under all conditions, makes it ideal for wheel bearings, brake connections, gear and clutch levers, universals, spring leaves and bolts, steering arms and knuckles and axle caps.

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☐ **CORUL**—A special quality liquid core binder that meets the eleven essentials of uniform and economical core making for malleable and gray iron casting.

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☐ **SLO-FLO**—A super-lubricant, made by the Acaloric Process. Does not climb, drip or spatter. It is adhesive and cohesive—heat and pressure resisting—non-volatile. It is extensively used:

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—for roller bearings in mine cars, automobiles, etc.—for hydraulic pumps, line shafting, lighting dynamos in railway cars.

—in railway and machine shops, in industrial and power plants where excessive heat and bearing pressures must be overcome and where oil is impracticable or grease impossible.

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☐ **TEXTUL**—A special oil compound which has all the good qualities of Red or Lard Oils—yet offered at far less cost. Textul saponifies readily—carries well through the carding process and needs no alkali added for emulsion.

☐ **ASBESTESE**—A special asbestos and wool-mixed grease combination for steam, electric and logging railways, traction lines, contractors'- and mine-car journal lubrication, etc.

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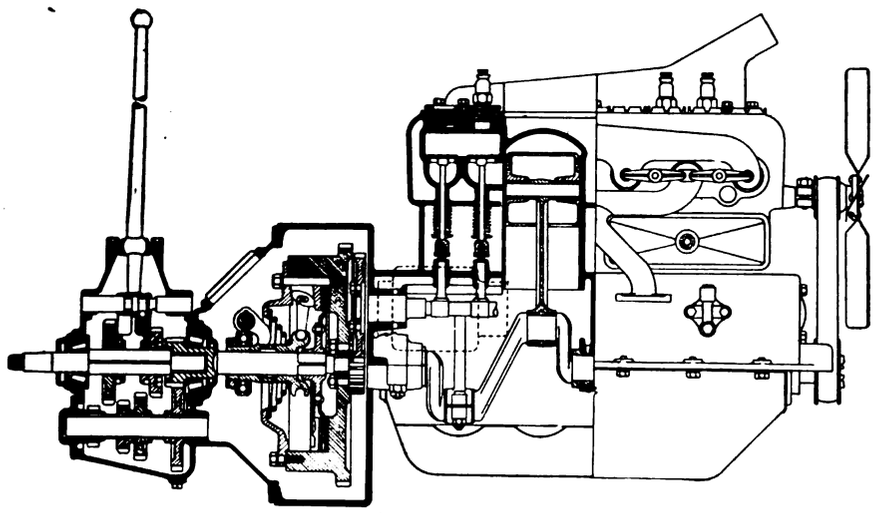
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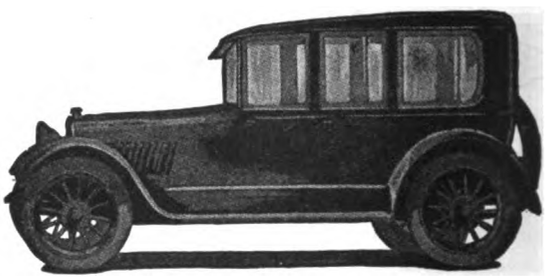
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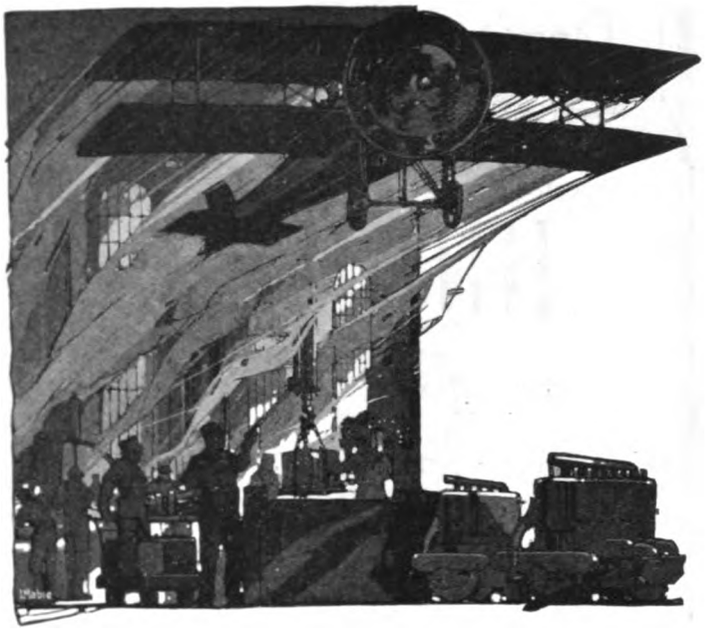
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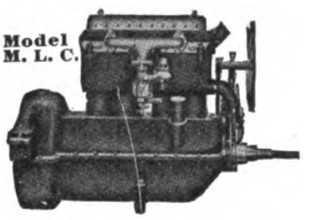
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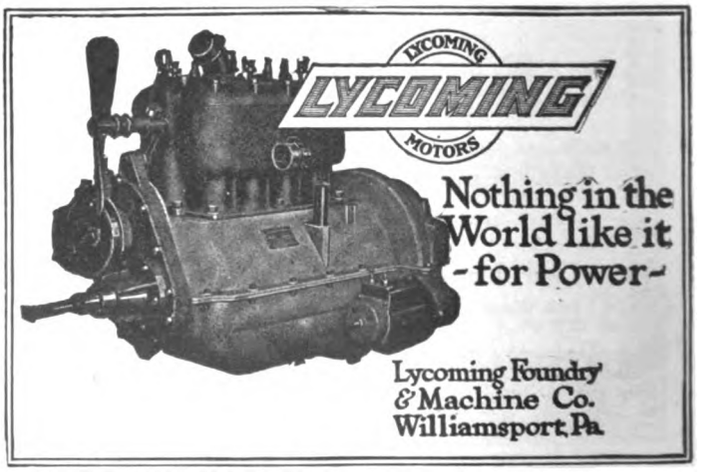
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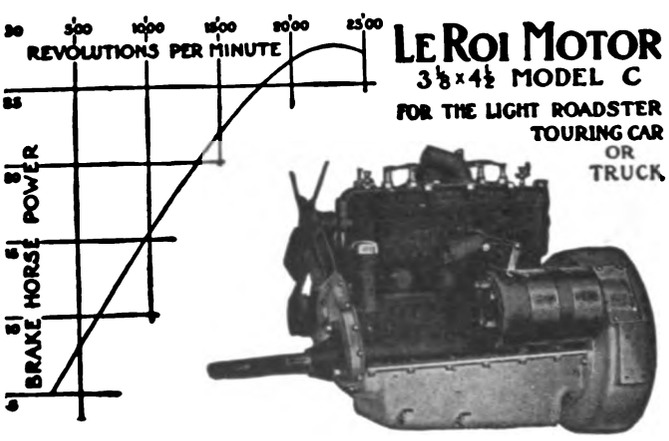
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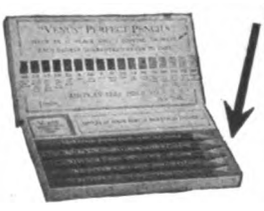


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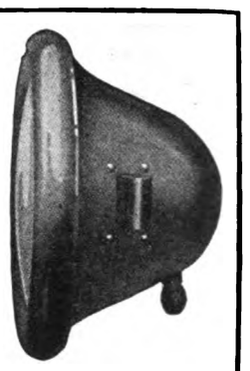
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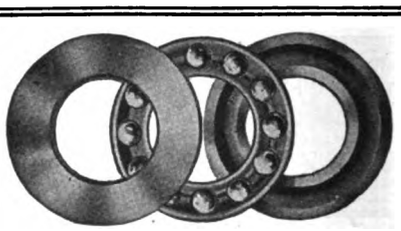
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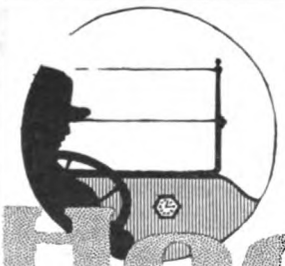
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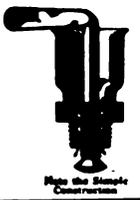

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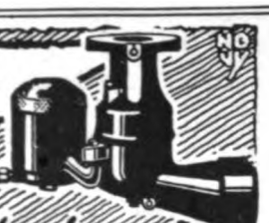
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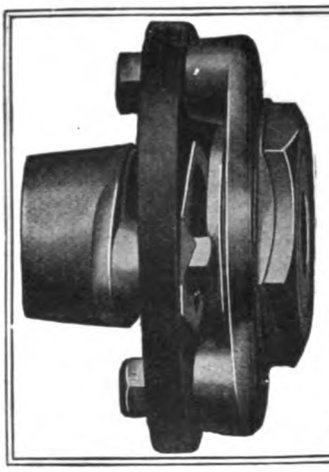
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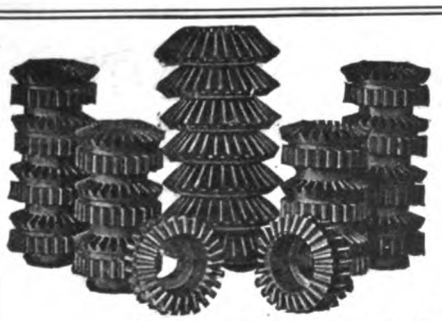
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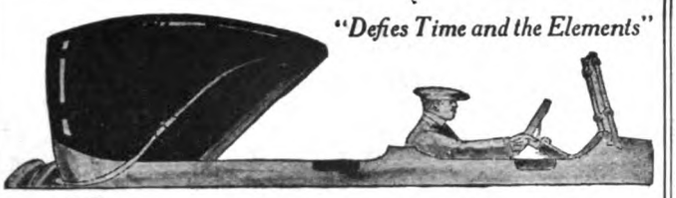
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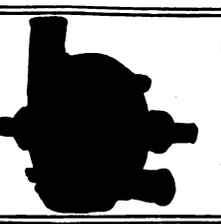
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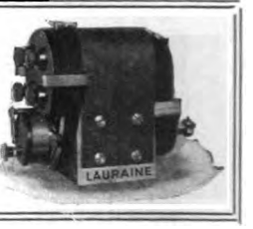


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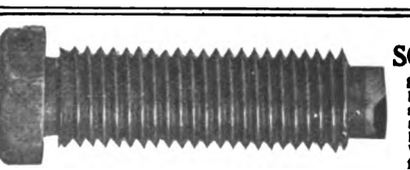
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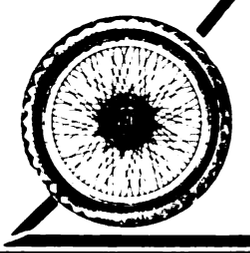
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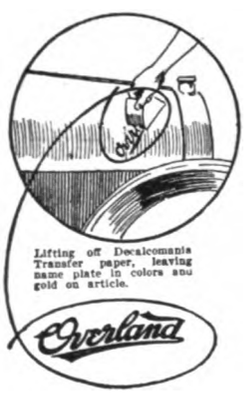
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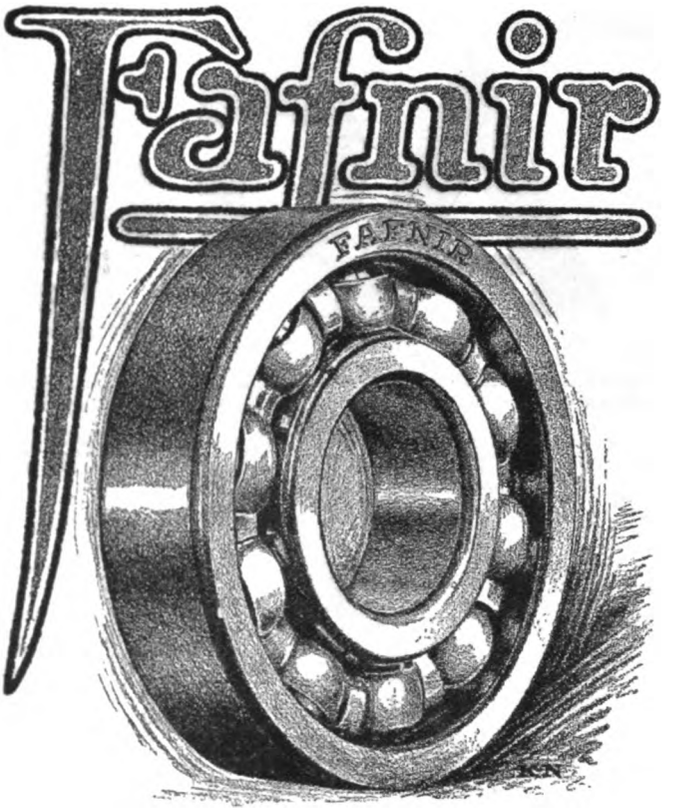
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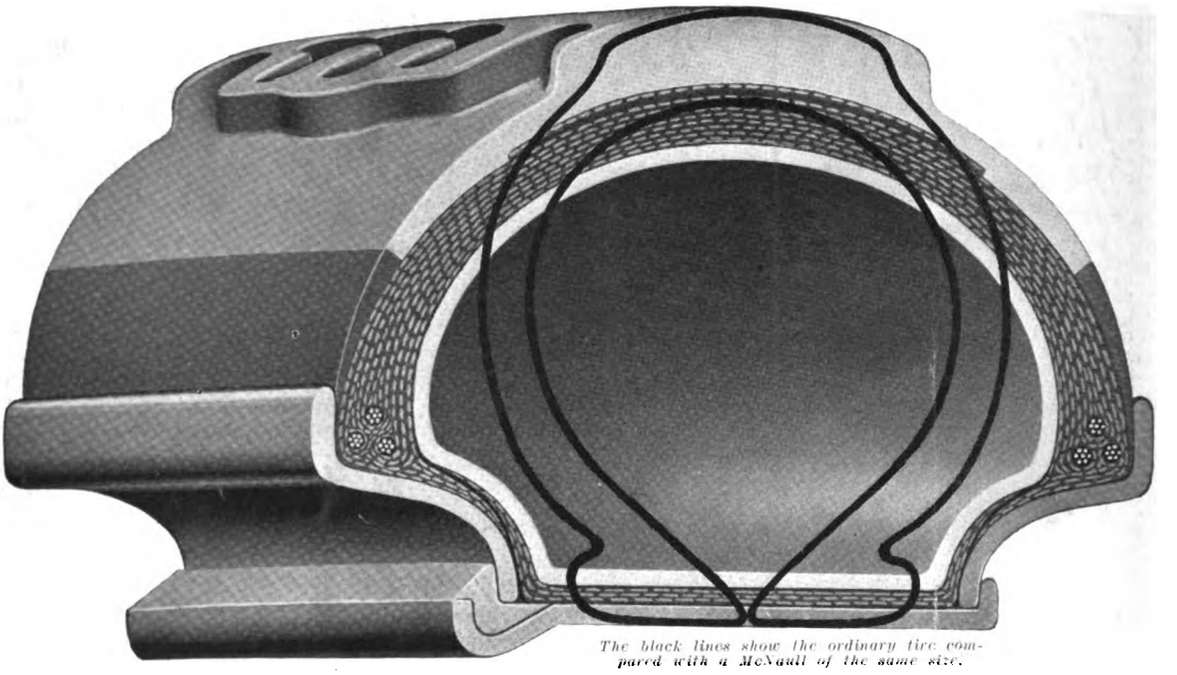
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The black lines show the ordinary tire compared with a McNaull of the same size.

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More Sidewall Strength

A BIGGER, wider, thicker tread—

A steel flange for sidewall—where ordinary tires "blow."

A bigger chamber for air.

More wear in the tread—more strength in the sidewall—more air to ride on—

But very little more material—we simply put it where it will serve.

That's why McNaull's cost very little more to **buy**—and so much less to **use.**

There are many more advantages.

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McNaull

"The Name of a GOOD Tire"

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Vol. XXXVIII
No. 12

NEW YORK, MARCH 21, 1918

Ten cents a copy
Three dollars a year

A Shortage of Automobiles!

Wise Dealers Are Taking Every Car They Can Get. Those Who Delay Now Will Face A Serious Situation When The Active Selling Season Opens.

Daily developments serve to confirm our earlier prediction that this year will witness an automobile shortage more acute than any the industry has experienced within the last several years.

From the present indications it seems certain that by July 1st all stocks of the most popular cars will have been exhausted, and that from that date on dealers and buyers will have to depend upon limited productions to meet their wants.

Because of war conditions a curtailment was made in the production schedules of every manufacturer in the industry. No maker had planned to produce as many cars this year as were built last year. But now even those greatly-reduced schedules have been so interrupted by one influence or another that it will be impossible to make up what has been lost.

The most serious condition from which there seems to be no escape is that resulting from freight embargoes. Dealers who do not have cars coming to them every day can hardly realize the seriousness of the situation which exists throughout the industry. Embargoes are placed on shipments without notice and for indefinite periods. A dealer may feel that if he gives his factory instructions to ship him cars on some future definite date that his wants will be taken care of. But before the date of shipment, an embargo may make it impossible.

This will inevitably produce a serious situation for those dealers who rely upon their being able to obtain cars from the distributor when and as they may want them. It will prove of particular disadvantage to those dealers who postpone making contract arrangements.

Hudson Dealers are going to need cars. The billions of dollars that are finding their way into circulation are going to look for automobiles.

No Hudson Dealer need have any worry about over-stocking this spring.

HUDSON SUPER SIX

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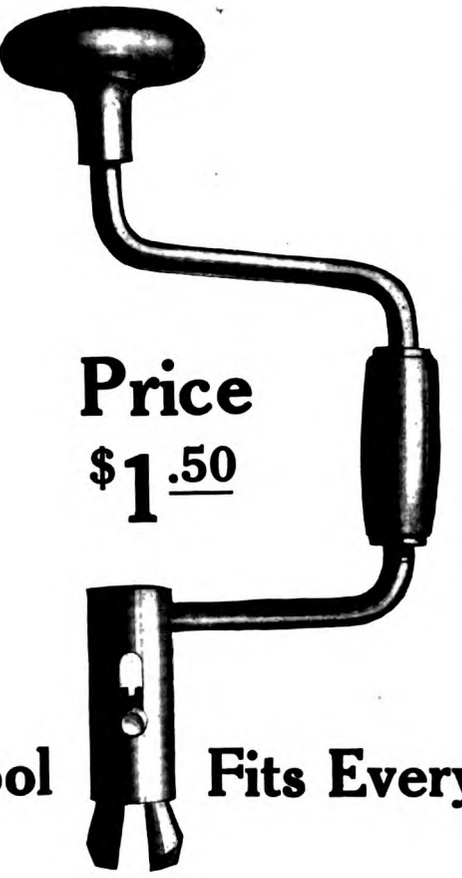
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Is the Most Serviceable Tool for Motor Car Use

Belongs In the Tool Box of Every Motor Car



Price $1.50

Indispensable In the Service of Every Going Garage or Repair Shop

One Tool Fits Every Nut

The UTILITY Universal Rim Wrench is built in only one size—yet it **automatically** fits every nut on every demountable rim. In the tool box of the motorist, in the stock or the shop of the garage or repairman, it is small enough to be always out of the way—except when you need it. Then it is always ready for use—a single tool that fits, holds, and turns any nut.

The new UTILITY Universal Rim Wrench is beautifully finished in nickel and black enamel. It is more compact and lighter, and built with practically unbreakable jaws. It is shortened to go into the tool box without folding, and is absolutely rigid in action—a stronger brace that cannot close up or slip while in use by the operator.

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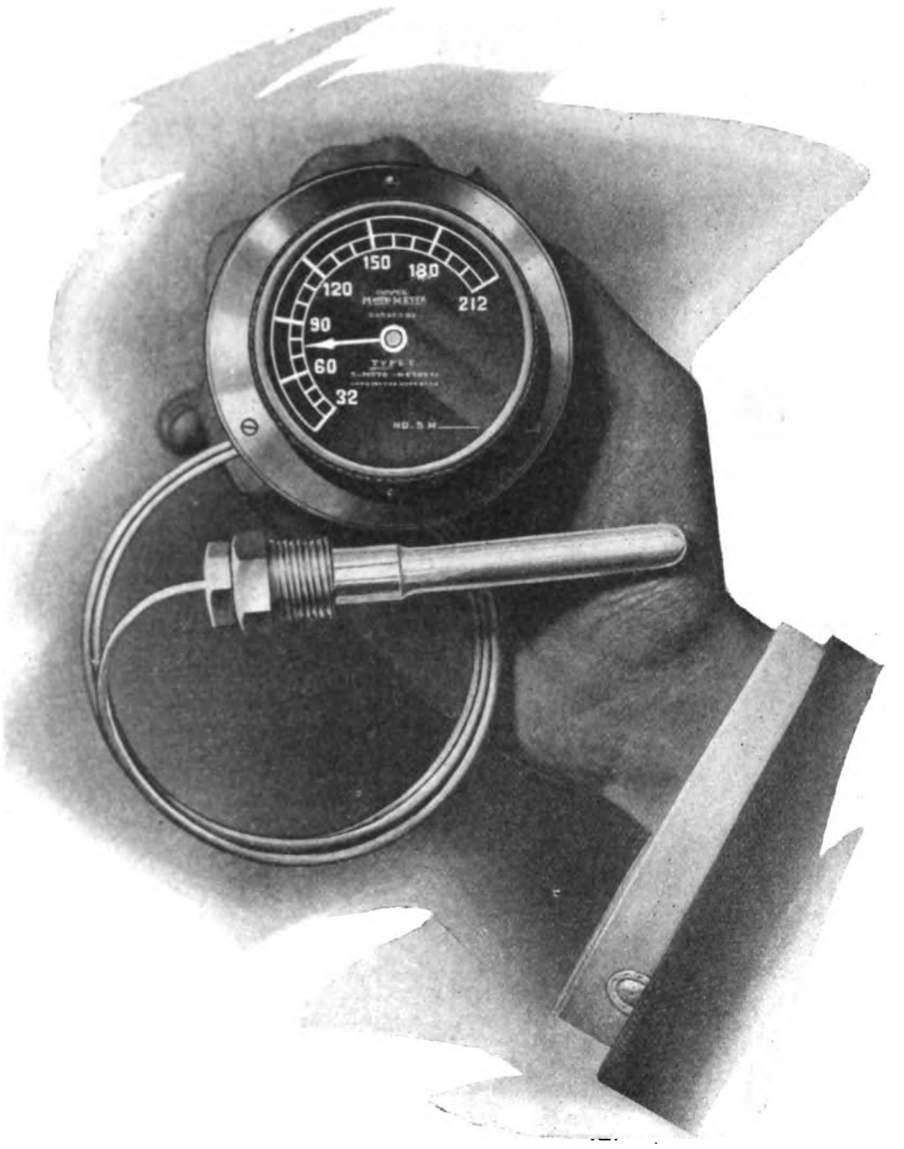
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For aeroplanes, tractors, stationary engines and motor boats.

BETTER BECAUSE—

FIRST, it registers the full scale of 32° to 212°. This is important. (Others from 100° to 212° only.)

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THIRD, smooth, unbroken, non-vibrating movement of the hand. (Others are unreadable under vibrations.)

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FIFTH, weight with 12 feet of tubing only 12 ounces.

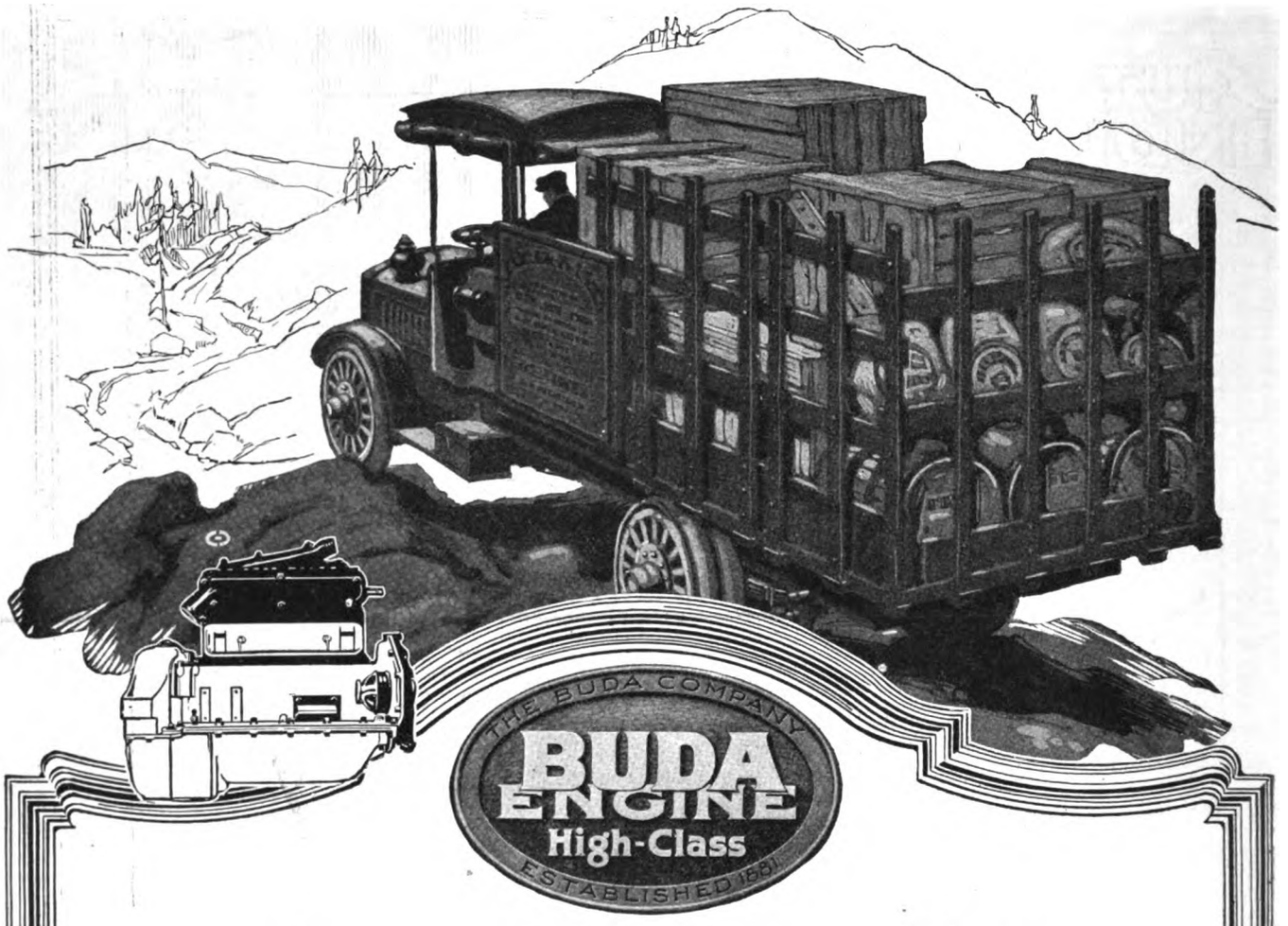
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May we ask you to compare this instrument with others before ordering your requirements? Don't pay more for a less reliable instrument.

SPECIFY THE BOYCE MOTO-METER DISTANCE TYPE

THE MOTO-METER CO., Inc., Long Island City, New York

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Except for its sturdy appearance, it would seem impossible that a machine which runs so smoothly could be so powerful or so enduring in severest use as the BUDA ENGINE.

The secret is in the careful BUDA manufacturing process, always putting "Performance before Price."

Made by **THE BUDA COMPANY**, Harvey (Chicago Suburb), **Ill.**

THE BUDA ENGINE
"HIGH CLASS"

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AUTOMOTIVE INDUSTRIES
THE AUTOMOBILE
THE CLASS JOURNAL COMPANY
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THE easiest and quickest way of repairing leaks in radiators, pumps, water jackets, motor head gaskets, hose connections, etc., is to use Johnson's Radiator Cement. This will stop the leaks in just a few minutes without laying up the car. No mechanical experience is required—all you have to do is remove the cap and pour the cement into the radiator.

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Quick—Efficient—Harmless

Johnson's Radiator Cement contains no powders, cement or anything which can coat or clog the cooling system and is absolutely harmless in every respect. It will ordinarily seal a leak from two to ten minutes.

Johnson's Radiator Cement blends perfectly with the water until it reaches the leak—just as soon as it comes in contact with the air it forms a hard, tough, pressure-resisting substance which is insoluble in water making a permanent seal.

Quarts, $1.75 Pints, $1.00
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If your dealer cannot supply you, use attached coupon.

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XXXVIII NEW YORK THURSDAY, MARCH 21, 1918—CHICAGO No. 12

U. S. A. Motorcycle Engine Completed

Of Two-Cylinder, Vee, Air-Cooled Type and Capable of Developing 15 B. Hp.—Moderate Compression Used to Enable It to Run Smoothly Under Load at Low Speeds

By P. M. Heldt*

WORK has about been completed on the new engine with which are to be fitted all motorcycles to be purchased by the Quartermaster General's Department from a certain date in the not distant future.

Like the three special truck models designed for the department, the motorcycle will bear the name of the U. S. A. and will be used for a wide range of duties at and behind the front. Probably 90 per cent of all the machines required will be fitted with side cars, and in view of this and the heaviness of the roads to be traveled, the engine will be built with slightly lower compression than present-day standard motorcycle engines. This will somewhat depress the power curve at the upper end, but will enable the engine to run on full throttle at a lower speed; in other words, it will cause the machine to "hang on" with great tenacity in pulling through sand and mud or under other difficult conditions.

There is nothing radically new in the design of the engine, which may be said to embody the best modern practice in motorcycle engines. Where deviations from stock practice have been made the reason has been either that the special purpose for which the machine is designed could be better met by a different design, or, since no commercial questions need be considered, and the best is just good enough for Uncle Sam's boys at the front, materials are used which would not be considered in stock practice because the average purchaser would not appreciate their value.

The U. S. A. cycle engine is of the 4-cycle, two cylinder, Vee type, air cooled. It has a bore of 3 5/16 in. and a stroke of 3½ in., giving a piston displacement of 60.34 cu. in. The compression space is such as to hold 6⅜ ounces of water, and as one ounce of water is equal to 1.728 cu. in., this figures out to 11 cu. in. As the piston displacement of each cylinder is 30.17 cu. in. this gives a compression ratio of

$$\frac{30.17 - 11}{11} = 3.74.$$

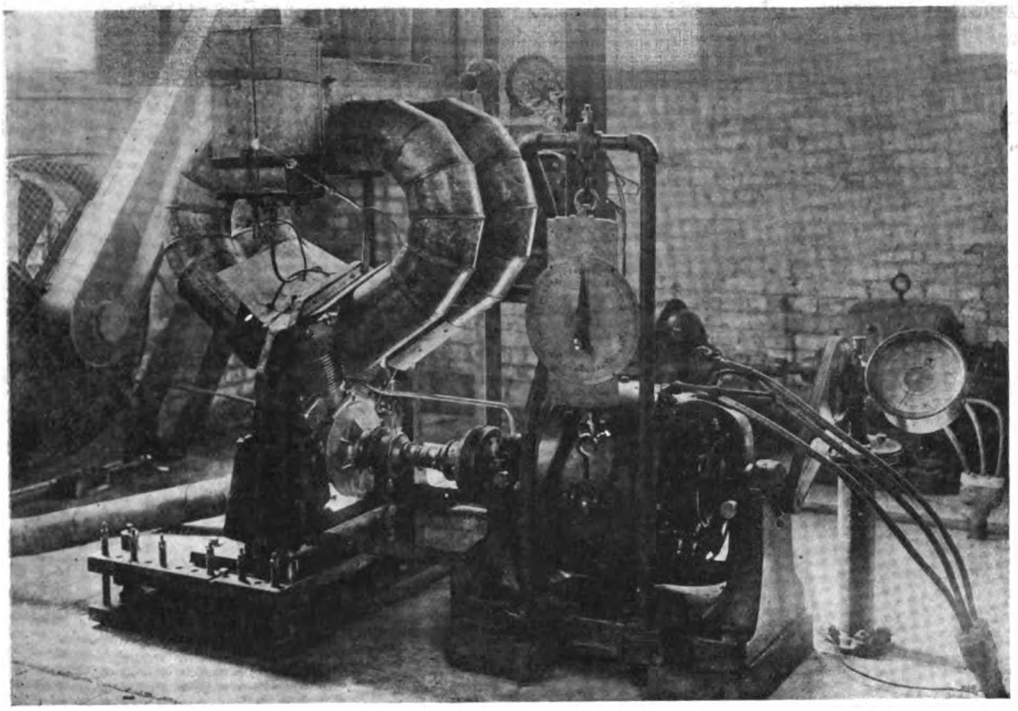
The cooling flanges on the cylinders run circumferentially, while those on the head run fore and aft. As the heads are cast integral with the cylinders, longitudinal flanges on the heads facilitate the casting of the cylinders, as compared with a construction in which the cylinder head flanges are arranged radially. The ribs on the sides of the intake valve pocket also run horizontally.

Between the axes of the two cylinders there is an angle of 45 deg., a feature of design that is largely determined by the space available in the conventional motorcycle frame. The two cylinders are secured by four studs each to the aluminum crankcase, which is made in halves, with the division in a plane at right angles to the crank axis.

On the crankcase castings are formed a bracket for the ignition magneto and a saddle for the lighting generator, the two being located on opposite sides. The

*P. M. Heldt went west and spent a week with the Board of Motorcycle Engineers while tests were being conducted to determine the characteristics of the new engine, to select the most suitable of a number of different designs of inlet manifolds, carbureters and air cleaners, and to determine the regulating qualities of a number of electric generators specially designed for this machine.—EDITOR.

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U. S. A. cycle engine on testing stand. Note arrangement for artificial air cooling

magneto is clamped down to a planed surface in accordance with standard practice, and the generator is clamped to a cylindrical seat or saddle.

This saddle is bored out and at the middle portion of its length it is relieved to receive a piece of strip steel which is secured in place by means of machine screws and has its end formed into hooks. These hooks engage slots in the clamping strips which are drawn together by a machine screw and nut at the top and thus securely hold the generator in place.

A so-called keystone type of frame is to be used in the U. S. A. motorcycle. Instead of the frame tubing looping around the crankcase at the bottom and carrying brackets to which the engine is secured, the engine crankcase forms the keystone of the frame structure. This places considerable strains on the crankcase in going over rough roads, and to allow for these some rather heavy lugs are cast on the lower part of the crankcase, and the crankcase wall between these lugs is thickened.

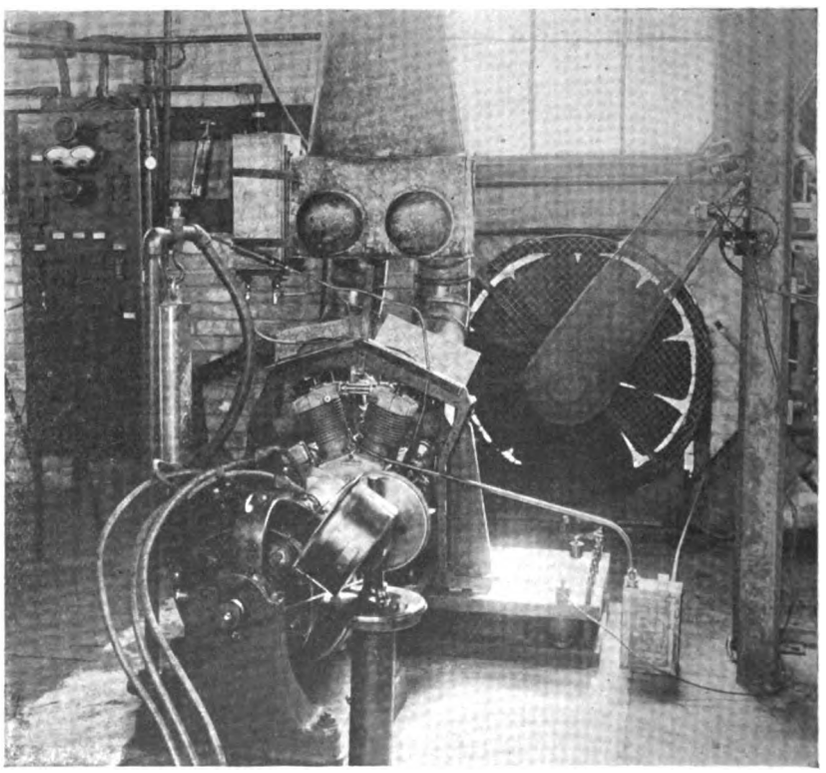
Roller Bearings Used

All bearings on the crankshaft, with the exception of that at the cam-gear end, are roller bearings. One of the connecting rods has its head made in the form of a yoke, and the other is of the ordinary type. Both have solid heads, which is rendered possible by the fact that the crankshaft is built up and the connecting-rod heads can be stripped over the crank-pin before the latter is assembled with the flywheels.

The joints between the journals and the flywheels are of the taper, key and nut type. The two inclosed flywheels will be made from drop forgings instead of from iron castings. Although the bursting of flywheels is an almost unknown occurrence in the motorcycle industry, it was considered good practice to make this impossible in the army machine. On the crank-pin there are four rows of rollers, two in each connecting-rod head, and on the main journal at the power take-off end there are two rows of rollers. The piston-pin bushing is bronze.

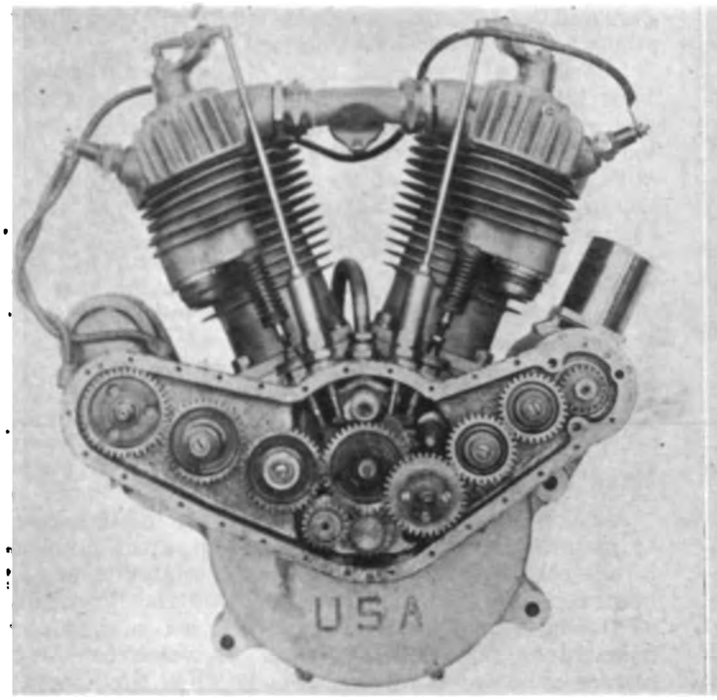
Cast-iron pistons are used, with three rings at the upper end and an oil groove at the lower end. There is a wide land between the top and intermediate ring which furnishes most of the bearing surface at the top end. A substantial rib connects the piston bosses to the head and helps in the transfer of heat from the head to the skirt. The wrist pin is secured in one of the piston bosses by a 3/16-in. solid pin with a cotter end. The connecting rods are drop forgings of I section, and are made as light as their work will permit.

An interesting feature of the engine is the all-spur gear drive for the camshaft, the magneto, and the lighting generator; with it is combined also the worm drive for the oil pump and the drive for the crankcase release valve. There are eleven spur gears in this double train, but each is of liberal dimensions for the amount of power to be transmitted, is carried on a well-supported shaft or a hardened stud supported at both ends, and provision is made for thorough lubrication, so the likelihood of trouble is very slight.

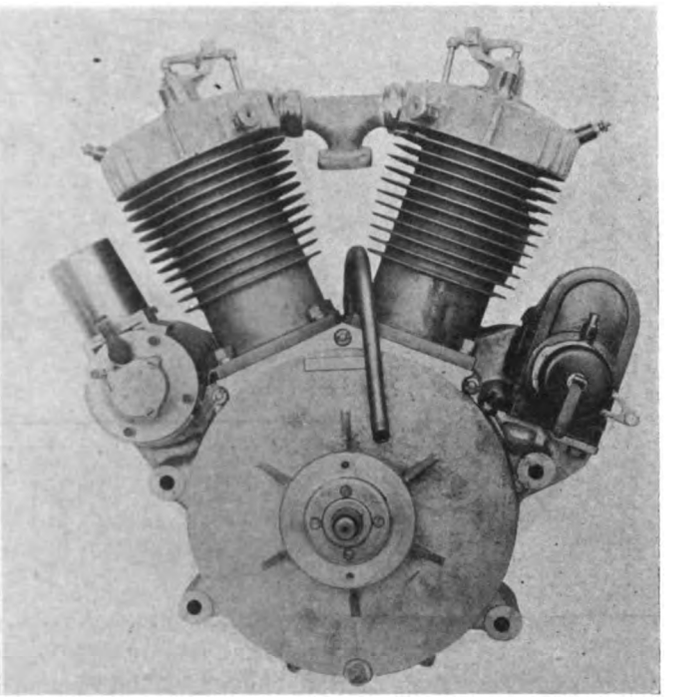


Another view of the testing stand with tachometer in foreground. Note ventilating fan in wall close to floor

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U. S. A. cycle engine with gear cover removed, showing generator and magneto drive



Driving side of U. S. A. cycle engine, showing generator and magneto mountings

Though the magneto runs only at one-half crankshaft speed, the generator runs at twice crankshaft speed, this high speed resulting in a very light and compact machine. As current for lighting is used only at night and the generator serves no other purpose than to furnish this current, provision is made for disconnecting the generator during the day.

Magnets and Generator Drive

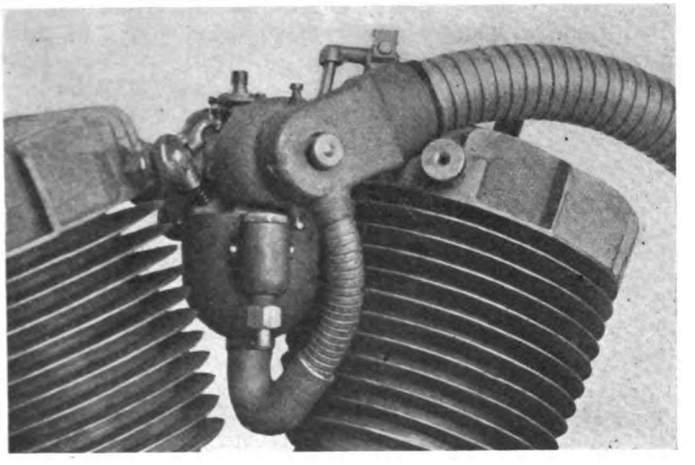
Referring to the photograph of the engine herewith, showing the gear case cover removed, the crankshaft pinion meshes with the camshaft gear directly above it. This latter meshes with a pinion to the right of it, which is hidden in the illustration by the gear in front of it. This set of gears on the same axis can be coupled together and disengaged from each other by means of a jaw clutch whose members are formed on the gears themselves and which is operated by means of a knobbed rod extending through the cover plate.

In designing the jaw clutch the engaging surfaces were given such a rake as to make it impossible for the driver to engage the clutch while the engine is running, though it can be disengaged without stopping the engine. The reason for this construction is that if the generator armature were connected to the crankshaft by a positive clutch while the engine was turning over at high speed, owing to the very considerable inertia of the armature, there would be a tremendous shock and very likely something would have to give way.

From the clutch gear, motion is transmitted through two idler gears to the generator gear and when the clutch is disengaged these four gears remain stationary. To open the clutch, the driver pulls on the knob of the clutch rod or pin. There are two circular grooves on this rod, into which the nose of a spring-pressed locking dog in the cover plate engages, one groove corresponding to the "in" position and the other to the "out" position of the clutch. All gears are case-hardened and run on hardened studs.

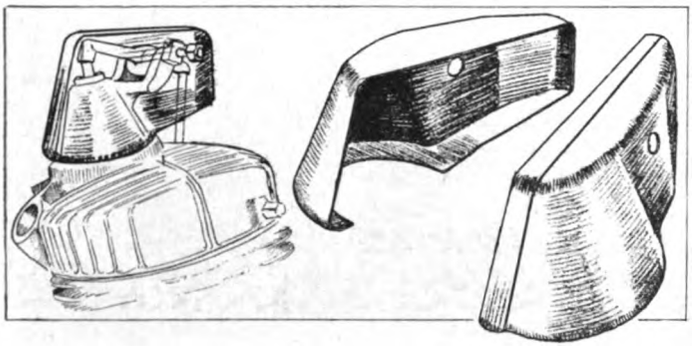
In the photograph showing the gear cover removed from the engine may be seen the method for insuring an accurate mesh of the generator gear with its driving gear. The forward end plate of the generator is turned with a shoulder 1⅝ in. in diameter and 5/16 in. long, which enters a bore in the gear housing in which it fits snugly. The generator is then drawn up tight against the housing by three ¼ in.-28 screws which extend through both the housing and cover plate, so it is not necessary to take off the gear cover plate in order to remove the generator. Provision has also been made to prevent oil from the gear compartment getting into the generator. To this end a knife edge is turned on the hub of the generator gear, which throws off any oil passing along the gear hub toward the generator.

As the two pistons connect to the same crankpin and move up and down in their respective cylinders with little phase difference, as it were, there is considerable pumping action in the crankcase, and to prevent oil being forced out through the vent the latter is opened and closed by a rotary valve at the proper periods in the revolution of the crankshaft. The timing of the valve is such that it is closed whenever the crankcase volume

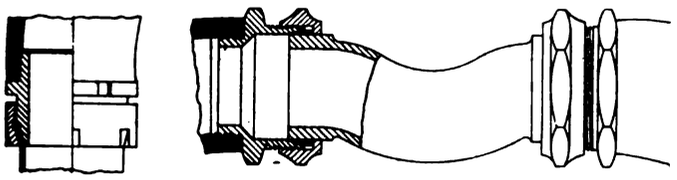


New carbureter specially designed for the U. S. A. motorcycle

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Pressed steel cover for inlet valve



Exhaust and inlet manifold joints

decreases. Thus there is at all times a partial vacuum in the crank chamber and there is no tendency for the oil to be forced out through the bearings and joints. The distance from the center plane of the engine to the front chain center line is 4 5/16 in.

The inlet valves are located in cages over the exhaust valves and are operated by tappet levers and rods from cams on the same camshaft as the exhaust cams. The main springs of the inlet valves are inside the cages, but there are supplementary springs on the tappet rods which cause these rods to maintain contact with the rock levers and the latter with the cams.

All of the valve springs are enclosed, and, in addition, a pressed steel housing in two parts has been worked out for the inlet valve cages and tappet levers. These housings are held in place by the bolts on which the tappet levers are mounted. The housing fits snugly around the bell-shaped inlet valve cage and is clamped under the head and nut of the tappet lever bolt. The bolt is drilled out for wick oiling and has a reservoir with clip cover in its head which comes outside the housing, so the latter does not interfere with lubrication. In fact, the whole inlet valve assembly can be removed without first taking off the cover.

Flared Tube Joints for Manifolds

Instead of the flanged joints for inlet and exhaust manifolds which are universal in automobile and truck practice, flared tube and gland type joints are used for the exhaust and inlet pipes. The exhaust outlet on both cylinders extends downward, as this is the direction the exhaust pipes must take, and hence the number of right-angle turns in the exhaust passage is kept down to a minimum.

Into this outlet is screwed a steel nipple with a hexagon on its outside which serves also as a flange that bears against the casting. The outer end of the nipple is tapered to receive the flared end of the pipe and a nut with a female taper screws over the nipple and securely holds the exhaust pipe in place.

The inlet pipe joint is similar, but the nipple, instead of being tapered on the outside, is tapered on the inside, and a gland ring on the smooth-turned end of the pipe is forced into the nipple by the gland nut screwing over the nipple. This form of joint has one great advantage at this point. The inlet pipe connects to both cylinders and the distance between cylinders will vary slightly, which causes no inconvenience with this joint.

Lubrication is effected by a plunger pump which is built into the gear cover plate and driven by a worm and worm wheel from the magneto drive gear. A rotary valve is used for the oil pump, which is in one piece with the worm gear of the drive, and it can hardly be doubted that this type of valve is more dependable than the more common ball check valve type.

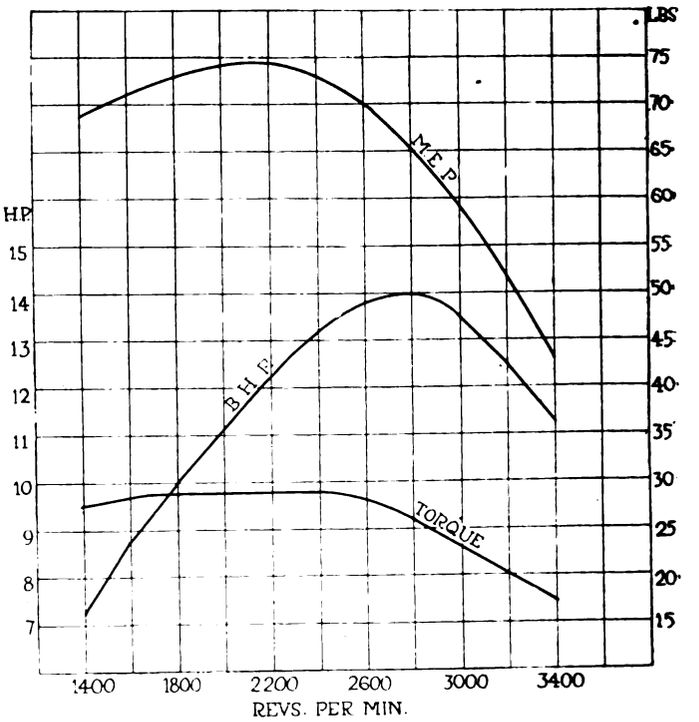
The oil is taken by the pump from the supply tank combined with the fuel tank and fed into the gear compartment on the engine and into the crankcase. As the oil is fed to the crankcase continuously there is always a certain amount in the case which is picked up by the revolving flywheels and distributed over all interior parts.

Hand Pump for Additional Oil

A hand pump is also to be carried on the motorcycle, to permit of delivering additional oil to the crankcase in climbing long grades or when the engine is working under other difficult conditions. In all the illustrations of testing stands herewith may be seen a hand pump mounted on the stand by means of which one of the testers could inject oil occasionally when the supply in the engine seemed to be running low. At the bottom of the crankcase is a shallow oil well into which a drain plug screws from the side of the case.

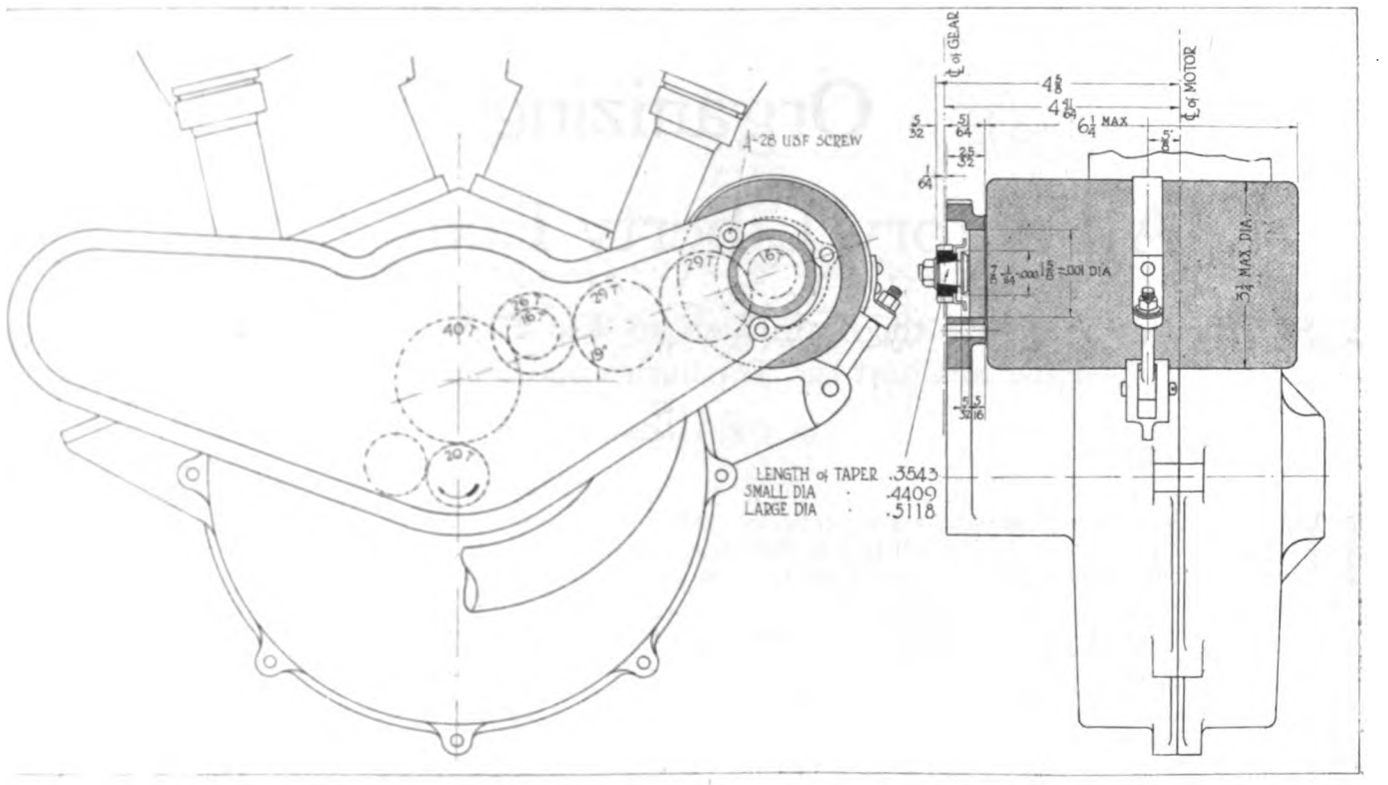
At the present time practically all motorcycles are fitted with a certain make of carbureter which seems to fit the conditions of motorcycle work particularly well, and the probability is that this carbureter will also be used on the U.S.A. motorcycle. It is of the type in which the needle valve in the spray nozzle is lifted by a cam mechanism actuated by the throttle valve.

It is now planned to use an air cleaner or strainer on the carbureter air inlet so as to keep dust and gritty matter out of the cylinders. This is particularly desirable on a motorcycle because it may happen that a rider on striking a sandy stretch of road may fall, the air inlet coming down to the sand and the motor continuing to



Horsepower torque and m.e.p. curves of engine with equipment finally selected

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Drawing showing generator mounting and drive

run may draw in sand which will ruin it in short order. Aside from this eventuality, the roads and tracks over which military motorcycles are compelled to travel, often in squadron formation, are apt to be very dusty in summer time and the fitting of an air cleaner would seem to be an excellent idea, if it does not materially reduce the engine power.

The make of carbureter referred to has had two separate air inlets, but in order that all of the air may be strained by a single cleaner the maker has brought out a special model in which the two air inlets are combined into one. From this inlet connection is to be made to the air cleaner by means of a flexible tube.

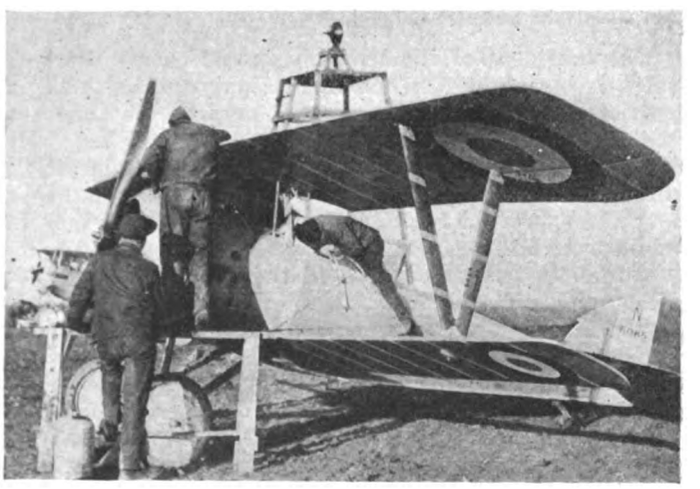
Several changes have been made in the carbureter to add to its efficiency. Thus a low speed adjustment has been provided by making the cam in the form of a bronze spring with screw adjustment. The throttle valve shaft is made of tobin bronze instead of brass and the throttle shaft bearing surface has been increased. The float valve is 35 per cent nickel steel to obviate rusting.

In one series of tests the engine developed a maximum power of 15.3 hp. at 2900 r.p.m. This corresponds to a piston speed of 1750 ft. per m. and a mean brake effective pressure of 65.6 per sq. in. Whether the equipment used during this test will be the regular equipment is still undecided.

Experiments are being conducted with three different designs of inlet manifold, with different carbureters, carbureter air valves and dust separators. It is the intention to use a dust separator if one can be found which does not decrease the power too much. The attachment of an air cleaner to the carbureter alters the suction curve and as the carbureter is of the type in which the gasoline flow is regulated by a needle valve lifted by the throttle through the intermediary of a cam it is likely that the cam outline will have to be changed. In a preliminary test run with one of the air cleaners the setting of the carbureter had to be changed with almost every increase in speed to get the best power results.

The final selection of equipment will be made not entirely on the basis of maximum power developed but also in accordance with the pulling power and smoothness of operation of the engine at low speed, easy starting and other characteristics.

The engine design for the U. S. A. military motorcycle is the work of the Motorcycle Division, Engineering Department, Quartermaster Corps, which occupies offices in the Union Station, Washington, D. C. This was formerly the Military Motorcycle Standardization Board, its members being William S. Harley of Milwaukee, Wis., Oscar Hedstrom of Springfield, Mass., and Frank Schwinn of Chicago, with Capt. F. C. Hecox representing the Army. Since the establishment of offices in Washington, Charles Franklin has been in attendance for Mr. Hedstrom most of the time, as Mr. Hedstrom's business does not admit of continuous absence, and A. W. Herrington has also been taking part in the work, having charge of all tests.



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Final inspection before a trip

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Organizing
A Factory Liberty Loan Drive

Method of Planning the Campaign to Tap Every Source in the Plant —How to Chart the Territories and Distribute Them

By J. Edward Schipper

HANDLE the Liberty Loan Drive systematically. A wonderful showing can be made if this is done, not only for your company, but, if carried out throughout the industrial plants, for the whole nation.

A simple, direct organization, well balanced, and with its roots tapping every source, will work wonders. Study the method herewith, and adapt it to your factory. You will be gratified with your success, and the company behind you will feel a thrill of pride in a truly patriotic and intensely useful accomplishment.

The loan drive starts Saturday, April 6, and will continue for three weeks. By April 1 your organization should be complete, with toes to the mark, ready to start with a dash at the flash of the gun, never to let up until Saturday, April 27, when the drive will be over.

Herewith are charts showing how to divide your company into territories. If your company has an organization chart, this is already done for you. If it has not a chart, the sample charts herewith will show you how to make one up. The organization must be first charted before you attempt to map out your company for the drive.

After the chart of the organization is in mind the chart for the Liberty Loan Drive can readily be made up from it, as illustrated herewith by the Packard example, where the chart of the organization is given, and a parallel chart for a typical suggested loan sales organization is shown with it. There must be a supreme head to the organization, and the best results are obtained if one man is picked for the job and given full responsibility.

Let President Select Manager

The president of the company should choose the best sales executive he can find in his company and make a patriotic donation of the greater part of his time for the three weeks during which the drive will last. He is put in charge of all matters pertaining to the drive, and has for his direct assistants an advertising manager and a treasurer, or accountant, who act as his advisers in addition to handling the duties hereafter described.

Authority must be vested in the Liberty Loan Sales Manager to pick his entire staff. He divides the organization into territories, which are really departments and sub-departments of the company. As he must make his sales campaign intensive in the highest degree, he must make his territories relatively small. Every one in the factory and office force is regarded as a prospect, and naturally every one must be reached and solicited.

In a big organization a number of sub-sales managers should be appointed. These would correspond to the branch managers in a sales organization which spread over the country. These men in turn divide the territories over which they have control into smaller territories, and appoint the sales managers for these. If these sales managers want assistants they must have the power to appoint them.

Do Not Rely on Volunteers

Like organizing an army quickly, it is imperative not to wait for volunteers. The volunteer system has been found to be useless. Volunteers will not make our drive on Berlin, and volunteers cannot be relied upon to make our drive at home. The president of the company, and its board of directors, must stand squarely behind this issue, and should make it a part of the business of the organization. Direct appointments selected in accordance with the fitness of the men for the work should be the method employed.

It is needless to point out here what interest industry in general has in the succcess of this new drive. The eyes of the world are on us; Teutonic eyes as well as those of the allied and neutral nations. Not to more than succeed would be giving the most effective kind of comfort to the enemy. The war has poured millions into the coffers of certain forms of industry, and naturally out of these same coffers must be loaned, not given, the millions necessary to successfully force the issue.

In a small factory it will not be necessary to divide the territorial underbranch managers. In a large organization it is better to do so in order to keep the entire work in hand and to make the campaign more intensive. As soon as the Bond Sales Manager has been appointed he should provide himself with a complete chart of the organization, in accordance with the plan shown in the charts herewith. He should make a study of this chart and then divide it into logical branches. It is good practice to make the branches and territories correspond to departments of the business rather than to attempt to divide the factory into geographical territories, such as floors and sections of floors. The reason for this is that the men and women in the same departments know each other better, and the sales are thus facilitated.

Chart the Territory

After the territory has been mapped out by the organization chart the number of sub-salesmen should be determined. In a fairly large concern, the branch manager selected should appoint a man in each of the sub-departments. For instance, in an automobile factory there may be a branch sales manager in charge of the manufacturing territory. This would include everything which would be classified on the organization chart under the head manufacturing, and would embrace, as

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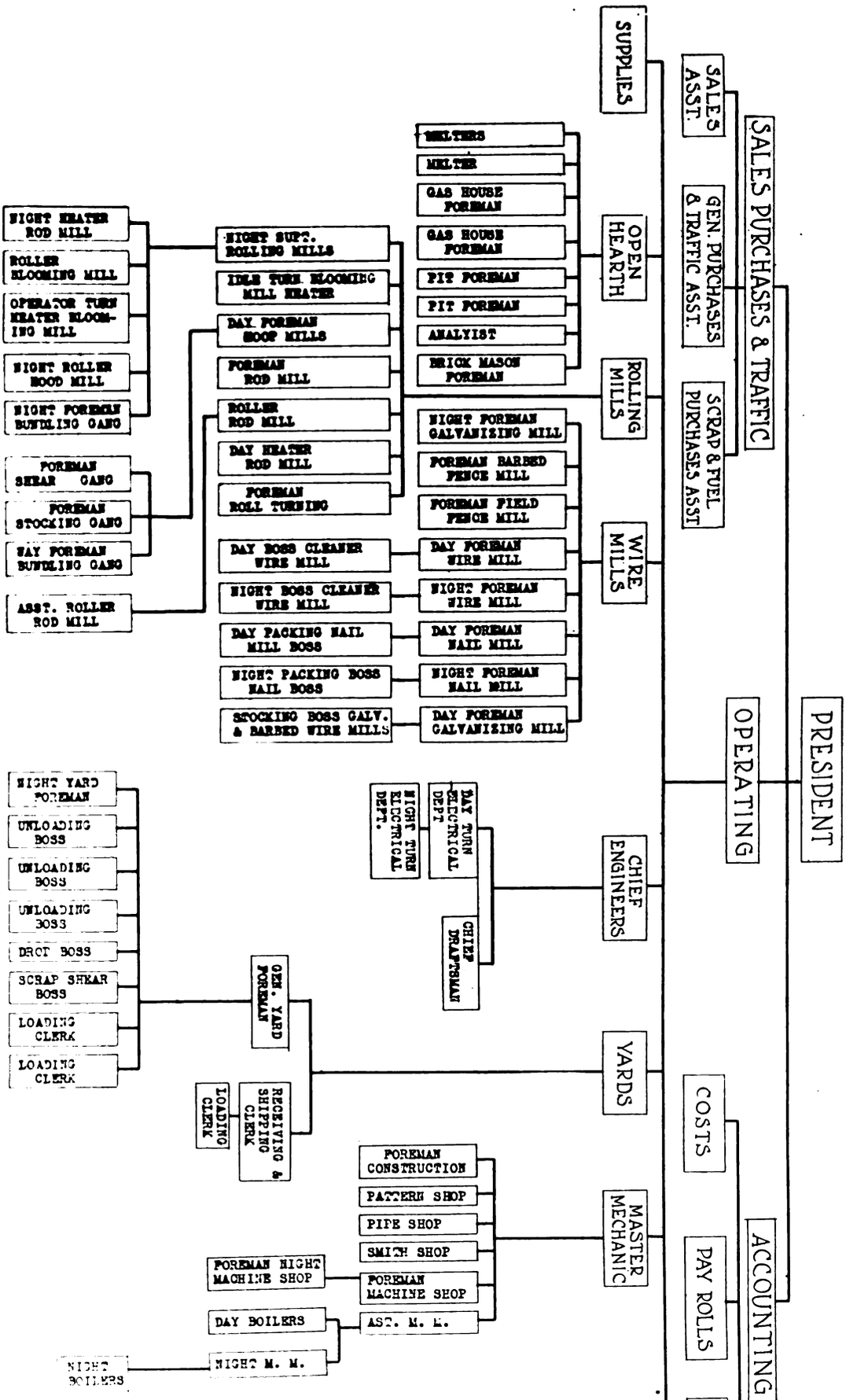


Fig. 1—A chart of the complete industrial organization of the factory should be the foundation upon which to build up an effective Liberty Loan Drive plan. This is a typical chart of the kind. With such a chart as a basis, the various territories in which the several committees and sub-committees are to operate can be visualized and clearly mapped out beforehand

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in the instance of the Packard, which is taken as typical, the following divisions:

MANUFACTURING TERRITORY

Carriage	Forge and foundry	Purchasing
Chassis	Service	Traffic
Body	Mechanical	Labor
Truck	Construction and maintenance	Welfare
	Material and laboratory	
	Production	

These departments are handled by a sub-branch manager, or a sub-dealer. If the number of men under any particular sub-dealer is large, he in turn should have salesmen. The sale must be made in the highest degree intensive. Every man in the organization, from the president down to the laborer, should be seen, not once, but many times, during the campaign, so that when the final day comes as near 100 per cent as possible should be obtained.

The sales campaign is handled directly, as far as policy is concerned, by the Bond Sales Manager. His authority should be absolute. More than that, he should have the backing and the indorsement of his company. Under his direct command he should have a competent advertising manager. The advertising manager of the firm will generally be the best man on this job, or a good live, enthusiastic young fellow from the copy department will oftentimes be glad of the opportunity to distinguish himself on this work.

The house organ, if there is one, should get out a daily newspaper, circulated to every man in the company, telling of the progress of the campaign, listing the names of those who have bought, those who have taken 100 per cent or more of quota, and generally keeping every employee informed and enthusiastic. The advertising manager should get this out, and he should in turn have a staff of reporters to help him. His reporters may oftentimes be salesmen, but it is just as well to have men who are not bond salesmen doing this work. It will have more people working.

Have Everybody Take an Active Interest

Do not be afraid to have the people in the factory working on this. The more that are working the bigger the results. Do not worry about the decrease in business because of the distraction of attention. In the first place, the cause is perfectly worth shutting down the plant, were that necessary; but when enthusiasm is worked up work will proceed faster. In fact, the results are more apt to be a gain in productive activity rather than a loss. Enthusiasm as regards a project only comes from working on it. It is impossible to have a man enthusiastic on the Liberty Loan question if he sits back in his chair while others about him do the work. Get as many men and women as possible in the plant to help.

It will be the duty of the advertising manager to advertise the drive. He will also be editor of the daily edition of the house organ; or, if there is no house organ, the daily bulletin news sheet which should be published. He will also print posters and put them around the plant. It is best to change these every day, if possible. If the sales manager puts on a contest, as he should, between the various branches or territories, the advertising manager should put his shoulder to the wheel and urge on the contestants by reporting in the daily edition of his newspapers the standings of the teams and the methods used by each to succeed.

The branch or department sales managers have direct charge of all sales in their respective departments. In consultation with the sales managers they arrange the quotas for their territories and appoint the sub-dealers or salesmen under them. As stated, where the territo-

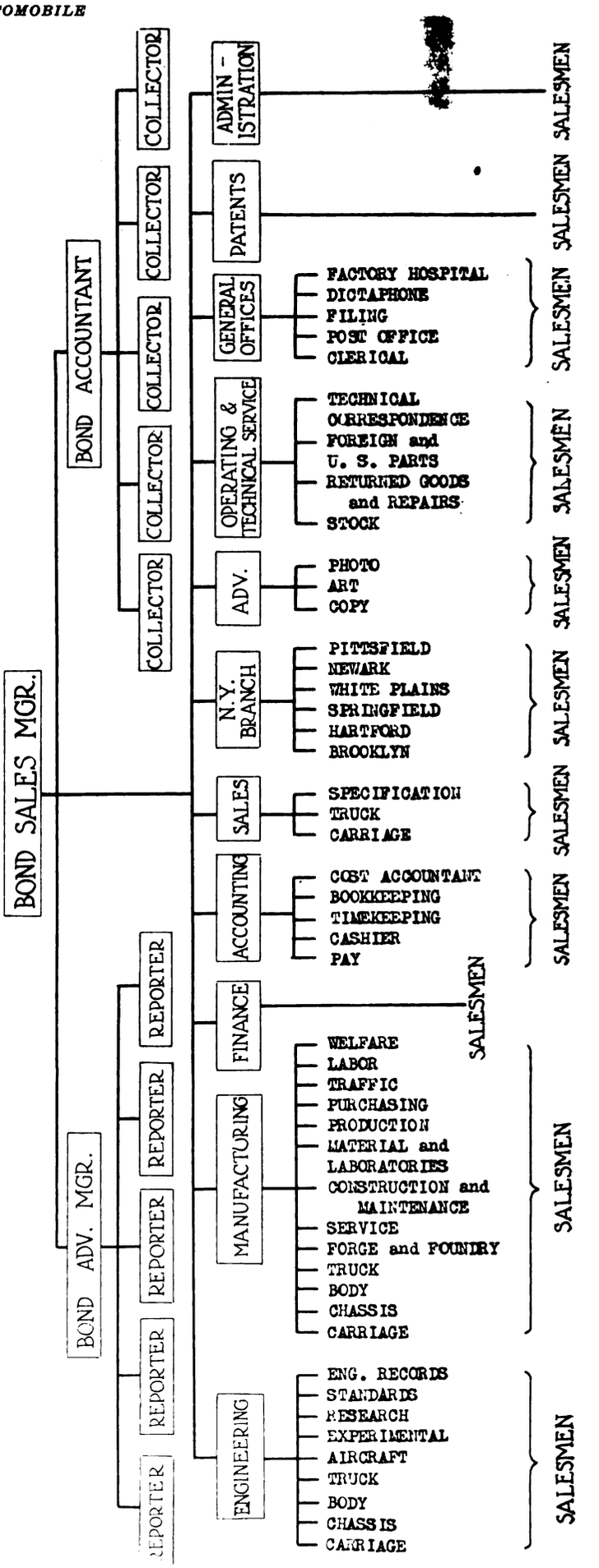


Fig. 3—Suggested chart for a Liberty Loan organization derived from the chart given in Fig. 2

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ries under the branch managers are large, such as they will be in the factory departments where large numbers of men are employed, it is always best to divide into sub-branches so that the sale will be on a more intensive scale.

The third branch under the sales bond manager has to do with the finance.

DO NOT ATTEMPT TO MIX THE ACCOUNTS WITH THE PAYROLL. IT WILL LEAD TO TROUBLE.

Even in a small organization endless confusion will result if you attempt to take the money for the Liberty Bonds out of the pay envelope. There is a better way.

The sales manager should appoint a bond accountant. He should be a man who is selected from the financial department. He must handle all the money that has to do with the bonds. This must be divorced entirely from the payroll or other books of the company. If a bond is sold for cash, the transaction is simple. The money is taken in, and the bond, or an advance substitute or receipt, handed out. When the bond is sold on the installment plan, as it usually is, it requires a set of books. These are simple by themselves, but when mixed with payroll accounts and time clerks' reports they are the reverse.

All bond transactions should be numbered. The installment book should have first the number, then the buyer's name, then the amount paid on deposit, and after that weekly blanks to be filled in with the installments paid. A deposit of 10 per cent cash should be required, and the balance at the rate of at least 10 per cent a month. As soon as an order is turned in to the accountant he enters it in his book, assigning the number and crediting the deposit, which must always accompany the order. Certain hours, certain days of the week, should be appointed for paying the installments. In the shop, where the men file past the pay window, it is a very good idea to have another window a short distance away, where the men file past in accordance with the numbers on their Liberty Bond orders. In this case, the bond accountant may need assistants from the pay department.

Summary of Organization

To summarize the organization:

1—There is first a supreme head. He may be entitled bond sales manager, or director of the Liberty Campaign.

2—Under him there are two direct assistants, an advertising manager and an accountant, and as many branch managers as the size and scope of the company necessitate.

3—The advertising manager is editor of the daily newspaper, which may be a special daily edition of the house organ or a regular daily newspaper sheet.

4—The accountant takes care of the books, recording the buyers and the deposits made by them, and also keeps an account of the weekly installments paid by each.

4a—He has as his assistants men who are drawn from the pay department. These he uses to collect money in different parts of the shop. He may set up pay booths or he may use the regular pay booth immediately after the the regular pay has been completed.

5—The branch managers are distributed to take care of the main divisions or departments of the organization. They are the main links in the chain. It is up to them to see that the quotas of the respective territories are sold, and it is up to them to arrange with the bond sales manager the quota of their departments. Under them they appoint sub-branch managers where necessary.

5a—Under the branch managers and the sub-branch managers the salesmen operate.

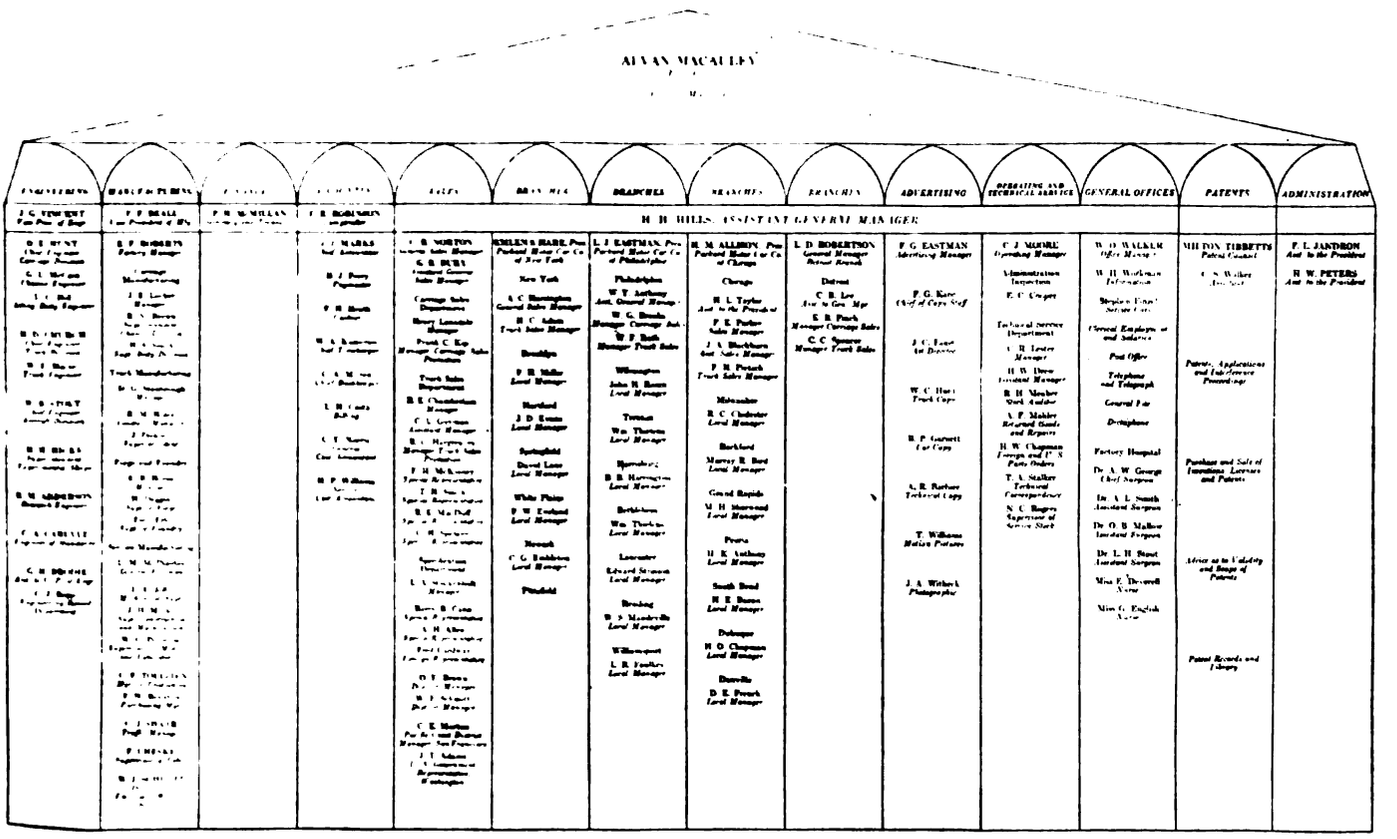


Fig. 2—Organization chart of the Packard Motor Car Co., from which the chart in Fig. 3 was taken, showing how the organization chart can be used for planning the Liberty Loan Drive and dividing the organization into territories

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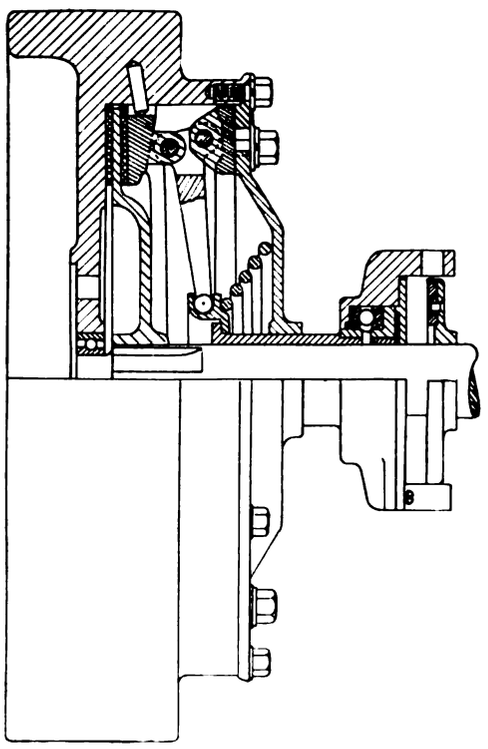
Borg & Beck Eliminates Clutch Brake

Thrust Bearing Prevents Spinning of Clutch Shaft, Thereby Obviating the Necessity for Friction Device

FEW developments have taken place in the clutch field during the past year, largely because this is one of the parts which give the least amount of trouble. Changes in clutch design were quite rapid during the first few years of the past decade, owing to the fact that the torque characteristics of automobile engines presented a variety of new problems to clutch manufacturers. The increasing rotative speed of automobile engines caused a revision of the earlier methods, with the result that changes were necessitated from year to year, until about 1915, when clutch design seemed to have attained a settled state.

Occasionally, however, minor alterations are made, and those observed during the past year indicate two tendencies, namely, the gradual abandonment of the clutch brake and a decline in the number of clutches with means for adjustment. A good example of these tendencies is found in the new Borg & Beck clutch, in which the clutch brake has been eliminated, thus giving a design which has made very substantial progress over the type used previously.

The Borg & Beck clutch is well known from its wide use among manufacturers of assembled cars. The accompanying sectional view shows the construction of this clutch and illustrates the method employed to render practical the elimination of the clutch brake. The principal change made to this end is the addition of a thrust bearing at the inner end of the clutch sleeve, so that there is no friction between the sleeve and the transmission shaft when the clutch is released. When there is no bearing at the inner end of the sleeve, the sleeve rotates around the shaft continually, being driven by the spring pressure. This clutch is mounted in the customary manner in a casing which contains both the flywheel and clutch member, or it can be fitted as a self-contained design in which the clutch itself is in a separate casing which is provided with a mounting flange, through which it is bolted against the flywheel web.



Borg & Beck clutch with clutch brake

Referring to the sectional view, the action of the clutch is clear if it is kept in mind that among the rotatable parts only the driven group, comprising the disk A and the shaft B, can stand still when the flywheel is running. All the other rotatable parts are anchored to the flywheel, and these must revolve and drive with the latter. The clutch brake was formerly mounted at the inner end of the clutch shaft and has been replaced by the thrust bearing shown at C. When the clutch is disengaged there is no friction between shaft B and the throw-out sleeve D, the thrust bearing taking the rotating drag of the clutch shaft, thereby eliminating the necessity for a brake to check the spinning action.

Action of Clutch

When the clutch is thrown in, all the rotating parts are friction-locked into a single combination and revolve as one with the flywheel. The power of the release thrust spring E, acting through the throw-out collar F, and the bell crank pivot G, drives the thrust shoes outwardly with a lever-wedge-toggle combination against the overhanging, inward-beveled face of the thrust ring H. The thrust shoes in making the friction thrust cannot recede as they climb the face of the thrust ring H, since the parts on which they are mounted are backed against the cover wall or rigid end of the clutch casing.

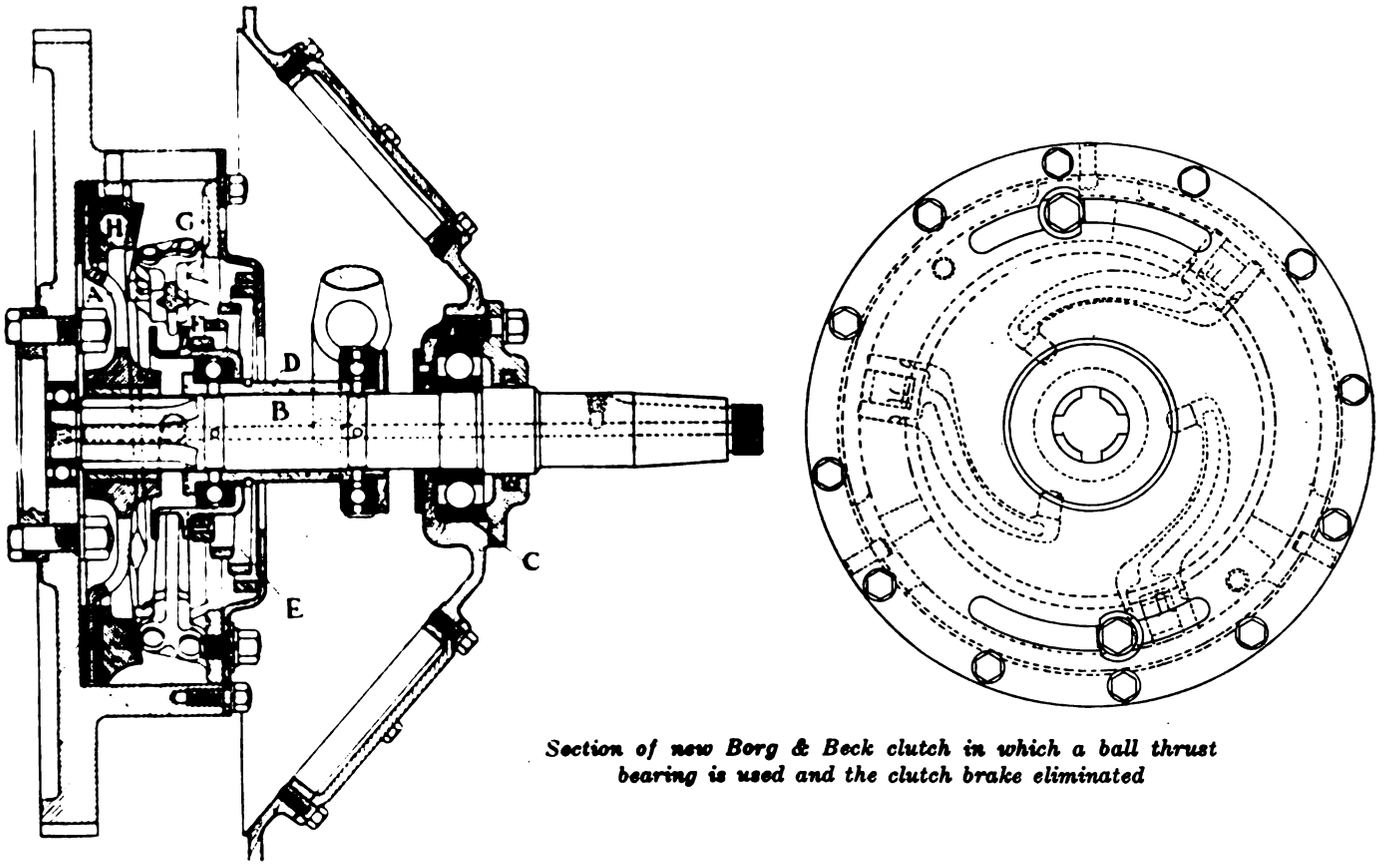
It therefore follows that the full, part-shafting effect of the thrust is communicated to the thrust ring H, and the latter, in being thus driven hard toward the flywheel, sets up between itself and the inner casing wall a friction grip sufficiently powerful to stop the slippage of the asbestos rings upon the polished faces of the disk, thus giving the drive to the car.

When the pedal is applied for releasing the clutch the retracting parts telescope the coil spring E until it occupies nearly a single plane. The withdrawing parts also release the clutch shoes a sufficient distance from the face of the thrust ring H to permit the latter, together with its companion friction ring, to back away from the disk, thus breaking the friction grip and permitting the parts to come to a stop, while the flywheel and the parts of the clutch anchored to it are left free to revolve idly. The release disk A is so light that it continues to spin only a very short time and does not cause any clashing action in the gears. The full thrust of the spring transmitted through the powerful lever-toggle action to the friction-grip parts is always and easily sufficient to lock the driving, flywheel parts and the driven disk into a fixed, non-slipping relation, for a full driving action; but it is still always within the control of the driver, through the foot-lever, to let the clutch into engagement by degrees; and thus, by a gradual increase of the friction-grip, gradually overcoming the starting slippage, to start the car so gradually as to eliminate everything in the nature of a starting jerk. At the same time that, by reason of the slippage grip, the clutch can be thrown in fast enough to bring the car from a standstill up to city speed within from 25 to 35 feet.

The starting-slippage necessary to obtain a gradual friction-grip calls for an incombustible, non-wearing friction material, and this is provided in the asbestos-friction facings developed in recent years.

Taking-up adjustment is made possible by means of bolts passing through adjustment slots in the cover. When the bolts are loosened and shifted in their cover slots, they control and shift with them an adjustment ring which brings

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Section of new Borg & Beck clutch in which a ball thrust bearing is used and the clutch brake eliminated

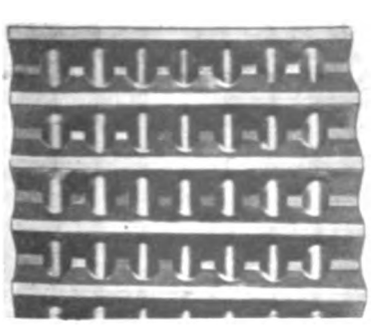
all the shoes to new seats against the non-shifting thrust ring; and these seats being further up the inclines of the tapered ring, the ring is necessarily thrust so much further toward the other friction parts, thus compensating for wear.

The throw-out adjustment can be controlled by taking up on the friction grip adjustment, these two adjustments being taken care of by the same mechanical means. The clutch is held entirely out by means of the pedal, and the parts are then free to be shifted in either direction. To take up for wear, the adjustment bolts are loosened and tapped in a clock-wise direction, ⅛ or ¼ in., or any distance required, and then tightened again. These clutches are made up to fit standard bell housings or individual mountings.

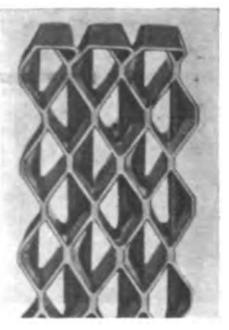
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Spery Radiator Is New Type

A NEW type of radiator, claimed to combine some of the advantages of the honeycomb and tubular types, is manufactured by the Hooven Radiator Co. of Chicago and is known as the Spery radiator. In outside appearance it is very much like the honeycomb type which seems to be preferred for passenger car use. A look at the cross-section, however, shows that the construction is entirely different. The elements of the radiator are zig-zag stampings of sheet metal, into which are stamped depressions which when the stampings are assembled together form vertical tubes. The water circulates not only through these vertical tubular passages but also through the fine passages adjacent to the tube formations.



Tubes pressed in



Front view

Owing to the large tubular passages in the radiator, it is practically impossible for the latter to become clogged. While the Spery radiator possesses some of the advantages of the tubular type, it is free from its liability to injury by freezing, as the narrow passage between adjacent zig-zag walls will expand readily and thus prevent injury. Repairs to the radiator are said to be easily effected, and its construction is such that it will withstand the shocks and jolts due to traveling over rough ground on solid rubber tires. Its immunity from injury by freezing is said to make the radiator particularly adapted for use on airplanes. Great rigidity is claimed to result from the zig-zag construction. The soldered surfaces at the front and back are particularly wide, which makes the danger of leakage comparatively remote. The Spery radiator is said to have from 35 to 40 per cent more water capacity than either the honeycomb or tubular type, but the basis of comparison is not stated.

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Quantities of Material Handled by Ford

SOME idea of the size of the Ford scrap pile may be formed from the fact that the tailings or steel trimmings that come from the lathes and other machines average 100 tons daily; cast iron borings, 25 tons, and sheet steel clippings, 50 tons. The total sales of scrap material from the Ford factory last year approximated $3,000,000 in value. This is in addition to an enormous amount of cast iron borings and baled sheet steel clippings consumed in the foundries of the Ford company. Figures indicate that for every Ford car manufactured waste material valued at about $4 is produced.

To manufacture the scheduled 90,000 cars, it would require over 400,000 tons of steel; over 126,000,000 sq. ft. of material for tops; 3,600,000 wheels and tires each; 4,500,000 lamps; 15,884,414 ft. of vanadium steel shafting and axles; 4,938,000 sq. ft. of glass for windshields; 109,484,404 ft. of copper tubing for radiators; 12,900,000 lb. of steel for magnetos, 30,838 miles of wire for magnetos; 7,836,593 sq. ft. of galvanized metal for gas tanks; 69,959,951 sq. ft. of sheet metal for fenders and guards; 27,940,382 ft. of tubular radius rods.

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Details of the Minerva Engine

A New Design Intended for Heavy Duty Only—Large Handholes in Cast Iron Crankcase, Magneto Ignition and Combined Force Feed and Spray Lubrication

IN its general design the Minerva engine follows lines of standard practice for unusually hard service. No radical innovations have been attempted; the requirements of tractor and truck service have in all cases determined the construction employed, and the Minerva is recommended by its makers only as a tractor and truck engine and for certain classes of marine work.

The cylinder bore is 4 in. and piston stroke 5½ in., giving 276 cu. in. displacement. L-head type cylinders are employed, with detachable heads. The cylinders are cast in pairs and have the waterjacket extend all round and down their entire length. The crankcase is a gray iron casting and is parted in a plane below the crankshaft axis. This permits of inspection holes in such positions as to allow direct and easy inspection of the main and connecting-rod bearings. All main bearings are carried by the upper section of the crankcase and the bearing supports are ribbed to the sides of the case, the ribs extending below the center line. Owing to the fact that pads for supports are machined both in front and rear, the engine can be easily mounted in almost any tractor or truck frame. The lower section of the crankcase serves as an oil reservoir and also contains the oil strainer.

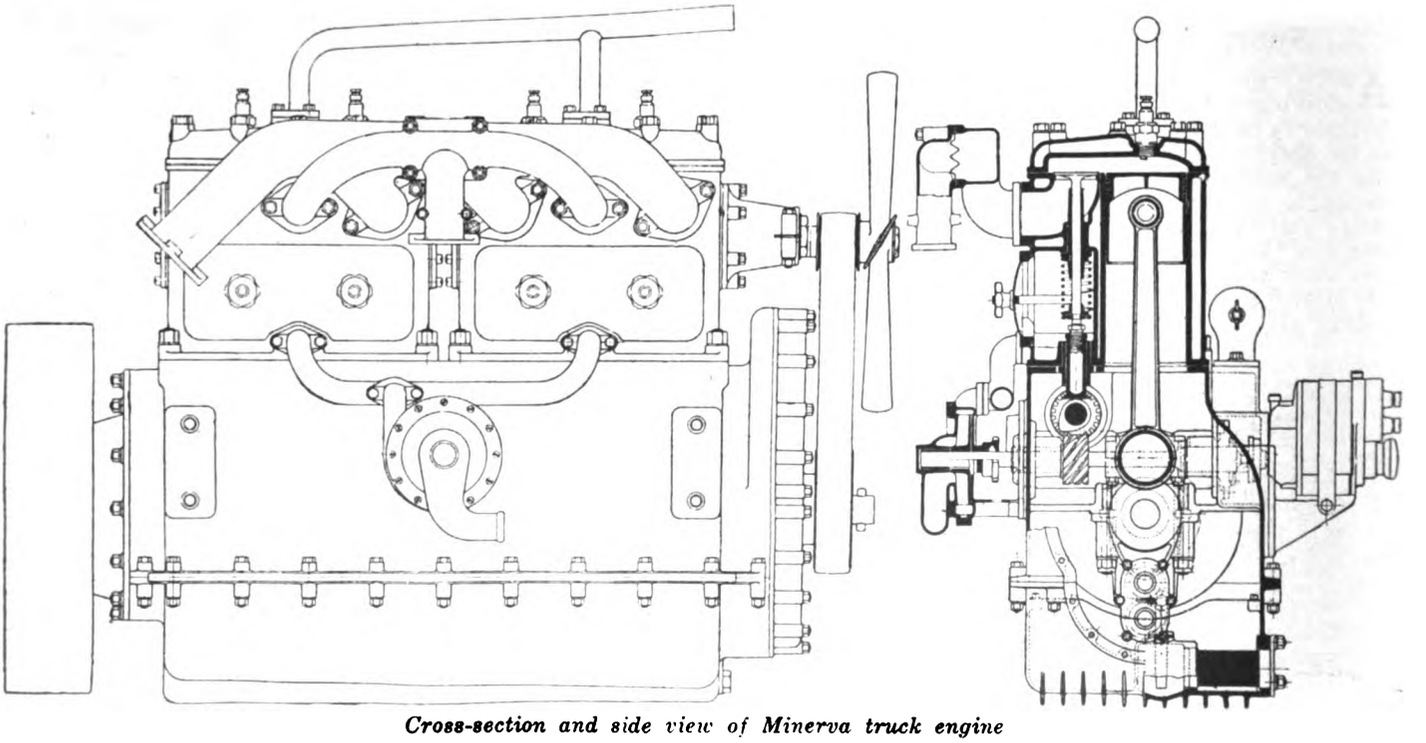
A three-bearing crankshaft is used; it is mounted in ample bronze-babbitt bushings and so constructed that the center bearing takes the entire thrust and allows for expansion or contraction of the shaft. At the rear end a large integral flange is provided, to which the flywheel is secured. This flange also prevents oil leakage at the rear end. I-beam section connecting-rods are used and the caps are fitted with four bolts. Adjustment is accomplished by means of laminated shims inserted between rod and cap, these shims being used also under the main bearing caps. At the wrist pin end the rod has a bronze bushing.

Gray iron pistons are fitted, each having three expansion rings. The pistons are also substantially ribbed. Large diameter valves insure high volumetric efficiency. The valves have a 45 deg. seat and are actuated by the camshaft through mushroom-type cam followers. Separate valve guide bushings are used, and provision is made for adjustments through cover plates on the cylinder blocks. The cams are integral with the shaft, which is mounted in four bearings and driven by spur gearing. Water pump and magneto drive is by means of a shaft placed at right angles to the camshaft, which brings the pump and magneto on the center line between the pairs of cylinders, the pump being on the right and the magneto on the left side of the engine. The driving gears are of the helical type, the driving pinion being of steel and integral with the camshaft, while the driven gear is of bronze and mounted on the cross shaft. Both ends of the cross shaft are carried in large-diameter plain bearings, and a ball thrust bearing takes the thrust of the driving gear. This construction makes it possible to remove the water pump without disturbing the magneto, and vice versa.

The water pump is of the centrifugal type, fitted with self-lubricated bearings and driven through flexible coupling from the cross shaft. Cool water enters the cylinders directly under the exhaust valves. The stuffing box on the pump is easily accessible and can be repacked without disturbing the pump. A high-tension magneto serves for ignition, and all high-tension wiring is incased in tubing.

Lubrication is in the main of the straight force-feed, high-pressure type. A gear type oil pump is cast integral with the front bearing cap and is driven by a spur gear which meshes with a gear on the crankshaft, the pump speed being slightly higher than engine speed. Oil enters the crankshaft through the front bearing and is distributed to the crankshaft, connecting-rod and wrist pin bearings. Oil is taken from the sump through a screen which can be easily removed for cleaning. Provision is also made for draining both sump and suction chamber separately. Other parts of the engine, such as connecting-rod bearings, valve guides, etc.,

(*Continued on page* 588)



Cross-section and side view of Minerva truck engine

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Tractor Gear Teeth and Materials

Heavy Service Demanded of Tractor Transmission Calls for a Liberal Factor of Safety—Materials Available for Gears and Their Properties—Different Tooth Forms Used

By A. W. Scarratt

THAT a farm tractor transmission does as much work in 1 year as an automobile transmission would have to do in 200 years was the startling statement made in a paper read before the Minneapolis S. A. E. section at its March meeting by A. W. Scarratt of the Minneapolis Steel & Machinery Co. The author's object was to draw attention to the severe service to which the gears of a tractor transmission are put and to explain the reason for making them strong and heavy. Says Mr. Scarratt:

IT is true that tractor transmissions have been heavy and crude, and that as a result the weight of the machines was high and the efficiency low, but it must be borne in mind that the large gas tractor of to-day is an outgrowth or revision of the steam threshing and road engine of twenty years ago, plus improvements, and not an offspring of the automobile. However, one cannot help but realize the advantages of refined engineering and quality of materials and construction, and of standardization, as exemplified in the modern automobile, and it is for these reasons that there is such a revolution in tractor design.

From the foregoing remarks it will be seen then that when laying out the gearing, careful judgment and good engineering are very essential, if high efficiency, minimum weight, and satisfactory service are to be obtained. Speed, torque, and space limitations, manufacturing facilities, and selling price will all have their influence on the type of gears and the material used in them. Of material the engineer has a considerable choice, and he also has several types of gear teeth to choose from. Materials for gears range all the way from paper, wood, cloth, hide and compositions to the finest alloy steels. Each has some advantage, be it strength, cost, operation, ease of production or wearing quality, and each tooth shape has some point in its favor.

Common Materials Suitable

Table A shows several of the common materials suitable for tractor gears, with the tensile strength, yield point, machining properties and characteristics of each. It will be seen that the variation in strength is great, but actually it is greater in practice than even these figures show, because of the necessity, when using the metals of low strength, to employ a larger factor of safety than is required when using the metals of greater strength, because of the variance in physical properties to be found in the lower grade materials. The physical properties of any of the carbon steels and alloy steels can be varied considerably to suit the designer's requirements, so that the figures given do not apply to all cases. The strength desired is regulated in the heat treatment by the drawing temperature used, the low drawing temperatures giving steels of high tensile strengths, high elastic limits and good hardness, but at a sacrifice of some of the toughness. The higher drawing temperatures decrease the tensile strength, elastic limit and hardness, but will materially increase the toughness. Therefore, in choosing the material for a gear, careful consideration must be given to see that it has the proper strength for the loads imposed upon it, proper hardness to insure reasonable service and proper dynamic properties to resist impact and fatigue. Here is where we lack much information.

Certain materials seem to be satisfactory for automobile gears, in view of the small amount of service they get, but it is questionable if gears made of similar proportions and of the same materials working under full load torque all the time, and, therefore, under much greater surface pressures, will last as long as they should in tractor service. It seems to the writer that experiments should be made which would give some definite data on the relation of surface pressures and the degree of surface hardness necessary for a given length of service. These properties must bear some reasonable relation to one another for any given material, and certainly private investigations have been made which have brought forth information on the subject which would be of great value to the engineering profession.

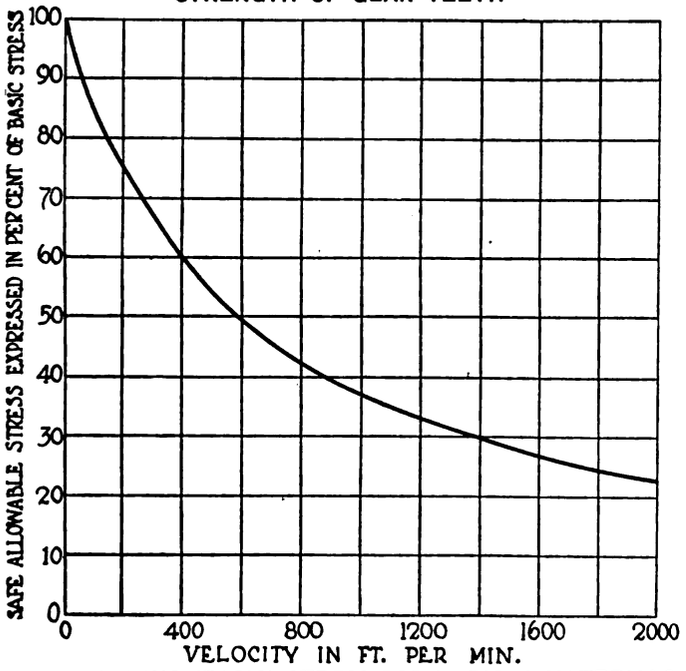
There is also much information lacking on the subject of the strength of gear teeth. On account of the various shapes of teeth, no common rule can be used in figuring their strength and the problem becomes a complex one. For instance, we have the Brown & Sharpe 14½° tooth, the Grant 15° tooth, and a 20° tooth, all of which are of equal length

TABLE A
Materials for Gears

Material	Tensile Strength, Lb.	Elastic Limit, Lb.	Machining Quality	Characteristics
Close grained cast iron	24,000	.....	Cuts freely Good surface	Easily obtained — low cost—satisfactory for low pressures.
Close grain semi steel	31,000	.....	Cuts freely Good surface	Easily obtained — low cost—satisfactory for high or low speed and low pressure — wears well.
Cast steel	60,000	31,000	Machines good when annealed	Medium priced—strong and tough, loss due to defects sometimes large. Wears well—satisfactory for low speed—low pressure.
Carbonized and Heat Treated				
0.020 carbon steel, S. A. E. No. 1020	75,000	43,000	Care needed to avoid tearing	Affords good combination of strength, toughness and hardness. Good for high speeds and medium pressures.
Heat Treated				
0.35 carbon steel, S. A.E. No. 1035	95,000	65,000	Machines good when annealed	Good combination strength, toughness and hardness. Good where high speed or heavy pressure prevails.
Heat Treated				
0.45 carbon steel, S. A.E. No. 1045	110,000	75,000	Machines good when annealed	Excellent strength, but more brittle than the previous steel. Suitable for high speeds and for steady heavy pressures. Wears well.
Heat Treated				
3½% nickel steel 0.20 carbon	130,000	99,000	Cuts hard with fine surface	Excellent strength, toughness and hardness. Very satisfactory for high pressures.
Heat Treated				
3½% nickel steel 0.40 carbon	155,000	130,000	Cuts hard with fine surface	Excellent strength, toughness and hardness. Suitable for very severe conditions; good for clash gears.
Heat Treated				
Nickrome forging steel	150,000	130,000	Machines good	Same physical advantages as above—easily heat treated. Excellent wearing qualities.
Chrome vanadium steel	190,000	150,000	Machines good	Same physical advantages as above—easily heat treated. Excellent wearing qualities.

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VALUES FOR FACTOR S IN THE LEWIS FORMULA FOR THE STRENGTH OF GEAR TEETH



SAFE WORKING (BASIC) STRESS FOR VARIOUS MATERIALS

	Lbs. per Sq. In.		Lbs. per Sq. In.
Raw hide	5,000	Bronze	12,000
Cast iron	8,000	Cast steel	20,000
Cloth	18,000	Forged steel (Not treated)	25,000
Semi-steel	10,500		

and which agree in all proportions except for the pressure angle. This, of course, varies the strength of the tooth in the ratio of the squares of the root thickness, which is the critical section of the tooth when figured as a cantilever beam, the load being applied at the outer edge of the tooth. In a rack gear of any given width, the 20 deg. pressure angle tooth is practically 25 per cent stronger than the 14½ deg. tooth. This ratio is not constant, however; in fact, it becomes slightly greater as the number of teeth in the gear becomes less. This is one advantage in favor of the 20 deg. pressure angle.

The most commonly used formula for these particular types of teeth is that originated by Wilfred Lewis,

$$W = SPFY\frac{600}{600+V}$$ in which,

W = safe tooth load.
S = safe stress in lbs. per sq. in.
P = circular pitch in.
F = face.
Y = factor depending on the number of teeth in the gear and the pressure angle used.

This factor Y is governed entirely by the number and shape of the teeth. Tables of these values are given in all handbooks. The values of S for different materials, starting with cast iron, and for various velocities are given in the accompanying diagram. These values I believe can bear criticism for the reason that the allowable stress drops with an increase in speed in the same ratio for every material regardless of its physical properties. This certainly should not be the case. When we consider the ability of such materials as chrome vanadium steel to resist impact forces, as compared to the relative inability of other materials, such as cast iron, it seems absolutely foolish to apply the same rule to both. In fact, several large manufacturers to-day do not adhere to the Lewis recommendations for the allowable stress.

Previously we have seen the value of increasing the pressure angle when considering the strength of the gear tooth. Another way of increasing the load carrying capacity of the tooth is by shortening it in a manner similar to the Fellows 20 deg. stub tooth standard. The word standard as applied here is a joke, as the so-called Fellows system is far from a standard. However, they realized the value of the short tooth and made a system of tooth sizes which, as you know, uses the addendum, dedendum, and clearance of a small tooth in combination with a tooth of large pitch. The Fellows stub tooth system comprises the following tooth sizes: 4/5, 5/7, 6/8, 7/9, 8/10, 9/11, 10/12, 12/14. It will be seen that there is no definite ratio between the height of the tooth and its pitch, such as prevails in the Brown & Sharpe system.

Why should we not have a standard 20 deg. stub tooth which does have definitely fixed proportions based on the pitch, such as is exemplified in the 20 deg. stub tooth, proposed and outlined in the *American Machinist*, in June, 1907, by an eminent authority, Charles H. Logue? Another disadvantage with the Fellows system is that the range of tooth sizes is not adequate, especially in tractor work. The writer has been forced on several occasions to use stub teeth of larger pitch than any given in the table, these sizes being the 3/4 and 2/2½ pitch. Another disadvantage in the present stub tooth system is that there is no convenient or accurate formula for figuring the strength of these teeth, and there cannot be until considerable investigation has been made.

The customary practice has been to figure the strength of the regular 20 deg. tooth and then increase this strength in the proportion of the inverted pitch fraction of the stub tooth. This does not give the correct strength, as it assumes the root thickness of the full length tooth and stub tooth to be alike, and this is not the case. The root thickness of the 20 deg. stub tooth is less than that of the 20 deg. full length tooth of equal pitch measure, and, consequently, it has a smaller section modulus.

In thus harshly criticising our present gear tooth practices, it is hoped that a general discussion of the subject will be created, with a view of bringing out valuable individual information on the subject generally.

The writer feels that there is certainly room for great improvement and much enlightenment on this subject through research work, if we are really going to use our valuable resources to the very best advantages.

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Italy's Exports Growing

ITALY occupies the position of the leading motor car exporting nation of Europe, according to official figures issued by the Ministry of Finance. For the first eight months of 1917 her motor exports increased 113.4 per cent, as compared with the corresponding period of 1915, and 96.4 per cent as compared with the first eight months of 1916. The largest proportion of vehicles consisted of motor trucks dispatched to the various Allied Powers. They numbered 6169, and had an average value of 14,375 lira each. Touring cars totalled 506 for the eight months, their average value being 17,568 lira each. They were practically all fully equipped cars for Allied staff service. Imports of motor vehicles into Italy were, on the other hand, low, the value being only 1,073,500 lira for 183 vehicles, of which ten were trucks. These figures show a drop of practically 70 per cent, as compared with 1915. It is rather curious to note that the average value of the motor trucks imported into Italy works out at the low figure of 2000 lira each, and that the average value of the touring cars is 6263 lira, or only a little more than one-third of that of the exported article.

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Details of the Minerva Engine

(*Continued from page* 586)

are lubricated by spray, which is thrown from the crankshaft. The oil-filler pipe and breather pipes are designed with a view to preventing dust and dirt entering the crankcase. The governor is operated by pressure from the oiling system.

Heat from the exhaust gases is used to pre-heat the incoming mixture in the intake manifold, which latter is of the down-draft, hot-point type. At the point of division between front and rear cylinder blocks, a deeply corrugated baffle-plate is inserted and this plate, being heated by radiation from the exhaust manifold, serves not only the usual purpose of diverting the incoming mixture, but also to accomplish more thorough vaporization of the fuel particles.

The Minerva engine is the product of the Minerva Engine Co., Cleveland, Ohio.

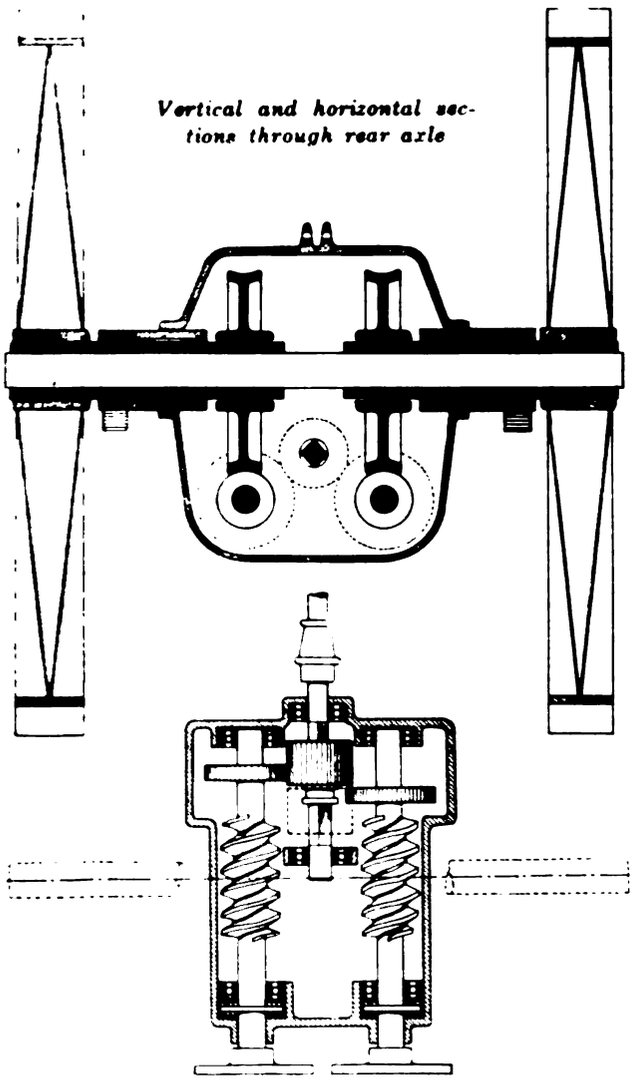
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New French Vineyard Tractor

Double Worm Drive in Rear Axle—Tread 37 Inches—Spring-Suspended for Roads

By W. F. Bradley
Paris Correspondent of AUTOMOTIVE INDUSTRIES

PARIS, March 1—Official France realizes that during the next few years thousands of agricultural tractors will have to be put into service in order to relieve the shortage of labor caused by the war. At the present time most of these tractors are being brought from abroad, owing to the inability of the home factories to produce. Immediately after the war, however, it is intended that France shall produce her own tractors, and already business men and factory owners are studying this question and automobile manufacturers in particular are turning to the agricultural tractor as an article which is likely to keep their enlarged factories busy. On the other hand, the French Agricultural Department is encouraging inventors to produce tractors suitable for French conditions, and has instituted a technical section which examines all new designs, reports on them, and when considered suitable endeavors to interest manufacturers in their production.



Vertical and horizontal sections through rear axle

One such tractor, considered by the French Government official as a most interesting type, is the Howald-Gerster, the patents for which are held by M. Howald, with the automobile engineer S. Gerster responsible for the general design. This tractor has interested one of the leading French automobile factories and will be built by them in a short time.

Has Narrow Tread

Foreign agricultural tractors rarely take into consideration the fact that in order to work in French vineyards the overall width of the machine must not be greater than 39 inches. Also on small farms the tractor must have a short turning radius, and while designed for work in the fields it must be capable of operating on macadam and paved highways. Even French manufacturers have preferred, up to the present, to build a machine for large farms and open fields rather than for the small farms and for use between vines.

The Howald-Gerster has been designed with French vineyard conditions prominently in view. The width of the machine is 37 inches, allowing it to go between vines, which are always 39 inches apart. In a country where gasoline is costly, weight has had to be kept as low as possible, and the engine is no bigger than is necessary for the work to be done.

Mechanically the feature of the machine is independent worm drive to each of the rear wheels, it being possible to transmit the power through a differential to both wheels, or to either one or the other, as desired. By means of this feature, the machine, which has a wheelbase of 75 inches and an overall length of 130 inches, can turn in a circle of 90 inches radius, or only a little more than its own wheelbase.

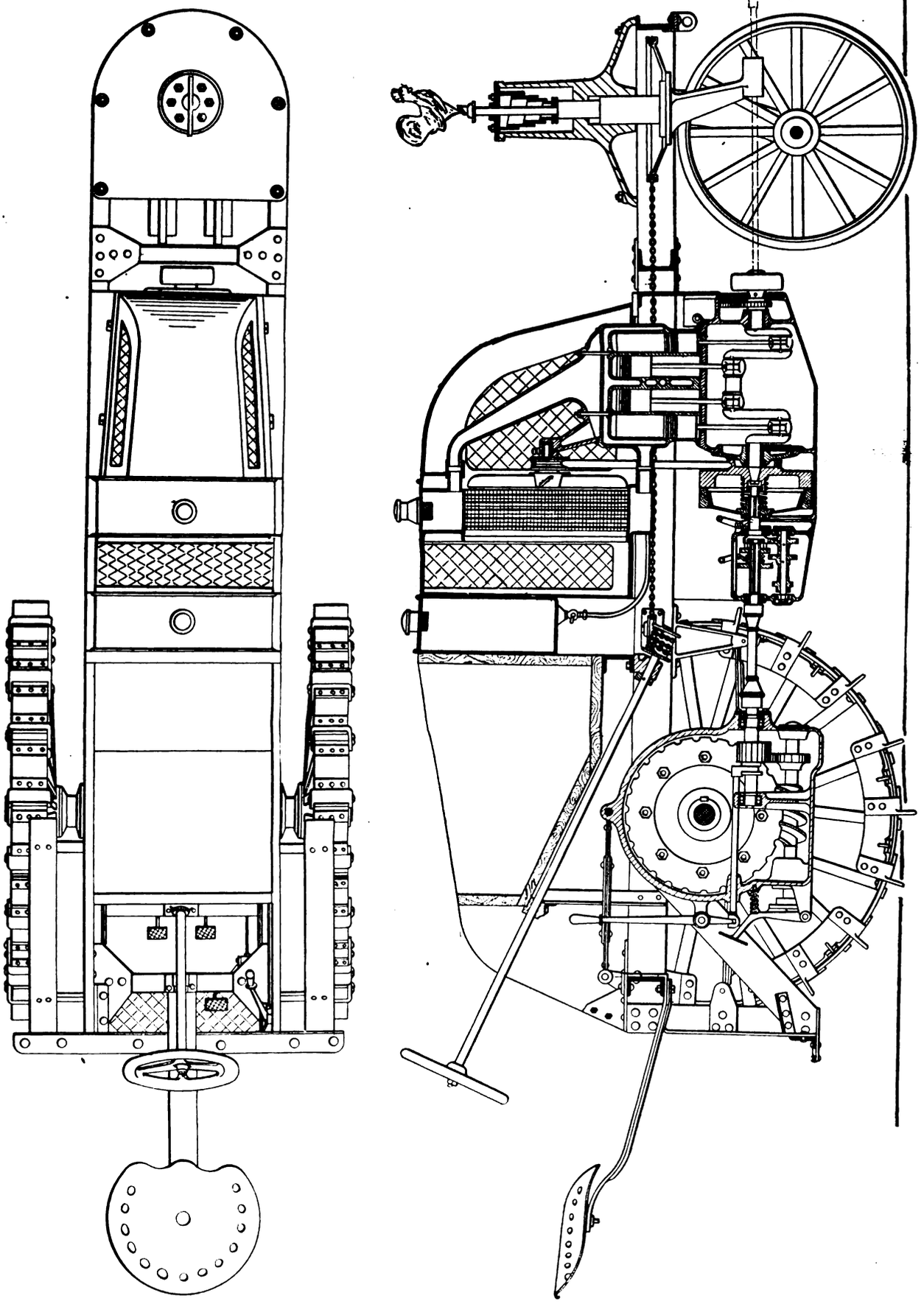
The tractor is of the four-wheel type, with two main frame members solidly united by transverse members, and is driven by a four-cylinder block engine 62 by 145 mm. bore and stroke developing 10 hp. at 1000 r.p.m.

Except for its simplicity there is nothing very distinctive in the motor. It has a two-bearing crankshaft, forced feed lubrication to all parts, including the wrist pins, ignition is by high-tension, dust-proof magneto, the carbureter is a standard make, and cooling is by thermosyphon water circulation.

Radiator Back of Engine

The radiator is set back of the motor, not only to give greater accessibility, but to prevent dust being drawn in. As will be seen from the design, cooling has been well taken care of by the provision of a big head of water and straight, big-diameter inlet and outlet pipes. There is a fan in front of the radiator, the two blades of which sweep the entire cooling surface; the fan bracket is mounted on the water outlet collector, and the drive is by means of V-belt from a pulley on the crankshaft just ahead of the flywheel. An inverted cone clutch, lined with thermoid, is made use of, the clutch being independent of the flywheel.

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Plan view and elevation, the latter partly in section, of Howald-Gerster vineyard tractor

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Bolted to the basechamber is a three-speed gearset within a cast-iron housing, with the drive taken by means of a short propeller shaft to the rear axle housing. A broad-faced spur pinion on the extremity of the propeller shaft meshes with two pinions slightly offset in relation one to the other, on the two underneath worm shafts. The driving pinion has a sliding motion on its shaft, and only meshes with both worm shaft pinions when in its central position. Brought fully forward or pushed fully to the rear, it engages one road wheel only, leaving the other free. By reason of this feature of the design, the machine, which has a wheelbase of 75 inches and a total length of 130 inches, can turn in a radius of 90 inches. To further facilitate turning there is an independent brake on each of the worm shafts, making it possible to lock the wheel not receiving power.

As the machine is intended for use on roads as well as over soft ground, it is spring suspended front and rear. The rear suspension consists of a pair of semi-elliptic springs passing under the axle and shackled at their forward ends to brackets immediately below the frame members; these springs provide for the torque.

The drive is transmitted through a flexible connection consisting of three or four-leaf, flat-blade springs riveted together and uniting the upper central portion of the axle housing with the transverse rear frame member. A French patent has been secured on this general layout.

Patent Detachable Lugs

Another patented feature, adopted in order to make the tractor suitable for road or field, consists of detachable strakes for the driving wheels. The rims of the wheels are fitted with ribs of sufficient depth to give adherence on a made road. The detachable strakes employed on soft ground are united together in series of three by means of curved lateral plates having the same curvature as the wheel rim. When these strakes, with their lateral plates, have been placed in position on the rim of the wheel, they are held by a couple of flat-blade springs, the center portion of each spring exerting a pressure against the inner face of the rim and the two ends dropping into notches on the side plates. No other tool than a hammer is required to dismount the strakes. When the end of the spring has been knocked out of its notch, it can be placed diagonally in relation to the strake and drawn out. This system gives ample security, while avoiding the use of bolts and nuts.

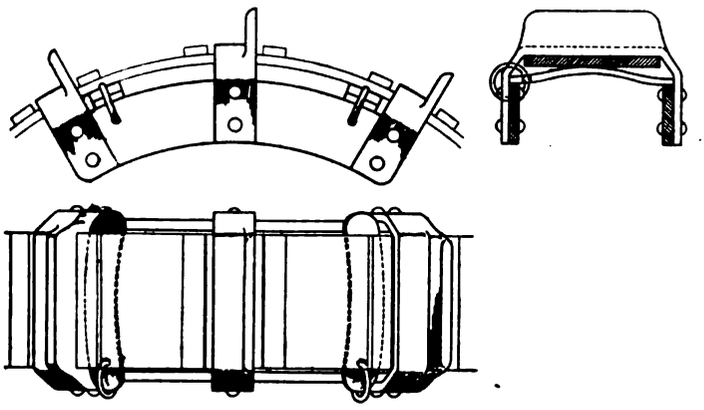
The steering wheels, which have a diameter of 23.5 inches and a rim width of 3.1 inches, are mounted on a central pivot and fork, with suspension by means of a rectangular section coil spring. The wheels are set very close together, but can be widened when desired for work on the road.

A similar system of variable track has been adopted for the driving wheels. While the minimum track is 37 inches, it can be increased to 51 inches by the interposition of couplings on the axle.

Automobile Type Steering

Steering is by means of an automobile type wheel, an inclined column and a pulley with chain, the ends of the chain being attached to the arms of the pivot and fork. The driver's seat overhangs the rear of the tractor, being sufficiently high to give him a good view ahead and at the same time to enable him to control the plow or other agricultural machine he may have in tow.

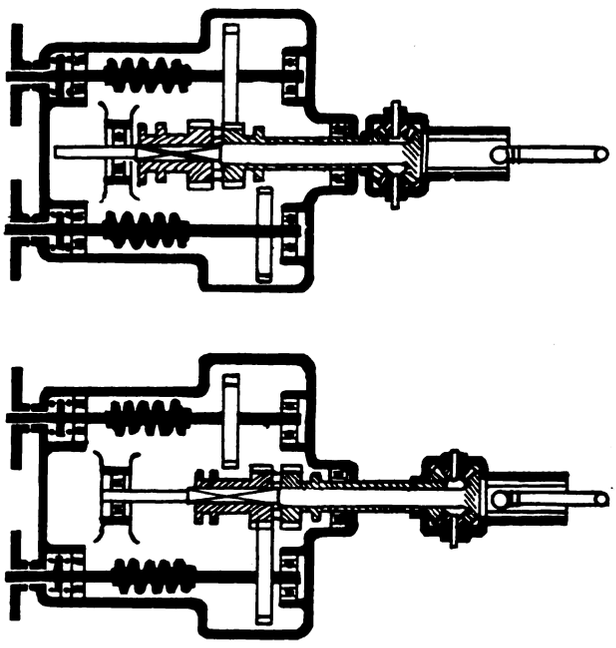
This tractor is intended to haul a two-furrow plow and to cultivate to a depth of 6 inches. The tractive effort required for this work varies from 660 to 880 pounds.



Detail of the driving lugs

On second gear, which is the one generally employed for plowing, and corresponds to a speed of 3 feet per second, or 2.05 miles per hour, the tractive effort at the drawbar is 680 pounds when plowing to a depth of 6 inches over a width of 20 inches in average earth having a density of 5.5 pounds per square inch. The required tractive effort corresponds to 3.7 hp., and, as the engine actually delivers 6 hp. at the drawbar, the margin is quite sufficient. On low gear the tractor advances at the rate of 2 feet per second, or about 1.3 miles an hour. On third gear the rate is 4.5 feet a second, or a little more than 3 miles an hour. It is intended that practically all plowing shall be done on second gear and road haulage only on third. On average ground, advancing at the rate of 3 feet per second, with a two-furrow plow covering a width of 20 inches, the surface turned over is 300 square feet per minute. During a ten hour day the machine can plow 3.8 acres of heavy ground and 5.4 acres of light ground. This estimate makes an allowance of 10 per cent for time lost in making turns, filling tanks, oiling, etc.

The tractor is handled in practically the same way as an automobile with a three-speed gearset. The only difference are two brake pedals, one for each worm shaft, and a separate lever to enable the drive to be transmitted to left or right hand wheel, or both, as desired. It is estimated that this tractor will be put on the market at an inclusive price of $1,700.



Illustrating convertible single and double wheel drive

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The Rumpler Two-Seater Biplane

Constructional Details of an Enemy Machine Which Has Great Climbing Power, High Speed and a Lofty Ceiling—Fitted with 250 Hp. Engine

WHAT is considered one of the fastest of German war planes is the Rumpler C-IV biplane, which, although classed as a general-purpose machine, has a high flying speed and a ceiling of 21,000 ft. The climbing capacity of this machine is also very good, being given as 5000 meters in 35 minutes (16,000 ft. in 34 minutes). To enable the occupants to breathe freely at the enormous altitudes to which this machine can climb the German Air Board has recently introduced a special form of respirator. Both the upper and the lower wings have a sweep back of 3 deg. The dihedral angle is 2 deg., and the wings are staggered forward 0.6 meter (2 ft.). Contrary to the usual German practice, the trailing edge is rigid. The ribs, which are made of three-ply wood pierced for lightness, are spaced 0.3 meter (1 ft.) apart. A uniform angle of incidence of 5 deg. is used.

Forms of Wings

The upper wings are of trapezoidal form, with rounded angles. Above the fuselage the trailing edge is cut out, as shown in the illustration. The maximum chord is 1.70 meters (5.58 ft.). Each of the upper wings has nineteen main ribs and five compression struts of tubular steel. The ailerons are tapering, their chord varying from 0.5 to 0.65 meter (20 to 24 in.).

As in so many other German machines, the lower wings have rounded wing tips. As the radius of the arc forming the rear edge is longer than that of the front, the wing tip resembles somewhat that of a propeller blade. Each of the lower wings has 17 main ribs and four steel tubular compression struts.

There are two oblique interplane struts on each side of the fuselage. The inner front struts measure 0.105 m. (4.12 in.) in section, and the rear struts 0.130 m. (5.12 in.). The outer front strut measures 0.090 m. (3.54 in.), and the outer rear strut 0.085 m. (3.35 in.). The gap between the wings is 1.85 m. (5 ft. 8 in.) and the total lifting surface is 33.5 sq. m. (360 sq. ft.), of which the upper wing is 20 sq. m. (215 sq. ft.) and the lower wing 13.5 (145).

Tail Plane Bracing

The tail plane is non-adjustable, and not as deep as in previous types. Its leading edge, in plain view, is approximately a semicircle. This tail plane is supported on each side by struts attached at the other end of the bottom rail of the fuselage. Two other struts brace the tail plane to the vertical fin. The struts under the tail plane are provided with a series of sharp-edged metal points. Apparently, these serve the object of preventing the landing crew, when wheeling the machine about, from catching hold of these struts and possibly bending them. The elevator is in two parts, each of which is partly balanced by a triangular forward projection. The rudder, which is built up of metal tubes, is of the usual type, and the control cables pass inside the fuselage, being guided through small wooden tubes.

The construction of the fuselage is of the current type, with four longerons, and struts and cross members, braced by piano wire. Front and rear are covered with three-ply wood and the middle with fabric. The propeller (a Heine) has a diameter of 3.17 m. (10 ft. 5 in.). As on all other German machines, the propeller boss is enclosed in a "spinner."

The engine fitted on the Rumpler is either a 260-hp. Mercedes or a 250-hp. Maybach, both having six vertical cylinders. When the Mercedes is fitted it is slightly tilted to the right in order to allow the induction pipes to pass between the legs of the cabane. With the Maybach, which is more compact, this arrangement is not necessary. The motor is supplied with fuel from two tanks. The main one (about 58 gal.) is placed under the seat of the pilot; the second, the service tank (about 18.5 gal.) is placed at the back of the pilot, between him and the gun ring in the gunner's cockpit. The quantity of fuel carried allows of a flight of four hours' duration. The covering over the engine leaves the tops of the cylinders exposed, and incloses a Spandau machine gun operated by the motor.

The exhaust pipes run from the six cylinders to a common chimney curving upward and backward. The chimney itself is divided about half way up into three branches, probably in order to obtain a certain amount of silencing effect. As in previous models, the radiator, which is semicircular in shape, is placed on the front legs of the cabane. In front of it is a series of small slats, which can be moved so as to be either parallel to or at right angles to the direction of flight. This makes it possible for the pilot to adjust the cooling according to the altitude at which he is flying.

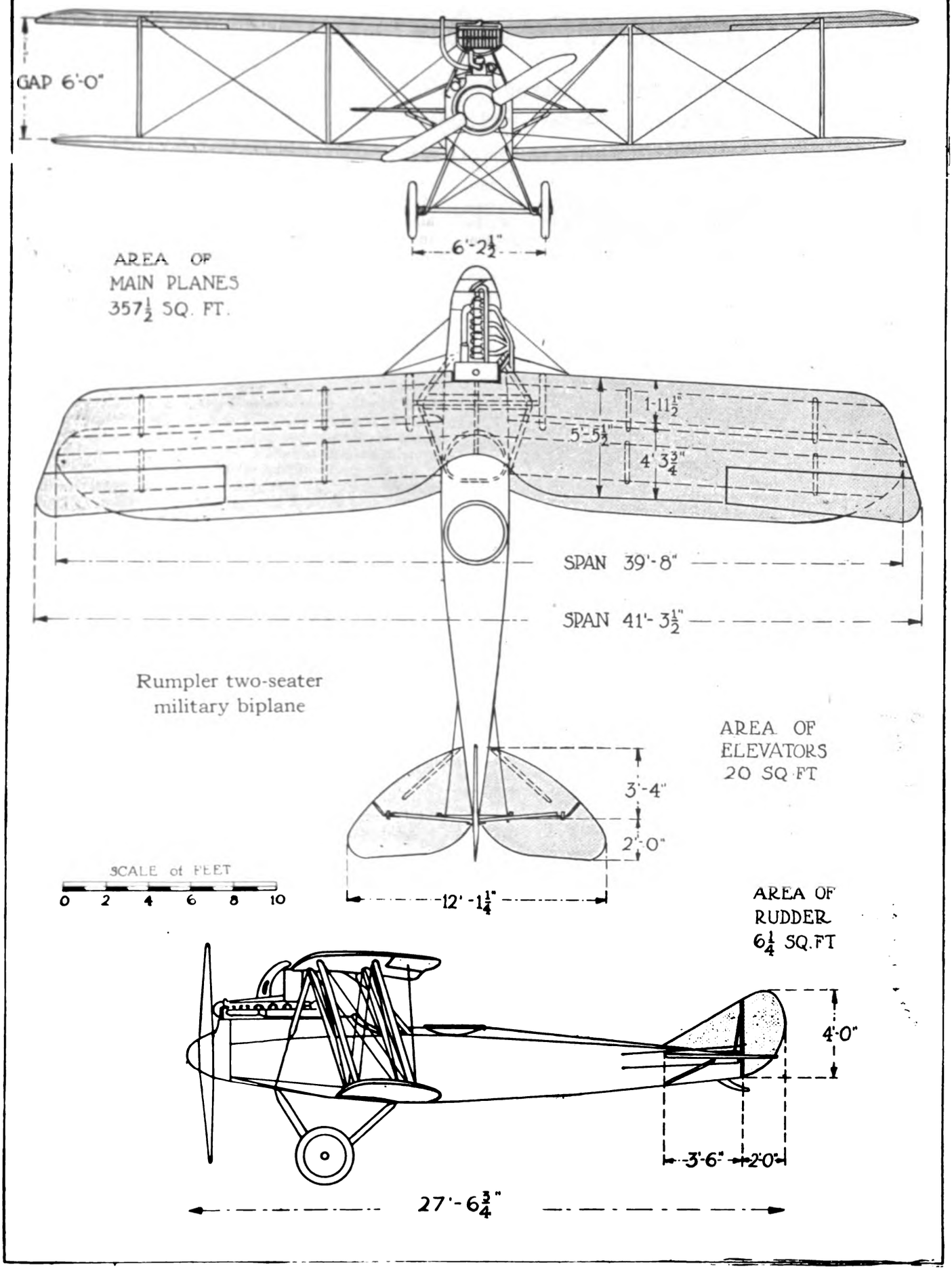
Behind the motor is the pilot's cockpit, and behind him again that of the gunner. Supported on a gun ring in the rear cockpit is a Parabellum machine gun. Pilot and gunner are very close together. In the gunner's cockpit there is a bomb rack of the usual type, carrying four bombs. An opening in the floor permits of taking photographs, and the machine carries a wireless set. The landing chassis is of the V type, with rubber shock absorbers. There is no brake fitted on this machine. An external drift cable runs from the nose of the fuselage to the foot of the inner front interplane strut.

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The Motor Industry

A COPY has been received of a new book entitled The Motor Industry, its growth, its method, its prospect, and its products; with an indication of the uses to which motor vehicles of all kinds are, or could be, advantageously applied. By Horace Wyatt, B. A., published by I. M. Pitman & Sons, 2 West Forty-fifth Street, New York. The book deals briefly with the history of motor car development and discusses the factors which have influenced that development. It seems to be written chiefly for the investor and for the man who wants a general knowledge of the motor car industry, for it does not go sufficiently into mechanical details to meet the requirements of a mechanic-driver nor is it of a technical character. The book was written in England and deals with the subject from a British viewpoint, though there are numerous references to automobile development in other countries.

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Specifications of Airplane Propellers

As Issued by the International Aircraft Standardization Board, Covering Materials Used, Methods of Manufacture, Inspection and Testing

ONE of the latest sheets of specifications issued by the International Aircraft Standardization Board at Washington covers the manufacture of airplane propellers. It is reprinted below.

1. The general specifications, 1G1, shall form, according to their applicability, a part of these specifications.

Materials

2. (*a*) *Wood.*—Woods used for the manufacture of propellers for motors of more than 150 hp., or more than 1600 r.p.m., are to be black walnut, true mahogany, or quarter-sawed white oak.

For machines under 150 hp. and 1600 r.p.m., will also be allowed the use of West African mahogany, cherry, and birch. In any case, the manufacturer is not allowed to use a different material from that specified in the design without permission of the purchaser.

Thickness of the boards shall be 0.75 to 1.0 in., finished.

(*b*) The laminations of the propellers being of irregular shape, imperfections are allowable on edges and parts of boards that will be cut away in the shaping of the propellers, but the stock that goes into the propeller must be straight grain, free from curls, burls, and spiral grain, without knots, checks, dry rot, shakes, dote, or other imperfections, in entire accordance with the I. A. S. B. specifications Nos. 2W3-8 for the lumber.

Sapwood is not permitted in the finished blade, and is not allowed to extend in boss more than 0.75 in. from the edge of the boss, and must in that case be sound.

(*c*) The physical properties of the wood shall be as specified in the I. A. S. B. specification No. 3W1.

(*d*) Stock shall be dried to a moisture content of 7 per cent by methods given in the I. A. S. B. specification No. 3W2.

(*e*) The *glue* used shall conform to I. A. S. B. specification No. 2V2.

(*f*) Materials used for the *sheathing* of propellers for sea planes may be the following:

(1) Sheet copper in conformity to I. A. S. B. specification 3N8.
(2) Monel metal sheet in conformity to I. A. S. B. specification 3N21.
(3) Linen in conformity to I. A. S. B. specification 2F3.
(4) Cotton fabric in conformity to I. A. S. B. specification 2F4.

(*g*) The *spar varnish* used shall conform to I. A. S. B. specification 2V1; the *filler*, to I. A. S. B. specification 2V2. The priming varnish shall be made by dilution of spar varnish with about 2 parts of turpentine.

Manufacture

3. (*a*) Each board shall be sawed and planed in accordance with blue prints. After planing they shall be glued promptly to avoid absorption of moisture, and great care must be taken to keep the wood under uniform condition of temperature and humidity during all the operations.

(*b*) Boards shall be balanced before gluing, and heavy ends alternated so as to minimize the effect of variation in the density of the material.

(*c*) The boards shall be sawed for gluing in such a way that the grain follows the lamination of the propeller, avoiding any cross grain. At the same time, the boards shall be so arranged that the grain comes out on the edge, avoiding any flat grain.

(*d*) The practice of gluing edge pieces onto the boards in order to fill out at the boss is forbidden, unless special permission is given by the purchaser. In case such permission is given, the lamination on both sides of the boss widener must be of the full width of the boss; that is, no two laminations which have wideners glued to them shall be adjacent. Both the lamination and the boss widener shall be corrugated at the joint to increase the gluing surface. No splice or "dutchman" shall be permitted on the blade of the propeller. Defective joints shall not be filled with glue. The practice of gluing a thin strip of veneer to the blades will not be allowed.

(*e*) The glue room must be kept at a temperature of 90° to 100° F. (32° to 38° C.), and an average pressure in gluing of 150 pounds per square inch (0.11kg./mm.^{2}) shall be maintained. Care shall be taken to insure an even pressure on all the parts of the glued surface for not less than 10 hours or longer, at the option of the purchaser. The pressure in the gluing process must not be removed before the expiration of 8 hours after it is completed. This period may be increased at the option of the purchaser.

(*f*) The propeller shall stand at least two days after gluing, nor shall it be finished in less than two weeks after roughing out.

(*g*) The surface of the propeller shall be smoothly sandpapered before the filler is applied, and the curvature shall be true and smooth throughout the length of the blade. Irregularities of contour are not permissible.

Tolerances

4. (*a*) Propellers shall be inspected for pitch angle, alignment, blade form, and shape of section, as soon as they are finished by the manufacturer and shall come within the following tolerance limits:

	Portion of Blades More than 50 per Cent Radius from Axis	Portion of Blades Less than 50 per Cent Radius from Axis
Alignment within	0.0625 inch	0.0625 inch.
Error in fit of templets	0.01 × width of blade.	0.02 × width of blade.
Width of blade	0.075 × width of blade	0.01 × width of blade.
Thickness of section..	0.0625 inch	0.125 inch.

For the inner half of the blade length the deviation from the specified pitch angle shall not exceed ± 1.0° at any station, and the difference between the pitch angles at corresponding stations on opposite blades must not differ by more than 1.0°. For the outer half of the blade length the average deviation shall not exceed ± 0.3°, the maximum deviation shall not exceed ± 0.5°, and the difference between corresponding opposite averages and maximum shall not exceed 0.3° and 0.5°, respectively.

(*b*) The diameter shall conform to the drawings within plus or minus 0.125 inch. The inspector may accept propellers when the diameter is 0.50 inch under specified dimensions, providing not more than 1 propeller in 10 is more than 0.125 inch under the specified diameter.

(*c*) Blades on the same propeller shall be alike within the limits given above. For example, the thickness of the blade may be 0.0625 inch greater or less than specified, but two blades on the same propeller shall not differ in thickness by more than 0.0625 inch.

(*d*) Propellers shall be inspected for alignment at the time of shipment and shall track within 0.0625 inch. If the propeller is not over 0.315 inch out of track, it is permissible to correct the alignment by scraping the wood in the boss.

5. (*a*) Before application the fabric shall be scrubbed

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thoroughly with hot water and soda, and after rinsing allowed to soak in hot water for four hours in order to remove all sizing from the cloth.

(*b*) The process shall be repeated until all the sizing is removed. The cloth shall be dried and applied to the blade in the glue room, with a standard temperature of 100° F.

(*c*) The blades shall be coated evenly with glue, and the cloth applied and ironed smooth, preferably with an electric iron.

(*d*) Twenty-four hours after gluing the fabric shall be given four coats of acetate dope, followed by two coats of varnish or enamel which conforms to I. A. S. B. specifications No. 2V1.

Sheathing of Propellers with Copper or Naval Brass

6. (*a*) Metal sheathing shall be set in flush with the blade. Rivets of the same material as the sheathing shall be spaced over the area of the sheathing. They shall be applied in such a way as to fit tightly without splitting the wood and shall be applied alternately from the face and the back. The rivets shall then be headed and filed to form a smooth surface. No rivets shall be driven closer than 1 inch from the propeller edge, except at the edge of the metal or in very small blades.

(*b*) A row of rivets about 0.625 inch apart shall be spaced along the edge of the sheathing.

(*c*) The rivets shall not exceed 0.085 inch in diameter and shall show a breaking load of at least 130 pounds (58.9 kg.) at the riveted end and 180 pounds (81.5 kg.) at the head end. The working stress due to centrifugal force shall not exceed 4,266 pounds per square inch (3 kg./mm.^{2}).

(*d*) Sheathing shall be formed to the exact shape of the blade before any rivets are placed.

(*e*) The rivets shall be applied in such a way that they do not follow the line of the grain.

(*f*) When the work is complete the tip shall fit snugly against the wood. Buckling or lifting of the metal shall be considered ground for rejection.

(*g*) Sheathing shall be perforated at the extreme tip by four holes 0.0625 to 0.0938 inch in diameter, to allow the moisture to be removed.

Finishing of Propellers

7. Propellers shall be finished by the application of 1 coat filler, 2 coats priming varnish, and 3 coats of spar varnish. Each coat should be allowed sufficient time to dry before the application of the next coat.

8. (*a*) The propellers shall be tested for balance after the shaping, and after each subsequent operation which affects the balance. For this test the propeller shall be mounted so that it can turn on a horizontal axis, and the sensitiveness of the mounting must be such that it will move at the application of 1 gram (equals 0.036 ounce) at a distance of 2 feet (61 cm.) from the axis.

(*b*) The balancing shall be done in a room free from air currents.

(*c*) The propeller when completed shall stand on the balancing machine in any position without persistent motion in any direction.

9. (*a*) One propeller of each new design shall be tested by running for at least 10 hours at rated speed on the engines for which it was designed.

(*b*) A centrifugal test of at least one hour duration shall be run at a speed of 10 per cent in excess of the rated speed. This test applies to one propeller of each new or of each unconventional design and to propellers made by inexperienced builders.

(*c*) The deflection of the tip in an axial direction shall not exceed 0.75 inch when the propeller is turning in free air at the rated speed unless greater deflection is an intended feature of the design. This requirement applies to propellers having a diameter of less than 10 feet (3.05 m.).

(*d*) Such additional tests as may be desired shall be stipulated for propellers of untried materials or of radical design, or larger than 10 feet.

Hubbing of Propellers

10. (*a*) The large boss hole shall be bored before roughing and shaping in order to insure perfect alignment.

(*b*) The fit of the hub in the large hole shall be neat and close, and the metal flange shall not show perceptible shake. The fit of the bolts in the wood shall be as tight as possible without danger of splitting the wood.

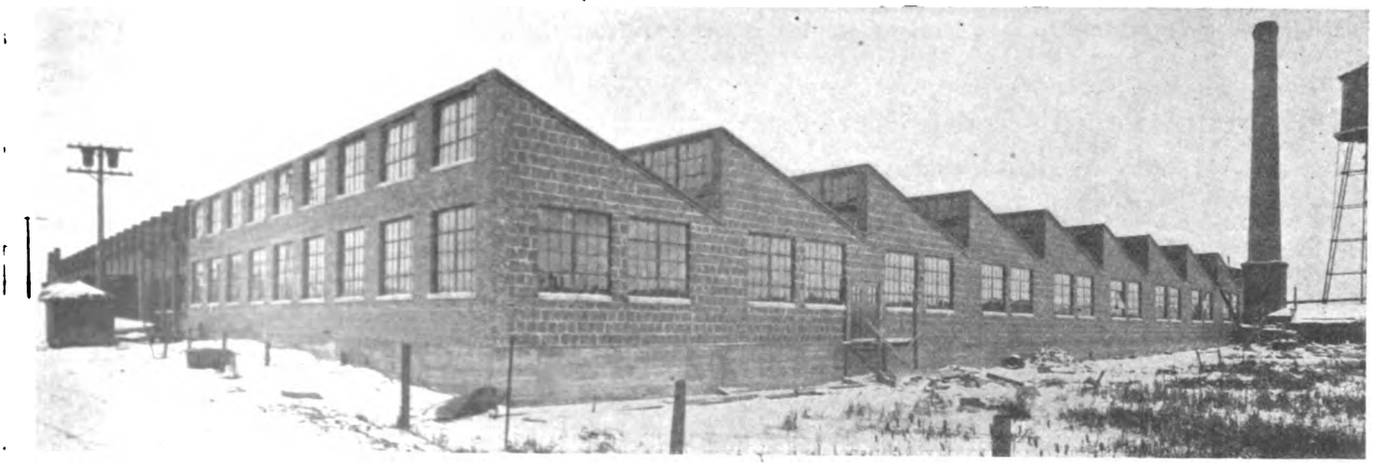
11. (*a*) The propellers shall be stamped in such a position on the boss as to be legible after the placing of the metal flange, with the following information: (1) Pitch, (2) diameter, (3) safe revolutions per minute, (4) whether right or left hand, and (5) serial number.

(*b*) On the blade shall be the manufacturer's trade-mark or name.

Addition to Berling Magneto Plant Opened

PRODUCTION has been started in the new addition to the factory of the Ericsson Mfg. Co., Buffalo, N. Y., which is shown in the accompanying photograph. This makes possible the doubling up of the former capacity. Heretofore the production facilities were limited, and made it impossible to use more than 400 or 500 employees, this necessitating day and night shifts in order to meet the demand.

The Ericsson Mfg. Co. started to manufacture the Berling magneto about seven years ago. To-day this magneto is made in one, two and four-cylinder models for motorcycles, four and six-cylinder models for automobiles and motor trucks, one, two, four, six and eight-cylinder types for marine engines, as well as six and eight-cylinder types for airplanes. The demand in the latter field, of course, is growing rapidly just now.



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The FORUM

"Superheated Gas" Methods

By W. P. Deppé

IT IS proposed that railway congestion be relieved by the greater use of gas engine trucks, etc. But note the fundamental problems which the present use of gas engines, present methods of refining oils and crude oil production have brought into the limelight in recent months. The oil fuel problem is the only great economic problem which will grow more acute with the mere passing of time, whether the war goes on for five years or ends to-morrow.

Since 1902 gas engine use has increased more than 5000 per cent. Since 1902 the production of crude oils has increased only 600 per cent. Since 1902 the production of so-called refined motor fuels has increased about 1000 per cent.

While methods of refining oils, engine design, etc., have been somewhat improved in technical mechanical details, the method of injecting wet mixture of oil and air into engine cylinders has not been altered since the first modern four-stroke engine was used.

With present commercial fuels, made under any refining method, from one-third to one-half of each gallon of commercial gasolines is wasted so far as useful work is concerned. Besides, the sending of wet fuel mixtures into engine cylinders dilutes the lubricating oils and causes further serious waste of lubricant, damage to engine metals, etc., as openly admitted by the leading engine builders, vehicle makers, engineers in noted engineering societies, etc.

Each interest is sitting tight and passing the buck to the uninformed public, which has most liberally supported the third largest industry in America. The wonderful development of this industry to date has been unprecedented in industrial history.

Stocks of Crude Dwindling

The Bureau of Mines and the Oil Administrator call attention to rapidly dwindling stocks of crude oils in storage, yet American engine builders are turning out about 2,000,000 gas engines per year, each of which requires some wildcatter to find wells to produce 65 barrels of crude oil per year, so long as each gas engine operates, in order to permit oil refiners to produce 13 barrels of suitable fuel oil for the carbureting methods used by engine builders.

Superheated methods of carburetion permit the oil refiners to double fuel oils over night by merely dumping a barrel of kerosene into a barrel of gasoline, thus making 25 barrels of fuel oil for motors out of each 65 barrels of crudes the wildcatter must find each year for each engine turned loose on the world of industry.

Superheated gas methods permit the use of approximately 40 barrels of crudes out of each 65 found. But the engine builders feel they cannot spend tens of dollars to permit individuals buying engines to save hundreds of dollars per annum.

Prerequisites for Using Kerosene as Motor Fuel

By W. L. Dempsey

THE power of an internal combustion engine varies directly with the number of atoms of carbon, hydrogen and oxygen taken into the cylinder in proper proportions. The whole automotive industry knows only too well that there is no difficulty experienced in getting enough carbon and hydrogen into the cylinder (and into the crank case also). Any carbureter and any kind of a manifold with or without a hot spot will always supply enough fuel, especially so when kerosene is being used. The problem of successfully using kerosene as motor fuel depends upon furnishing a sufficient amount by weight and not by volume, of oxygen-bearing air, to combine with the fuel in the proper proportions. The amount of air which it is necessary to supply in addition to that taken in with the fuel is exactly equal to the reduction of the air in the gaseous charge due to the heat necessary to gasify the kerosene or other heavy oil. Until this additional weight of air is supplied, more kerosene will continue to be wasted than is transformed into foot-pounds.

Expansion Due to Heating of Charge

A pound of kerosene requires approximately fifteen pounds of air, to insure complete combustion. One cubic foot of air at standard pressure at 60 deg. F. weighs 0.08075 of a pound and, since the weight of gases varies as their density and since air expands 1/493 times its volume with every degree of heat added and every distilled hydro-carbon fuel requires a temperature greater than that at which it was distilled, in order to produce a dry gas, it will require a temperature of not less than 500 deg. to gasify kerosene, which would double the volume of the air and cut down the efficiency of the motor 50 per cent—unless provision is made in the design of the engine to force into the cylinder an amount of oxygen equal to the loss in oxygen and air of the regularly inducted charge due to the heat of gasification. This is the first and absolutely necessary step to be taken to improve the performance of kerosene motors.

Kerosene must not only be vaporized; it must be gasified by heat, at a temperature not less or equal to, but greater than that at which it was originally distilled. The sole function of a carbureter is to break up, to comminute as finely as possible, the fuel, and mechanically mix and mingle it with the air, in the proper proportions. With highly volatile fuels the velocity of the air, in the act of carburetion, together with the radiation from the motor, supplies the necessary heat, but no such temperatures as are necessary to form a dry gas from kerosene can be supplied. Therefore some method of heating, either by the hot spot or heated manifold, is indispensable.

Character of Fuel Changing

The ever increasing demand for gasoline has compelled the refiner to introduce new processes and constantly raise the temperature of distillation in order to extract the last drop possible from crude oil, so that the kerosene of commerce is not only distilled with initial temperatures of from 450 to 500 deg., but there is not left in it a single drop of the more volatile oils. It therefore becomes imperative not only that the kerosene motor shall be provided with means for adding additional air to that which is taken in with the fuel, but means must be supplied for maintaining at all speeds an air temperature of from 400 to 500 deg.

Revolving Disk for Spraying Kerosene

By R. C. Sackett

IT seems to me that, to design a satisfactory kerosene carbureter, some mechanical device must be used for vaporizing or finely dividing the kerosene spray.

Could this not be accomplished by placing in the carbureter at a point where the kerosene would drop or be sprayed onto it a very rapidly revolving small disk with a roughened surface? The result would be that this disk, rotating at a high rate of speed, would create a mist or vapor of kerosene. It would have the same effect on the dropping kerosene that an emery grinder running at a high rate of speed has upon the grinding liquid used in the automobile shops. That is, it is broken up and thrown off the wheel in a very finely divided spray.

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The Draftsman, the Purchasing Agent and the Forge Shop

A Three-Cornered Combination Which Often Fails to Produce the Desired Results in the Shop

By J. Edward Schipper

IN the manufacture of machinery comprising drop forgings, the draftsman will first make his design, and then the purchasing agent will be called in to buy the forgings. Occasionally the foreman of the forging shop will be called in for consultation regarding the practicability of manufacture, but unfortunately this is not always done. Probably the chief reason for the difficulties encountered is that the draftsman quite often knows relatively little regarding forging practice. It is very rare that the draftsman has had practical shop experience in this line of work, and consequently he cannot appreciate what the forge men must know in order to satisfactorily and intelligently produce the parts desired. These points were covered very completely in a paper recently read by E. J. Frost, president of the Frost Gear & Forge Co., Jackson, Mich., before the Drop Forge Association.

Some extracts from this paper clearly illustrate the difficulties which are sure to occur when there is lack of co-operation between the draftsman and the man in the shop. It is a fact that sometimes the machining processes are entirely overlooked, either by the purchasing agent or by the draftsman, with the result that a forging which may not be expensive in first cost may come very high in the end owing to the greatly increased cost of machining.

Shop Experience Necessary

Draftsmen require a certain amount of knowledge that can only be acquired by actual experience in the shop. One point upon which they are generally weak is the necessary tolerance for drive, press, shrink and running fits. They are also weak regarding the fitting of keys, size of drill holes for rough and finished bolts, various qualities of surface desired in lathe and planer work, and hundreds of other matters which, if not shown on the drawing, must be left to the discretion of a foreman whose time should be devoted to manufacturing problems.

Efforts are being made by the Drop Forge Association to simplify a great many of these problems by standardization of fits and other details, and a tentative program has been laid out to handle situations of this nature which may arise.

One point which cannot be insisted upon too strongly is that practical drop forgers should be called in for consultation and advice when new designs are being worked out, or at least preliminary drawings or sketches should be sent to prospective sources of supply to get constructive suggestions and to avoid the revising of completed designs and details. Most drop forgers would be more than willing to render this service for their regular customers, if not for the trade at large, and in some instances the saving would be enormous.

In the case of large automobile forgings, such as axles, crankshafts, camshafts, and the like, tolerances and amounts for finish should be established within the practice of a well-organized forge shop, and it should be understood that any requirement beyond this will call for a corresponding increase in price, as will also extra-thin ribs or webs, which cool too rapidly in the dies, thus necessitating reheating or causing folds or cold shuts.

In the case of axles, the method to be employed in machining has much to do with the accuracy of forging required, and especially the relative accuracy of the various parts. The tendency during the past 2 years has been to compel the drop forger to produce an axle of such refinement that the machining cost will be brought to the lowest possible amount. This would be fair enough if the price was commensurate with the extra care and work entailed, but with a return to normal business conditions we may have a return to the old competitive methods so disastrous to peace of mind and condition of pocketbook.

It seems that an over-all tolerance of ⅛ in. should be as close as is required between knuckle-pin centers, although some axle manufacturers are demanding 1/16 in. This is hard to maintain through heat treatment, especially if the composition of the steel varies much.

An understanding should be had at the time of bidding on the work as to whether the flat surfaces on the spring pads for the U-bolt nuts are to be put in padding or are to be afterward machined.

In regard to twist in an axle, some purchasers are requiring that the yokes come absolutely to gage, but this practice is unfair unless an additional price is paid. At least 1/32 in. on the knuckle-pin centers should be allowed for distortion in this respect.

The yokes should have an allowance of from 1/16 in. to 3/32 in. on each surface for finish, plus the necessary forging draft. Restriking of the spring pads in order to conform to the curvature of the springs should be specified in drawings if wanted.

Crankshafts Have Vagaries

Coming to the crankshafts, there are such vagaries in the design that it is extremely hard to make definite statements; but, generally speaking, there should be allowed more stock on the cheeks where finished, as it is impossible to allow but 1/16 in., as is sometimes asked, and still be sure of cleaning up in machining. This is especially true of some alloy steels.

Frequently drawings show a rectangular section for that portion of a crankshaft connecting the shaft with the crank pin. This should be stopped, and the drawings should show the forging draft and also indicate finish, if required, as the forger does not know whether the draft is to be included or added. Where flanges are wanted on a crank it naturally will be necessary to have

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draft produced in the hammer, and this should be considered in the design. If the flange is large, and must be made on the upsetter, side draft would not be necessary, but the expense of the extra heat should be considered.

At the Frost factory, the making of gear blanks forms a large part of the work, and these blanks are made chiefly from alloy steel. It is found that on nearly everything, from 1/16 in. to 3/32 in., finish on each surface makes for good machining conditions on turret lathes. Where it is necessary to add draft, the finish allowance at the corner is made 1/16 in., and the draft, of course, has to be machined off. In the case of wide faces this may give excessive stock, but that cannot be helped, except by the use of the upsetter.

Frequently controversies arise over the subject of countersinks for centering. Generally speaking, when the first operation on the forging is on the drill press, it is desirable to have the center in, but if it is on a turret lathe the center is objectionable and should be omitted. The customer's drawings should invariably cover this point.

Some shops require that clutch jaws be made in the forging so as to leave a minimum of stock for machining, while others prefer to mill from the solid, as the removal of the extra stock is more than offset by the extra facility in setting up on the miller. This should be specified by the customer and should be known at the time of estimating, as it has much influence, not only on the cost of making the dies, but also on the life of the dies.

In connection with small work, there is another item that is frequently a subject for contention, and that is ends of pieces that require threading. It seems bad practice to attempt to thread rough forgings, but the fact remains that some customers require it, and in one instance a certain drop forger was compelled to make new dies because he had allowed stock for machining before threading; this in spite of the fact that the drawings did not specify the method to be used.

Where there is likely to be interference of unfinished surfaces, customers should furnish assembly drawings. In one case in point a wheel hub unfinished surface came very close to a pressed metal cap, and a better understanding of the requirements allowed the drop forger to get from 1500 to 2000 more forgings from the dies before resinking, without detriment to the product.

Rex All-Season Tops

SEVERAL styles of convertible or all-season tops have been developed by the Rex Mfg. Co. of Connersville, Ind. They include sedan, coupé and roadster types. When it is desired to prepare the car for summer use the side sections are removed bodily and thus the dead weight carried is materially reduced.

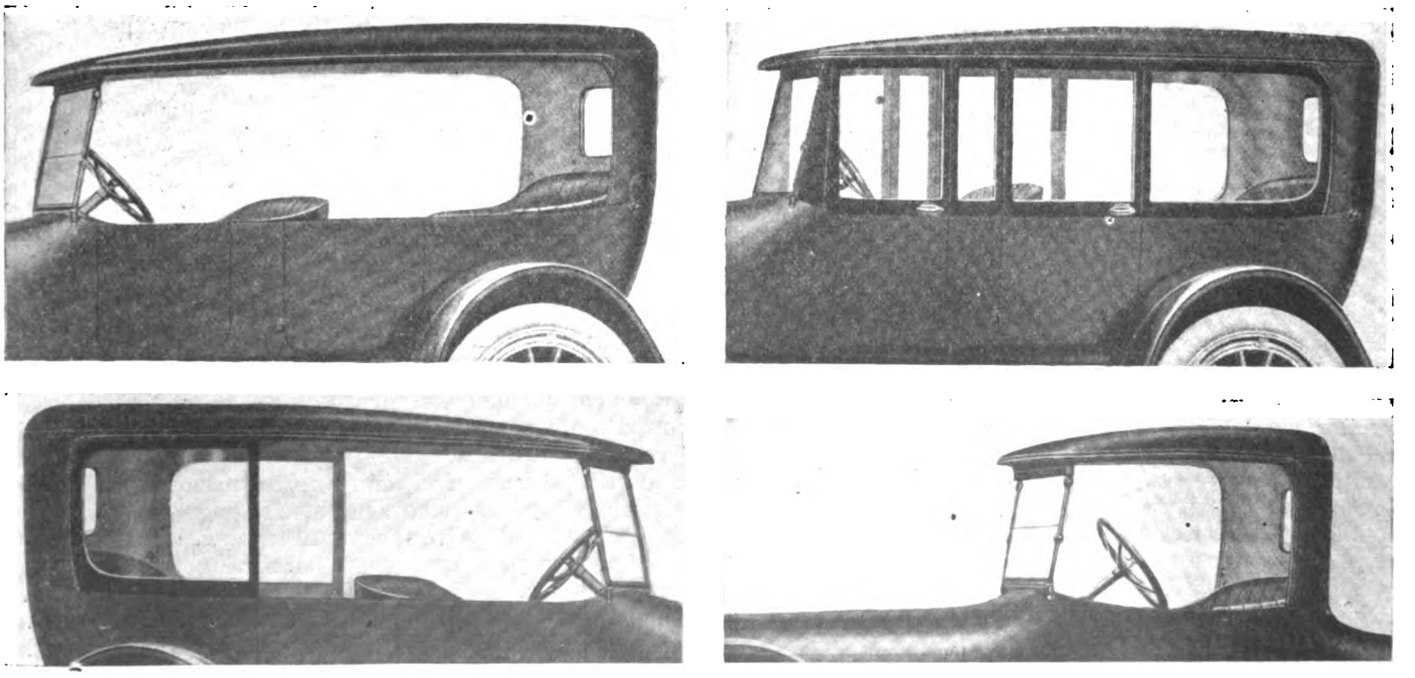
The door windows have upper glass panes held by non-rattle screw fasteners, and slide in velvet-covered channels. Rubber bumpers are provided on which both top and bottom glasses rest. With all windows removed the sides are wholly unobstructed.

The top is specially designed to harmonize with the body lines of the make of car with which it is used, though its mechanical features and general appointments are standard. The door and outer sections are held in position by attaching irons. When these are removed the holes are covered by leaving the plates in position, where they are firmly held by the cap screws.

The Rex top is built of hard wood, mitred and mortised and iron-braced. The back and the rear sections of the roof are reinforced with sheet steel. The water-proof fabric cover overlies a layer of wadding and the whole is finished for all-weather service in any specified color. The interior finish is made to match the upholstery of the car.

A special patented latch, used with the exterior coach handles, enables opening doors from both inside and outside.

WE have received from the Norman W. Henley Publishing Co., New York, a copy of a wall chart for the instruction of aviators and aviation engine repair men. The chart contains a large scale halftone cut of a six-cylinder aircraft engine partly in section, together with smaller sectional views of the carbureter and magneto. On the margin of the chart are given the different causes of trouble that may occur with an aircraft engine, the symptoms of these troubles and their remedies, together with certain other hints regarding the operation and maintenance of aircraft engines. The chart sells for 50 cents a copy.



Appearance of Rex all-season convertible tops: Above—left, top open; right, closed. Bottom—left, partly inclosed; right, coupé top open

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Contracts for Class B Trucks

Complete List of All Contracts for Parts and Complete Assemblies—List Indicates Value of Standardization in War-Time Manufacture

IN the attack on the standardized war truck the statement has been made that the initial order for 10,000 trucks had never been fully placed, and that while original orders for this number had been placed some companies had refused to take such orders. Malicious rumors to this effect have been current for some time, and to set them at rest AUTOMOTIVE INDUSTRIES asked for a complete list of contracts showing the names of concerns with which contracts have been signed for the manufacture of parts entering into these 10,000 Class B trucks, as they are officially known.

The following list, which has been made public by the Quartermaster's Department, not only shows the names of those concerns that have signed contracts for manufacture of the parts, but it also contains the names of the different truck makers who have signed contracts to assemble all of these 10,000. This list should set at rest those rumors that even the contract for the 10,000 had not all been taken by assemblers, and that instead of contracts for 10,000 being placed there were only contracts placed for 7000.

Most Comprehensive List Issued

This list is one of the most comprehensive covering a line of contracts that has been made public up to this time, and is a good indication of how well scattered have been the contracts for these 10,000 war trucks. The list shows that there has not been any placing of contracts with one company in a certain line, but rather a fair spreading of them over a wide range of factories. A few examples of this follow:

Frames are being made by five different companies; radiators by eight different companies; steering gears by four companies; magnetos by three companies; motors by four companies; transmissions by four companies; clutches by three; spare assemblies by five; mufflers by four; radiator guards by five; batteries by seven; lamps by four; cape tops by four; and so through the complete gamut of parts. These contracts have been spread over a great many States; in fact, the complete scheme of contracts shows how successful has the general scheme been, and indicates the extent to which standardization can be relied upon for spreading manufacture over wide areas.

List of Contracts Under Direction of the Motors Division

Name and Location	Quantity	Item
Garford Motor Truck Co., Lima, Ohio	900	Chassis
Locomobile Co. of America, Bridgeport	1,650	Chassis
Pierce-Arrow Motor Car Co., Buffalo	2,300	1½-ton trucks
	1,000	5-ton trucks
Packard Motor Car Co., Detroit	4,800	3-ton trucks
Harley-Davidson Motor Co., Milwaukee	8,125	Motorcycles
Hendee Mfg. Co., Springfield, Mass.	5,500	Motorcycles
Mulholland Co., Dunkirk, N. Y.	500	Truck bodies, Type A
Hercules Buggy Co., Evanston, Ind.	400	Truck bodies, Type A
International Harvester Co., Chicago	1,000	Truck bodies, Type A
Theodor Kundtz Co., Cleveland	550	Truck bodies, Type A
Grand Rapids School Equipment Co., Grand Rapids	6,400	Truck bodies, Type B
Continental Car Co., Louisville, Ky.	2,000	Truck bodies, Type B
Eagle Iron Works, Auburn, N. Y.	1,200	Truck bodies, Type B
International Harvester Co., Chicago	9,000	Truck bodies, Type B
Edw. G. Budd Mfg. Co., Philadelphia	5,000	Truck bodies, Type B (steel)
J. G. Brill Co., Philadelphia	300	Truck bodies, Type B
	125	Truck bodies, Type A
Hopkins Mfg. Co., Hanover, Pa.	200	Truck bodies, Type B

Parts and Assemblies Class B Standard Motor Trucks

Continental Motors Corp., Detroit	6,400	Motors
Wisconsin Motor Co., Milwaukee	1,000	Motors
Waukesha Motor Co., Waukesha	2,000	Motors
Hinkley-Motor Corp., Detroit	1,200	Motors
Timken-Detroit Axle Co., Detroit	5,000	sets Axles
The Sheldon Axle Co., Wilkesbarre	2,500	sets Axles
American Ball Bearing Co., Cleveland	2,000	sets Axles
Covert Gear Co., Lockport, N. Y.	5,000	Transmissions
Warner Gear Co., Muncie, Ind.	4,000	Transmissions
T. W. Warner Co., Muncie, Ind.	2,000	Transmissions
Muncie Gear Co, Muncie, Ind.	1,000	Transmissions
Covert Gear Co., Lockport, N. Y.	4,000	Clutches
Warner Gear Co., Muncie, Ind.	4,000	Clutches
Detroit Gear & Machine Co., Detroit	4,000	Clutches
Covert Gear Co., Lockport, N. Y.	5,000	Controls
Warner Gear Co., Muncie, Ind.	6,000	Controls
Dayton Engineering Laboratories Co., Dayton	10,000	Generators
Bijur Motor Lighting Co., Hoboken	2,000	Generators
Eisemann Magneto Co., Brooklyn, N. Y.	5,000	Magnetos
Splitdorf Electrical Co., Newark	3,000	Magnetos
Ericsson Mfg. Co., Buffalo	2,000	Magnetos
Remy Electric Division, United Motors Corp., Anderson	12,000	Distributors and coils
Kellogg Switchboard & Supply Co., Chicago, Ill.	12,000	Switches
Splitdorf Electrical Co., Newark	500	Magnetos
C. A. S. Products Co., Columbus	2,500	Steering gears
Warner Gear Co., Muncie, Ind.	3,000	Steering gears
Ross Gear & Tool Co., Lafayette, Ind.	1,000	Steering gears
Gemmer Mfg. Co., Detroit	5,000	Steering gears
Fedders Mfg. Co., Buffalo	2,000	Radiators
McCord Mfg. Co., Detroit	2,000	Radiators
National Can Co., Detroit	1,000	Radiators
Perfex Radiator Co., Racine	1,000	Radiators
Long Mfg. Co., Detroit	4,000	Radiators
English & Hersick Co., New Haven	1,000	Radiators
G. & O. Mfg. Co., New Haven	1,000	Radiators
Rome-Turney Radiator Co., Rome, N.Y.	1,000	Radiators
Savage Arms Corp., Sharon, Pa.	2,500	Frames
A. O. Smith Corp., Milwaukee	2,000	Frames
The Hydraulic Pressed Steel Co., Cleveland	2,000	Frames
Detroit Pressed Steel Co., Detroit	2,000	Frames
Parish & Bingham Co., Cleveland	2,000	Frames
Detroit Steel Products Co., Detroit	4,000	Springs (front)
	4,000	Springs (rear)
Standard Parts Co., Cleveland	8,000	Springs (front)
	6,000	Springs (rear)
The Mather Spring Co., Toledo	6,000	Springs (front)
	6,000	Springs (rear)
Sheldon Axle & Spring Co., Wilkesbarre	4,000	Springs (front)
	4,000	Springs (rear)
The Cleveland Canton Spring Co., Canton, Ohio	4,000	Springs (front)
	4,000	Springs (rear)
Schwarz Wheel Co., Philadelphia	500	Sets wheels
Hayes Motor Truck Wheel Co., St. Johns, Michigan	2,700	Sets wheels
Standard Wheel Co., Terre Haute, Ind.	300	Sets wheels
The Auto Wheel Co., Lansing	500	Sets wheels
Prudden Wheel Co., Lansing	250	Sets wheels
Dayton Steel Foundry Co., Dayton	1,250	Sets steel wheels (40 x 10)
Michigan Malleable Iron Co., Detroit	750	Sets steel wheels (40 x 10)
Standard Steel Castings Co., Cleveland	2,000	Sets steel wheels (40 x 10)
Dayton Steel Foundry Co., Dayton	1,000	Sets steel wheels (40 x 12)
Michigan Malleable Iron Co., Detroit	250	Sets steel wheels (40 x 12)
Standard Steel Castings Co., Cleveland	1,500	Sets steel wheels (40 x 12)
Otis Elevator Co., New York, N. Y.	150	Sets steel wheels (40 x 10)
	100	Sets steel wheels (40 x 10)
Prudden Wheel Co., Lansing	500	Sets wood wheels
Bimel Spoke & Auto Wheel Co., Portland, Ind.	500	Sets wood wheels
Hayes Mfg. Co., Detroit	8,000	Seat Assemblies
C. R. Wilson Body Co., Detroit	3,000	Seat Assemblies
Michigan Stamping Co., Detroit	8,000	Dashes
International Metal Stamping Co., Detroit	3,000	Dashes
International Metal Stamping Co.	5,000	Hoods
Hayes Mfg. Co., Detroit	6,000	Hoods
	11,000	Fenders (pairs)
	5,000	Fan shrouds
Michigan Stamping Co., Detroit	6,000	Fan shrouds
Geuder, Paeschke & Frey, Milwaukee	5,500	Feed tanks
	5,500	Reserve tanks
Kardell Bros. Co., Utica, N. Y.	5,000	Feed tanks
	5,000	Reserve tanks

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Hartford Auto Parts Co., Hartford	2,000	Universal joints, rear
Kinsler-Bennett Co., Hartford	2,000	Universal joints front
Peters Machine & Mfg. Co., Cleveland	2,500	Universal joint assemblies
Spicer Mfg. Corp., Plainfield	4,000	Universal joint assemblies
Universal Machine Company, Bowling Green, Ohio	3,500	Universal joint assemblies
Philadelphia Storage Battery Co., Philadelphia	2,000	Batteries
Prestolite Co., Indianapolis	3,000	Batteries
U. S. Light & Heat Corp., Washington	2,500	Batteries
Vesta Accumulator Co., Chicago	2,000	Batteries
Utility Battery Co., Chicago	1,000	Batteries
Willard Storage Battery Co., Cleveland	2,500	Batteries
Detroit Battery Co., Detroit	1,000	Batteries
Guide Mtr. Lamp Mfg. Co., Cleveland	2,500	Sets lamps
Edmunds & Jones Corp., Detroit	3,000	Sets lamps
C. M. Hall Lamp Co., Kenosha	4,500	Sets lamps
Indiana Lamp Co., Connersville, Ind.	1,500	Sets lamps
Barbee Wire & Iron Works, Lafayette, Ind.	3,000	Radiator guards
Buffalo Pitts Co., Buffalo	2,000	Radiator guards
Stewart Iron Wks. Co., Cincinnati	2,000	Radiator guards
Gier Pressed Steel Co., Lansing	3,000	Radiator guards
Van Dorn Iron Wks., Cleveland	2,000	Radiator guards
Michigan Stamping Co., Detroit	6,000	Dust pans
J. W. Murray Mfg. Co., Detroit	3,000	Dust pans
H. W. Johns-Manville Co., New York	2,000	Odometers
Stewart-Warner Speedometer Corp., Chicago	10,000	Odometers
Schweppe & Wilt Mfg. Co., Detroit	3,000	Reach rods
Michigan Plant Steel Products Co., Detroit	5,000	Reach rods
Cincinnati Ball Crank Co., Oakley, Cincinnati	3,500	Reach rods
Schweppe & Wilt Mfg. Co., Detroit	2,500	Sprag assemblies
Gier Pressed Steel Co., Lansing	2,500	Sprag assemblies
Detroit Pressed Steel Co., Detroit	2,500	Sprag assemblies
Stewart Iron Wks., Cincinnati	3,000	Sprag assemblies
Thompson Mfg. Co., Des Moines	3,500	Sprag assemblies
Michigan Plant Steel Products Co., Detroit, Mich.	7,000	Crank assemblies
Stromberg Motor Devices Co., Chicago	1,250	Carbureters
Zenith Carbureter Co., Detroit	1,250	Carbureters
Stromberg Mtr., Chicago	3,300	Carbureters
Mich. Stamp. Co., Detroit	6,000	Bumpers
Salisbury Wheel & Axle Co., Jamestown, N. Y.	5,000	Bumpers
Gramm-Bernstein Mtr. Truck Co., Lima, O.	1,000	Assemblies
Kelly-Springfield Mtr. Truck Co., Springfield, O.	500	Assemblies
Indiana Truck Corp., Marion, Ind.	500	Assemblies
Service Mtr. Truck Co., Wabash, Ind.	500	Assemblies
Republic Mtr. Truck Co., Alma, Mich.	1,000	Assemblies
Pierce-Arrow Mtr. Car Co., Buffalo	1,000	Assemblies
Selden Truck Sales Co., Rochester	1,000	Assemblies
Bethlehem Motors Corp., Allentown	700	Assemblies
Diamond T. Motor Car Co., Chicago	500	Assemblies
	150	Assemblies
United States Mtr. Truck Co., Cincinnati	500	Assemblies
Brockway Mtr. Truck Co., Cortland, N. Y.	500	Assemblies
	150	Assemblies
Velie Mtrs. Corp., Moline	500	Assemblies
Sterling Mtr. Truck Co., Milwaukee	500	Assemblies
Garford Mtr. Truck Co., Lima, Ohio	1,000	Assemblies
Oldberg Mfg. Co., Detroit	3,000	Mufflers
Michigan Stamp. Co., Detroit	2,000	Mufflers
Gemco Mfg. Co., Detroit	3,000	Mufflers
Xardell Brothers Co., Utica	3,000	Mufflers
Standard Parts Co., Cleveland	5,000	Draw bar assemblies
Savage Arms Corp., Sharon, Pa	3,000	Draw bar assemblies
Salisbury Wheel & Axle Co., Inc., Jamestown, N. Y.	3,000	Draw bar assemblies
Steel Products Co., Cleveland	8,000	Rear spr. shackle pins
	8,000	Rear spr. frt. brack. pins
	24,000	Frt. spr. hangers and shackle bolts
	8,000	Engine support bolts (front)
	22,000	Engine support bolts (rear)
	7,000	Rear spr. shackle pins
Brown Co., Syracuse	7,000	Rear spr. frt. brack. pins
	21,000	Frt. spr. hangers and shack. bolts
	9,000	Frt. spr. hangers and shack. bolts
	7,000	Engine support bolts
	7,000	Brake equal. lever pins
	5,000	Rear spr. shackle bars
	15,000	Brake equal. lever pins
Michigan Screw Co., Lansing, Mich.	7,000	Spring shackle pins 7414-V
	7,000	Rear spr. frt. brack. pins
	7,000	Engine support bolts
Columbia Axle Co., Cleveland	6,000	Rear spr. shackle bars
Standard Parts Co., Cleveland	5,500	Sets rear spr. shack. sub.-assem.
National Machine Products Co., Detroit	5,500	Sets rear spr. shack. sub.-assem.
E. A. Laboratories, Inc., New York	12,000	Warning signals
General Mtrs. Corp., Flint	5,500	Transm. frt. hangers
Standard Parts Co., Cleveland	5,500	Transm. frt. hangers
General Mtrs. Corp., Flint	11,000	Spr. shac. forgings
Standard Parts Co., Cleveland	11,000	Spr. shac. forgings
General Mtrs. Corp., Flint	5,500	Engine supports
Standard Parts Co., Cleveland	5,500	Engine supports
Massnick Mfg. Co., Detroit	6,000	Steering gear frame brackets
	6,000	Steering gear frame brack. caps
	6,000	Intermed. brake shaft brack.
Standard Parts Co., Cleveland	5,000	Intermed. brake shaft brack.
National Machine Products Co., Detroit	5,000	Steering gear frame brackets
	5,000	Steering gear frame brack. caps
Union Forging Co., Union, N. Y.	40,000	Minor parts
Sterling Mtr. Truck Co., Milwaukee	103,000	Minor parts
	24,000	Minor parts
Indiana Mtr. Truck Co., Marion, Ind.	147,000	Minor parts
Gramm-Bernstein Mtr. Truck Co. Lima	257,000	Minor parts
Cleveland Hardware Co., Cleveland	82,000	Minor parts
Standard Parts Co., Cleveland	520,000	Minor parts
Stewart Iron Works, Cincinnati	110,000	Minor parts
Gramm-Bernstein Mtr. Truck Co., Lima, Ohio	5	Complete assem. minor parts
	515	Minor parts
Empire Brass Mfg. Co., Cleveland	6,000	Gas reserve tank drain cocks
Metal Forming Corp., Elkhart, Ind.	5,000	Exhaust pipes
Standard Brass Wks., Detroit, Mich	5,000	Gas reserve tank drain cocks
	11,000	Radiator drain cocks
Cook Spring Co., New York, N. Y.	11,000	Springs, brass wire
Burton Lowery Co., Detroit	4,000	Sets upholstery
J. C. Wilson Co., Detroit	3,000	Sets upholstery
Briggs Mfg. Co., Detroit	2,000	Sets upholstery
American Auto Trimming Co., Detroit	2,000	Sets upholstery
Walker Mfg. Co., Racine, Wis	4,000	Sets jacks
Keeler Brass Co., Grand Rapids, Mich	500	Sets brass hood fast.
	4,500	Sets hood fast., mall. iron
Columbus Auto Parts Co., Grand Rapids	3,000	Sets hood fast., steel
Hancock Mfg. Co., Charlotte, Mich.	3,000	Sets hood fast., steel
Hughes & Curren Co., Rochester	3,000	Cape tops
Briggs Mfg. Co., Detroit	3,000	Cape tops
Anchor Top & Body Co., Cincinnati	3,000	Cape tops
American Auto Trimming Co., Detroit	3,000	Cape tops
Gramm-Bernstein Mtr. Truck Co., Lima	250	Sets spark and throt. control assem.
Standard Parts Co., Cleveland	5,000	Sets spark and throt. control assem.
National Machine Products Co., Detroit	6,000	Sets spark and throt. control assem.
American Brass & Iron Co., Detroit	6,000	Gas. feed pipe shut-off cocks
Standard Brass Works, Detroit	5,000	Gas. feed pipe shut-off cocks
Packard Electric Co., Warren, Ohio	4,500	Sets wiring assem.
Remy Electric Division United Mtrs. Corp., Anderson, Ind	4,500	Sets wiring assem.
Barcy Nicholson Co., Detroit	2,000	Sets wiring assem.
Dover Stamping & Mfg. Co., Cambridge	11,000	Funnels
Gray & Davis, Inc., Boston	11,000	Light bulbs, cases
National Can Co., Detroit	10,000	Water cans
Chicago Raw Hide Mfg. Co., Chicago	10,000	Fan belts
Graton & Knight Mfg. Co., Worcester, Mass.	10,000	Fan belts
Crowe Name Plate & Engraving Co., Philadelphia	10,500	Name plates
Champion Ignition Co., Flint	100,000	Spark plugs
Vicheck Tool Co., Cleveland, Ohio	11,000	Sets tool bag equip.
	11,000	Wrenches, brake adj.
	3,000	Wrenches, worm
	6,000	Wrenches tappet
	3,000	Valve lifters
	3,000	Wrenches, spr. clip, open end, 1 in.
	3,000	Wrenches, spr. clip, open end, ¾ in.
	3,000	Handles, pipe, galv., 16 in. long
	3,000	Gauges, valve tappet, etc.
Standard Parts Co., Cleveland, Ohio	6,000	Gas. feed pipe, sub-assemblies
Imperial Brass Co., Chicago, Ill	5,000	Gas. feed pipe, sub-assemblies
Cook Spring Co., New York, N. Y.	11,000	Radiator foot bolt springs
	11,000	Brake rod springs
	11,000	Start. crank catch brack. springs

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IN an interview given to a representative of the *Petit Parisien*, M. D'Aubigny, Deputy President of the Inter-Ministry Civil Aeronautic Commission, stated that the project for the establishment of a postal air line between France and Great Britain was approaching realization. He considers that it would be of great usefulness, as it would enable the members of the Inter-Allied Committee at Versailles to communicate rapidly with the British Government. The plan was originally conceived some time ago and M. Flandin was entrusted with a mission to the British Government to consult with the Air Board concerning it.

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Pennsylvania's War Road Example

Snow Removal Reduces Annual Maintenance

By R. H. Johnston*



Trains of motor trucks carrying an additional truck, from factory to dealer, are met on Pennsylvania's war road

THE deficiencies of our principal systems of highways from the all-the-year-round point of view have been forcibly impressed upon me as the result of two tours of exploration I recently made with the object of determining the feasibility of driving new cars and trucks from the automobile factories of the Middle West to the Atlantic seaboard. When I say feasibility I do not mean only the possibility of driving cars and trucks through to their destination. I mean the possibility of bringing them through without subjecting them to an abnormal wear and tear prior to their delivery into the hands of purchasers. After examining the Mohawk Valley route, by way of Albany and Utica, and also the Lincoln Highway route by way of Philadelphia and Pittsburgh I must report that over neither route is it possible, at present, to bring through cars and trucks without subjecting them to greater wear than the purchaser could reasonably expect. In the case of Government trucks, I know from actual observation that almost all of these trucks which have been driven through are in need of a certain amount of overhauling before they are in a proper condition to send "over there."

With the Mohawk Valley route the obstacles are snow and ice. The State of New York, which has been so active in all the other items of the war program, has fallen down completely in the very essential one of keeping its main highways free of snow. Nothing whatever has been done by the State government in this respect. For example, the main road between Schenectady and Amsterdam has been completely blocked by ice and snow for months, and the Government trucks which have been laboriously driven to New York from Buffalo have come through only by making a detour which has involved a precarious drive on the Erie canal towpath. One day of hardship spent in the Mohawk Valley was sufficient to convince me that this route is out of the question and will be for some time to come.

Over the Lincoln Highway route, through Pennsylvania, the difficulty is another kind. The State of Pennsylvania has kept the highway open practically all winter by using snowplows attached to motor trucks. In fact, of this route from Cleveland to New York it may be said that 90 per cent is excellent, and 7 per cent is good to fair. But the remaining 3 per cent is almost impassable, and that is about the same as saying that the Lincoln Highway, as a whole, is almost impassable.

The neglect of an 18-mile stretch of road between Beaver Falls, Pa., and New Springfield, Ohio, has practically shut off, for the time being, motor travel between the Middle West and the Atlantic seaboard over this important route. Of course, it is possible to get through this bad stretch of road, as is being demonstrated every day, but no car or truck can come through it and be in proper condition to deliver to a customer without considerable work being necessary. When we traveled over this route from New York last week, we were fully advised in Pittsburgh of the condition of this road and, accordingly, when we came to the beginning of this bad stretch, we left our car and walked ahead through the fields to inspect the road.

We found the road strewn with license plates, engine pans, tail lights, running-board fixtures and other equipment, proving only too plainly that all the cars had been running aground and that neither high power nor skillful driving was of any avail. I never saw a main road in such bad condition, and I am president of the "Mudlarks," the organization composed of those who went through the memorable New York-to-Pittsburgh endurance run in 1903. The reason the road is so much worse than the ordinary bog road is that the passage over the road of heavy Government trucks—some with 40 hp. engines, and some with four horsepower—has cut great ruts, and the weight of the trucks has pushed down into the mud all the broken stone and other solid road material. Some of the drivers, who had succeeded in coming through, estimated that there were 200 cars stuck in the mud and practically at a standstill, and others estimated the number as high as 500.

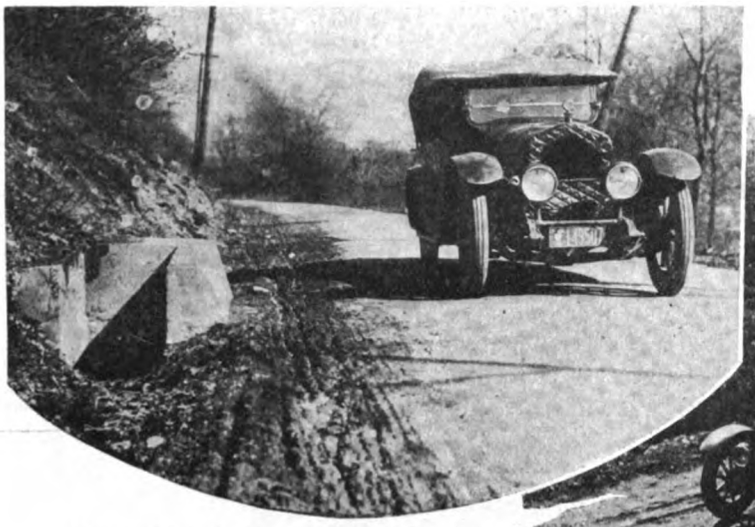
All the possible detours have been tried, and those who have tried them tell the same kind of stories as those who kept on the main road—stories of sleeping all night in cars and in farmhouses, stories of tire chains lasting only a few miles, stories of farmers with teams getting rich quick, stories of mud and cold and despair. In fact, the only method which has proved effective for getting around this bad stretch of road is that adopted by the Quartermaster's Department.

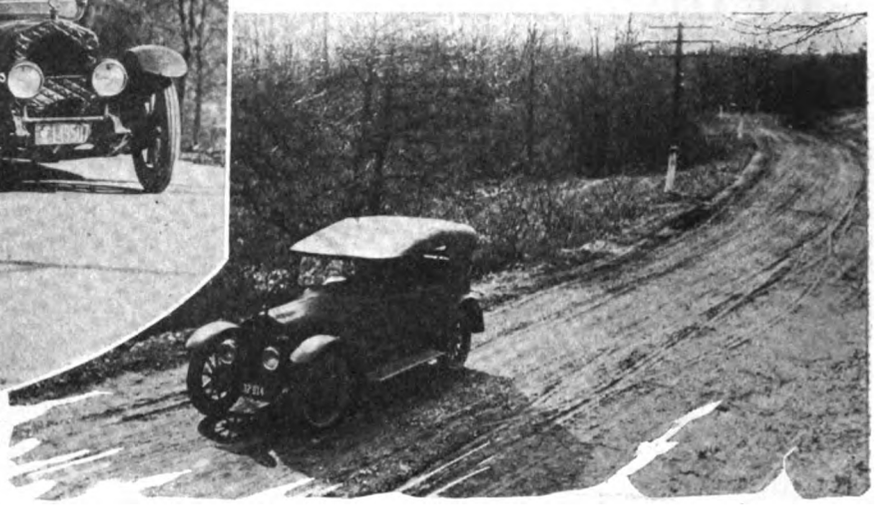
(*Continued on page* 618)

**Editor's Note.—R. H. Johnston, manager of the New York branch of the White Co., has recently driven over the highway from New York to Pittsburgh and over the New York-Buffalo route to Amsterdam, for the purpose of investigating snow conditions on these highways and the effect of snow removal from them. Mr. Johnston is well qualified to criticise modern road conditions, as he is a pioneer tourist and president of the Mudlark organization, a group of those motorists who participated in the New York-Pittsburgh endurance run of 1903. Mr. Johnston was for many years a contributor to the* AUTOMOBILE *under the nom de plume of Pathfinder.*

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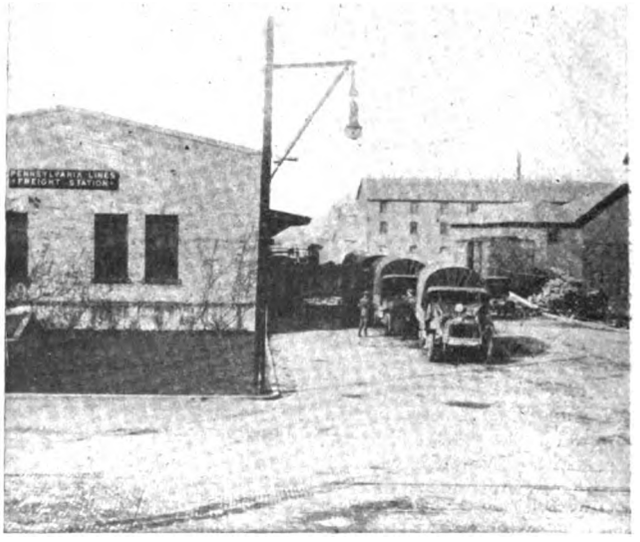
Scenes Along Pennsylvania's





Above—Culverts keep the water off the road. Right—Road to McConnellsburg through the Alleghenies

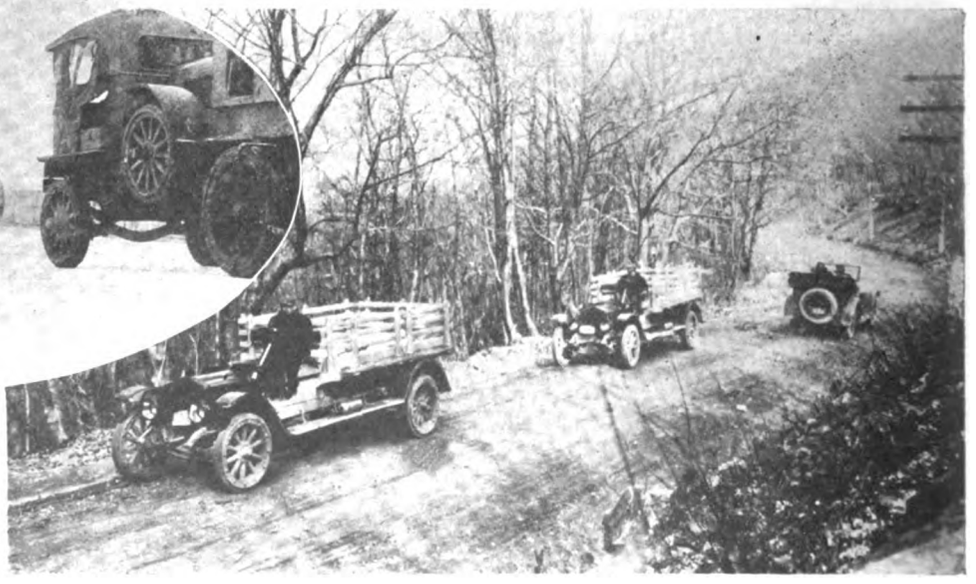




To avoid the almost impassable stretch of road beyond Beaver Falls (shown at the left) the Government loaded its war trucks on flat cars and shipped them over the railroad



Garford motor truck train on its way to the seaboard, showing each motor truck carrying a complete chassis



Trains of White trucks are encountered along the West-East Highway en route to Atlantic ports

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Well-Kept Highway System



A sample of good Pennsylvania highway on the road to Bedford, showing recent work done on road



One of the Pennsylvania State Highway Department good road trucks, which kept the war road in good condition all winter





Good roads material is obtainable right alongside the road from one of the quarries. On the right is shown one of the many road patrolmen fixing up a bad piece of road on the way to St. Thomas





Hairpin turn on the road to Fort Loudon. This is right in the heart of the Allegheny Mountains and shows a good sample of fine road work. Right—Pennsylvania State Constabulary patrols the highways of the State

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Rural Express Possibilities

Maryland Has Twenty-Two Routes—Exclusive Franchises Granted—Department of Agriculture and Food Administration Investigate Possibilities

BALTIMORE, MD., March 20—The map on this page and the illustrations on the following page give impressions of the working of rural express systems radiating from this city and also from Washington. All told there are twenty-two different rural express routes in this area and thirty trucks are employed on these routes. The road mileage embraced on the schedules approximates 1574 miles.

In Maryland exclusive licenses are being given for the operation of rural express systems over certain routes on assurance from the applicant and truck operator that he will maintain a schedule agreed upon and further agree to provide truck capacity to take care of all the express matter offered to the system. If the applicant for the franchise cannot meet these conditions the exclusive license is withdrawn in that competing companies are given franchises over the same routes. Much criticism has been offered on this exclusive franchise basis on the ground that it may possibly be used for political purposes, which would eventually react on the development of the system. Maryland is certain to be watched closely and perhaps used as an example by other states in this rural express service.

For some unknown reason the system has developed more in this zone than in others. One explanation of this may be that there are 75,000 to 100,000 more people living in Washington, D. C., than a year ago, and yet there has not been any increase in railroad tracks to serve this influx of population. The rural express is serving to good ends in this way.

Baltimore has gained unexpected importance because of war shipping, and the fact that Newport News has not good enough highways to make it available for motor truck traffic. Baltimore has profited as a direct result of this.

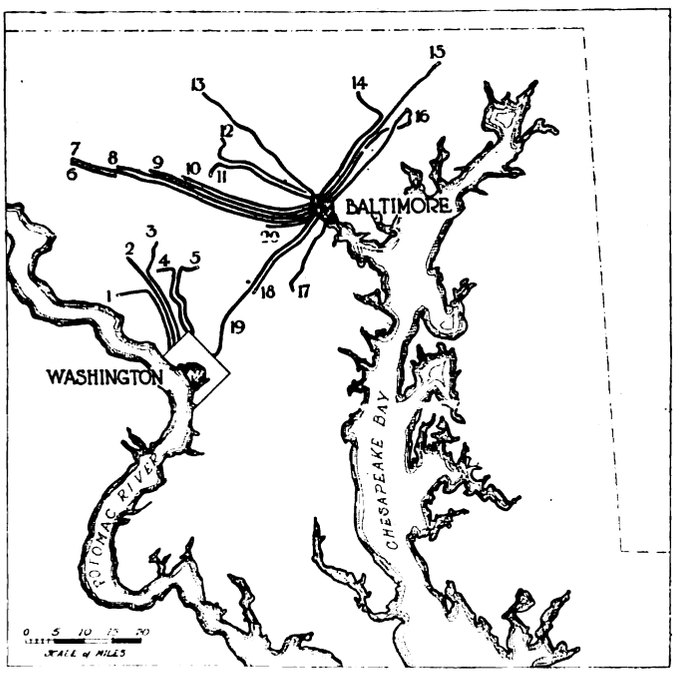
The possibilities of rural express are unlimited and it largely depends on the extension of the service and the adherence to schedule. Already the service has shown what a conserver of man power on the farm it can be. The Department of Agriculture has become interested in it as a means of getting products from the farm to the city which is normally allowed to waste on the farm. It has approximately thirty-seven investigators studying the system with the thought of applying it in many other parts of the country. The Maryland system has demonstrated how it is possible to develop a business between remote farming sections and such cities as Baltimore and Washington. Farm produce and supplies are reaching these cities in a few hours, which formerly required several days, and due to which delay the volume shipped from the farms was very small compared with that handled by the express companies.

The Food Administration has already realized the value of the rural express as a means of increasing the volume of food, and also reducing the cost. It also has investigators studying the system, doubtless with the thought of urging its more general application.

As a conserver of man power the rural express has many advantages. It makes it possible for the farmer to market his food products without his having to leave the farm and neglect farm duties. There is approximately a 10 per cent shortage of help on the farms in the Baltimore and Washington zone and it is possible to an extent to compensate for this shortage of help by the rural express. It has been stated that one truck operator on a rural express system is bringing to Washington produce which was formerly brought by forty farmers. In this way man power on the farm is being conserved at approximately a 40 to 1 ratio. The rural express is also being used to carry merchandise from the city to the farm and is thus working on a return-load basis.

In northern Ohio good progress is being made and already a great many routes have been mapped out. Alert motor truck salesmen have seized the opportunity of advancing truck sales by showing the possibilities of the rural express system.

The great amount of time that is saved by rural express by motor truck as compared with horse delivery is well brought out by one example. Whereas the speed of horse-drawn wagons is but 2 m.p.h., average, trucks of light capacity, such as are used in this service, travel an average of 16 m.p.h. In other words, the truck is eight times as fast as the horse. This means, of course, that a corresponding increase in the amount of merchandise moved is effected, or that the utility of the service is proportionately increased.



Rural Express Development in Maryland

No.	Routes From	To	Miles	Equipment Trucks	Cap.*	Mileage
1	Washington...	Travilah	18	1	2	36
2	"	Germantown ..	25	3	7.3	150
3	"	Latonsville ...	20	1	2	40
4	"	Redland	15	1	1.5	30
5	"	Ashton	15	1	1	30
6	Fredericksburg	New Mart	8	1	0.5	16
7	Baltimore.....	Fredericksburg.	47	2	3	188
8	"	New Mart	39	1	0.8	74
9	"	Mount Airy ...	33	1	3.5	66
10	"	Lisbon	28	1	3	56
11	"	Gamber	23	1	1.5	46
12	"	Sykesville	23	2	8	92
13	"	Westminster ..	30	1	3.5	60
14	"	Taylor	30	1	3	60
15	"	Dublin	35	1	4	70
16	"	Emerton	22	1	3.5	44
17	"	Camp Mead ...	18	1	2	36
18	"	Laurel	20	1	4	40
19	"	Washington ...	40	4	13	320
20	"	Ellicott	10	2	3	40
21	Hagerstown...	Hancock	28	1	2	56
22	Cumberland...	Flintstone	12	1	1.3	24
	Total.....		30		73.4	1,574

*Capacity in tons.

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Rural Delivery Routes Will Join Farmer and Market



Five horses drawing baled hay—One truck eliminated five horses from this farm. One man hauls for many farms. He has some 36 acres additional sown in wheat and corn which previously produced oats and pastured his horses



Accumulated loads—Eight gallons being transferred to milk truck; four to six hundred gallons travel rapidly to market 20 to 50 miles away. The wagon travels one-quarter of a mile back to the farm over mud road



More food made available for use—Three-gallon can of cream is $3.90 gain per day for the farmer. It will be delivered to city creamery 20 miles away in 1 hr. and 30 min. at a cost of 10 cents. A colored lad has just come down the lane from his barn 400 yd. away. In no other manner could this cream be made available at the market or the extra profit gained by the farmer



The farmer places tags on his calves and ties them in front of the house by the roadside. When the rural express truck comes along it takes the calf to market



In addition to corn being loaded into the truck there are two calves billed to market 22 miles away by Barnsley's Express—a greater profit to the farmer because of modern marketing facilities

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The AUTOMOBILE

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Automotive Industries-The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

Liberty Loan Drive

EVERY industrial organization, factory and business institution should organize a Liberty loan drive. The drive is simply a matter of salesmanship and planning from beginning to end, and hence should be handled in the same manner as a sales campaign.

In other parts of this issue directions are given which can readily be applied to any factory or business organization. The executives should not miss this opportunity to serve the government, and should immediately set to work to plan such a campaign. It is necessary to start at once if it is to be made a success, as there are a number of details in connection with such a plan that require time and thought.

Let not the idea that the matter might interfere with the regular work stop any one from organizing such a drive in his plant. The interruptions will be made up many times over by the fact that you are helping in the most potent cause which confronts us to-day. The government must have money to win this war. The Liberty loans are the only means to get it and the factories and business houses are the best medium through which to address large numbers of people collectively. Furthermore, the work will serve to engender an *esprit de corps*, a sense of participation in team work, which will fully repay the company for any loss of time.

The next drive is the most important one we have to date. The eyes of the world are on this country, and we must show our determination to win. There is no way of expressing our determination so strongly as by our willing sacrifices. Furthermore, we are not urged to give but to lend in these campaigns, and for that reason, while helping the government is the chief consideration, at the same time a habit of saving may be developed in our country whose people frequently have been accused of lack of thrift.

The U. S. A. Motorcycle

THE advantage of a single design machine for war operations, chiefly due to the simplification of the spares problem, led the Quartermaster Corps to the decision to have a special motorcycle designed for army use. The machine which has been produced (the engine of which is fully described in the leading article in this issue) does not differ materially from current stock models of the heavier type, but is probably the most advanced design ever evolved. It is essentially a side-car type, being provided with the necessary lugs for side-car attachment, and powered sufficiently to make it possible to negotiate all road conditions with the side car in place. Moderate compression is used, giving an engine which can pull hard at relatively low speed.

Protection of the working parts from dust evidently has been a problem uppermost in the minds of the engineers who worked out the design. Not only are the inlet and exhaust valve springs fully enclosed, but a special pressed steel cover has been developed for the inlet valve tappet lever, which does not interfere with oiling of the pivot bearing of this lever. To keep dust out of the engine a dust separator or air cleaner will probably be used. This may possibly somewhat reduce the engine power, but the damage done by dust getting into the engine when motorcycles are being driven in squadron formation over dusty roads is believed to be so serious that this slight sacrifice seems justified.

Sturdiness is a characteristic of the U. S. A. cycle engine and will also characterize the complete motorcycle. This is a highly desirable quality in a machine for use on the shell-torn roads of France and Flanders. The severity of the service at the front is indicated by a rumor current here last winter to the effect that one of the allied nations then had a junk pile of 70,000 motorcycles, and was considering the best means of salvaging part of this material. Even now American motorcycles of the heavier type have established for themselves a reputation of unequalled reliability at the front, and the prospects are that when the new olive drab-painted U. S. A. motorcycles arrive on the scene next fall they will give an even better account of themselves. There will be no skimping of expense for material and labor, as shown by the fact that there are no less than five annular ball bearings in the rear wheel alone.

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Airplane Production

THE three airplane investigations now under way will accomplish much good if they succeed in informing the public of many of the unexpected problems that have had to be met and overcome in the development to date of the Liberty engine. The public is quite unfamiliar with the program of carrying a design such as this engine through the various steps up to production, and the difficulties to be overcome in the design of the Liberty engine were especially great because there was no aircraft engine industry in existence in this country at the time the program was decided upon.

That the production program is behind schedule is a matter of regret. There have been troubles with the Liberty aviation engine. There have been differences of opinion with regard to certain features of design right from the inception of it, but such differences of engineering opinion are bound to arise. In the development of this engine it was impossible to ride rough shod over all of the opposition. The alterations in the lubrication system of the engine to the complete force feed system might be cited as an example in point. Some of the engineers realized last June that force feed was better—in fact, essential—but the sum total of engineering knowledge to-day is greater because of some of these errors which were made to maintain co-operation in engineering circles than if such co-operation had been cut off last June. The Liberty engine of to-day is a better engine because of these problems.

These investigations, we hope, will expose to public gaze much of the pernicious pro-German activity that has been directed against this engine. Not enough publicity was given to the machinery for some of the airplane factories that arrived in ruined condition. Not enough has been said about special materials for the engines that have not been up to specifications, although there seems not the slightest reason for such delay. Too great a veil of secrecy has surrounded the engine, although this has generally been justified in that the engine occupies an entirely different field from that of almost any other piece of automotive apparatus. The airplane, serving as the eyes of the army, possesses much greater potential possibilities of destruction, directly or indirectly, than can be incorporated in a motor truck, a tank, or motor apparatus for moving artillery or other weapons of aggression or defense. It is unique in this respect, and as such greater secrecy must surround it than the other war apparatus cited.

Unfortunately, not a few of the messages that have gotten to the public have not been the most desirable, and others that should have been given circulation have not. There is no use denying the fact that some changes have been made. The engine has so much good in it that its case to-day, and the work of the Aircraft Board, would be much stronger had some of these difficulties been given a measure of circulation.

To-day it is not so much the performance of the engine but rather its speed of production that is up for investigation. The general public is not able to conceive of the amount of work necessary from the time the first design is completed until the factories are tooled up and jigged up to go into quantity production. This is an unknown story to the average mind. It is a story the meaning of which will not be fully conveyed by one telling. To put an engine of these cylinder dimensions into quantity production is a herculean task. The production of the jigs and tools alone is a big task. The time necessary becomes much greater when factories have to be built and machinery installed as well.

Co-operation Is Needed

AT a time when co-operation so far as representing the automobile industry in Washington is needed perhaps as much as at any time in these critical days the N. A. C. C. has decided not to work in the same committee with the M. & A. M. A. The dissolution of the Automobile Industries Committee by the action of the N. A. C. C. in withdrawing from it seems like a step in the wrong direction and more of a slap at co-operation than a boost for it. These are days for increased co-ordination of effort rather than reduced co-ordination.

Why should not all of the so-called automotive industries have a common representation in Washington? Such industries as automobile, motor truck, farm tractor, airplane and motorcycle have many interests in common. This is particularly true of the automobile, the truck and the farm tractor. Instead of each of these having a separate representation they should have certain joint representations. The question of fuel is common to them all. The problems of materials are much the same in all three. The same applies to railroad transportation. It is unity of effort and representation among kindred industries that should produce that war efficiency which is needed.

While co-operating together in the Automobile Industries Committee much good was accomplished and the very necessary point of contact between the industry and government department was established last November when the chrome situation was so acute. The necessary point of contact was provided through the committee during January when the coal situation was acute. The necessary point of contact was provided when the conversion work was going on. Other acute situations are bound to arise and it is difficult to see why two offices, two organizations and two avenues of approach are necessary and it is questionable if they will prove as strong as one united, harmonious presentation. These are not days for petty jealousies as to which organization is the dog and which the tail, but rather days for the strong co-operation for the general good.

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Latest News of the

Committee Named to Fix Prices

To Investigate Costs of Basic Raw Materials and Recommend New Figures

WASHINGTON, March 20—A Price-fixing Committee has been appointed under the authority of the War Industries Board and will pass upon prices of basic raw materials and from time to time establish price-fixing policies for the approval of the President. The committee consists of Robert S. Brookings, Brigadier-General Palmer E. Pierce, Paymaster John Hancock of the Bureau of Supplies and Accounts of the Navy, Dr. H. A. Garfield, F. W. Taussig, chairman of the U. S. Tariff Commission, W. J. Harris, chairman of the Federal Trade Commission, Hugh Frayne of the War Industries Board, and Bernard M. Baruch. A civilian member will be appointed later.

The object of the price-fixing committee is two-fold. First, it will be a separate body, quasi-judicial in nature, for the purpose implied in its name and it will serve this purpose through being made up of men separated so completely from industrial interests that their motives and actions in the determination of prices can be subject to no suspicion of mercenary interest. Prices will not be made until after costs have been passed upon by the Federal Trade Commission. With costs as a basis, the price-fixing committee will then consider problems of production and distribution before arriving at its decisions. The second object to be achieved by the committee is speed. The committee will sit all the time and will thus eliminate unnecessary delay caused by the consideration of price-fixing problems in several different quarters.

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Truck Brings Produce From Farm to Consumer

NEW YORK CITY, March 20—The possibility of delivering produce direct from the farm to the consumer in the city by motor truck was demonstrated yesterday when a motor truck made the trip of 180 miles from Lancaster, Pa., to New York City carrying 1000 small chickens, fifty crates of eggs, and 200 lb. of honey. The truck left at 4.25 a. m., and reaching New York City at 5 p. m., delivered the produce direct to the New York merchant.

The trip was made by John I. Blakeslee, Fourth Assistant Postmaster General, who has charge of parcel post delivery work. Mr. Blakeslee is an ardent believer in the use of motor trucks for rural parcel post delivery work and believes the high cost of living and the scarcity of help on the farm can be materially remedied by long distance service of this nature, bringing the food products from the farms direct to the centers of population without the necessity for frequent handling.

The truck will leave New York City to-day for Lancaster loaded with parcel post packages from New York to that city. The total postage charges on the truck load arriving yesterday was $31.61 and it is estimated that $10 represents the cost of the trip.

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Ordnance Department Not to Control Truck Transportation

WASHINGTON, D. C., March 20—It may be authoritatively stated that recent plans held by the War Department to place all motor transportation of the army under the Ordnance Department have been cancelled. It now seems as if the motor truck activities will either be placed under a new division directly under the General Staff or will remain in the Quartermaster Corps, which will in that event control all of the motor transport activities of the army.

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Stromberg Earns $318,819

CHICAGO, March 20—The Stromberg Motor Devices Co. earned net profits of $318,819 for 1917, before the deduction of war taxes. This is equal to $6.37 a share on the 50,000 shares of outstanding stock, as compared with $5.56 in 1916. Net sales totaled $1,644,947 as compared with $1,208,443 in 1916, making the net profit on sales 21 per cent as against 23 per cent the year before. The net income account of the company for 1917 follows:

Net sales		$1,644,947
Mfg. cost		1,173,890
Gross profit on sales		471,056
Administrative and general expenses		235,917
Balance		235,138
Other income		335,330
		$570,562
Loss on investments and bad accounts		16,511
Profit for year		$318,819

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Kerosene Carburetor Company Is Reorganized

DETROIT, March 21—The Kerosene Equipment Co. is being organized with $50,000 to take over the Detroit Kerosene Carburetor Co. A factory will be built for the manufacture of kerosene carbureters. E. E. Schwarzkopf, president of the Detroit company, has been elected president and treasurer of the new corporation. J. W. Racklyes is vice-president.

Enlarge Washington M. A. M. A. Office

To Be Distinct from N. A. C. C. Which Also Will be Greatly Enlarged

WASHINGTON, March 20—Following the separation of the N. A. C. C. and M. A. M. A. the Motor and Accessory Manufacturers Association will occupy offices in the Ouray Building, 8th and G Streets, where it will have a considerably enlarged personnel. The National Automobile Chamber of Commerce will take over the offices previously held by the Automobile Industries Committee in the 2nd National Bank Bldg. The N. A. C. C. will have the following engineers in its organization here: C. C. Halliday, of the Lewis Spring & Axle Co.; F. H. Kane, Oakland Motor Car Co.; H. T. Woolson, Studebaker Corp.; G. L. Bixby, Anderson Electric Car Co., and C. W. Neff, of the Buick Motor Co. The men will operate under the direction of Hugh Chalmers.

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Class "B" Convoy En Route

NEW YORK CITY, March 20—The first convoy of thirty-three of the Class B standardized war trucks started from Ohio on the trip to an Atlantic seaboard. These trucks are following the route over which the Detroit truck convoys have been traveling, and which has been kept cleared of snow through Ohio, Pennsylvania and Maryland during the past winter.

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Withhold "A" and "AA" Contracts

WASHINGTON, D. C., March 20—Letting of contracts for the Class A and Class AA standardized trucks is temporarily withheld. The contracts will not be let until it is definitely ascertained which department and individuals will control the future of these trucks.

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Liberty Engine in First Service

WASHINGTON, March 21—A navy flying boat equipped with a Liberty engine flew from the naval air station at Hampton Roads, Va., to the capital yesterday, covering 180 miles in 2 hours. There were a pilot and two passengers aboard, and no trouble with the engine was experienced during the trip. The return journey will be made in a few days. Secretary Daniels and other navy officials are highly satisfied with the performance of the engine, and further long-distance tests will probably be made within a few days.

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Automotive Industries

Steel Trade Denies Any Shortage

Rumors of Lack of Chrome Suggest Further Curtailment —Labor is Plentiful

WASHINGTON, March 20—Washington has heard many rumors in the last week that Government officials are considering a further curtailment in the automobile industry due to an alleged shortage of steel. Again it is the chrome situation that is advanced as the reason for any further curtailments. The steel shortage is denied by the steel industry itself. It is stated here that the real reason for the curtailment by the steel shortage route is need for skilled labor of the automobile industry. Several members of the Council of National Defense admit this and have gone so far as to say the automobile industry should be curtailed another 50 per cent to provide sufficient workers for the shipyards—which is additional proof that official Washington works in circles and that one department is not all conversant with the facilities of another department. As a matter of fact there is no labor shortage in the United States anywhere that is serious. There is no shortage of shipyard workers. There is no shortage of munitions workers. There is no shortage of farm labor.

It is these three that comprise the important branches of our industrial and agricultural existence and which must have labor to insure military victory. In the New England states which are hustling and alive with industrial work of every kind including munitions manufacture and shipbuilding, and which states are regarded as an industrial barometer by the Department of Labor, there is no shortage of skilled labor and there is even a surplus in some localities.

Last week shipbuilders testified in Washington before the Wage Fixing Commission but there was no shortage of labor. This week the United States Employment Service of the Department of Labor notified all shipyards that through its usual employment channels and through its U. S. Public Reserve which has enrolled 225,000 shipyards workers, that it is now prepared to fill all their labor needs, and requests shipbuilders to obtain their workers exclusively through this service. Compliance by the shipyards with this request will eliminate labor shortage hysteria, will prevent unnecessary and permature withdrawal of workers from other industries, will abolish "stealing" of men by one yard from another, and will prohibit a piling of idle labor in the shipbuilding centers.

Insofar as munitions plants are concerned the U. S. Employment Service is ready and capable here too to provide all of the workers necessary. For example, a large munitions manufacturer in Detroit yesterday telegraphed the Department of Labor that he was in urgent need of a number of men. The Department of Labor instructed its employment service of the request and asked it to secure the labor through its usual channels adding that if this did not suffice it should draw on the Public Service Reserve branch at Detroit. This morning it was reported that the order had been filled satisfactorily. The Department of Labor now operates a weekly report system which gives an excellent indication of labor conditions. In the past week for instance, reports show that twenty-seven industrial centers east of the Mississippi felt a normal shortage of labor proportionate to the present industrial activities while eighteen centers showed no shortage or surplus and fourteen centers reported large surpluses. On the west side of the Mississippi this report is reversed and the majority of industrial centers have a large surplus of labor which displays that there is no labor shortage but there is a labor distribution problem.

The Department of Labor estimates that there will be a large demand for farm workers when the season opens. It plans to meet this demand by means of a special farm service division which will have special field agents, posters announcing federal farm labor co-operation, 55,000 post office operating as labor agencies, weekly bulletins listing opportunities for farm employment, weekly reports of farm labor conditions, co-operation of 2300 Department of Agriculture county agents, and enrollment of labor through the Public Service Reserve. In addition newspapers and other publications will open farm bureaus where men seeking farm work can register and Boards of Trade and Chambers of Commerce will operate as employment agencies. During the harvest season in the central western states temporary offices will be open in many cities to furnish accurate information as to where harvest hands are needed. A campaign is now starting to enroll 250,000 boys under 21 years in the Boys Working Reserve for farm work and another campaign will shortly begin to enroll not less than 250,000 farm workers in the U. S. Public Service Reserve. The Department of Labor states that its study has convinced it that while there will soon be a severe shortage of farm labor, there is sufficient available labor to meet the demands of agriculture and it is confident that the agencies which have been conceived and placed in operation will with co-operation meet every demand.

Pool Truck Activities of Army

Conflicting Reports Place Control of Standardized Vehicles Under Three Heads

WASHINGTON, March 20—The past week has been exceedingly active as regards matters automotive. Standardized trucks, airplane production, standardized motorcycles, and labor entered into the events of chief importance. The pooling of all motor truck activities for our army now seems to have entered into another stage. Within the last few days there have been rumors that all the motor truck activities would be pooled under the Ordnance Corps and under direction of Colonel Moody. To-day reports are current that the General Staff has decided on a new course by whcih it will pool all of the motor truck activities of the army under a civilian who will be directly responsible to the General Staff. So that now we have three reports, one that the Quartermaster Corps will control the trucks, another that the Ordnance Department will direct them, and a third that these activities will come directly under the General Staff. It is difficult to predict just which will be decided upon.

News of the completion of design and first sample engines of the new standardized Liberty motorcycle has been received with considerable interest. There have been many rumors of dissension between some of the motorcycle manufacturers on this plan which are now shown to have been false by the complete harmony with which they devoted their energies to completing this engine.

Separate War Industries Board?

WASHINGTON, March 20—The Council of National Defense seems to be gradually coming out of the muddle in which it found itself following the recent Congressional investigations. The appointment of Bernard M. Baruch as Chairman of the War Industries Board has had a stimulating effect. Reports are current that eventually the War Industries Board will separate from the council and become the only purchasing agency for the Government and for the Allies, thus bringing about that centralization of buying which the President advocated months past and which depends upon the passing of the Overman Bill. The Council itself will probably be allowed to exist as a smaller, less-important body. Such a movement would not affect the automotive section other than to increase its importance.

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M. & A.M.A. Appreciates Work Done

Copland to Represent the Association in Washington—Will Continue Work Done During Life of Automobile Industries Committee—To Work with Tractor Shows

NEW YORK CITY, March 15—The Motor & Accessory Manufacturers' Assn. is going to continue its active work in Washington by way of assisting the Government in war work and also assisting its members in connection with this work. For these activities Alexander W. Copland, who was chairman of the automobile industries committee until it was dissolved, and who represented the accessory association as chairman of this committee, will continue to represent the 308 members of the association. Mr. Copland will have headquarters in the Ouray Bldg., Washington, and will be the point of contact between the various Government departments and all of the members of the association. He will continue to carry on the work that he was carrying on for these manufacturers during the life of the automobile industries committee.

Representation Continued

The Motor & Accessory Manufacturers' Assn., at its regular monthly meeting held to-day, did about the only thing left for it to do after the National Automobile Chamber of Commerce had withdrawn its representative, Hugh Chalmers, and after the Ford company had withdrawn John R. Lee, its representative, from the automobile industries committee, namely, to continue its Washington representation alone, and leave this work in charge of Mr. Copland, who has proved himself an able point of contact between the industries and the Government since the appointment of the committee last November.

Satisfactory Work Done

In taking this action, the Motor & Accessory Manufacturers' Assn. in a letter to its membership states that it considers that the work done by the automobile industries committee has been very satisfactory and that the spirit of co-operation last November as embodied in the committee was a wise move. The following closing paragraph from a letter to its membership expresses the appreciation of the association:

"Your directors cannot refrain from commending the work of the automobile industries committee, and the loyal, unselfish, patriotic and sacrificing services of the members of that committee, Messrs. Copland, Chalmers and Lee."

The association has also addressed a letter to the National Automobile Chamber of Commerce asking that body to cooperate in a letter of appreciation to the automobile industries committee for what it has done. This letter sets forth the views of the association as follows:

"We believe that the unselfish and loyal work of Messrs. Chalmers, Lee and Copland should at least be rewarded with a vote of thanks, and the directors of the Motor & Accessory Manufacturers' Assn. desire to express to the directors of the National Automobile Chamber of Commerce a willingness to cooperate with them at any time where our mutual interests are concerned.

"We believe the interests of both associations can now best be served by separate representation, although we are confident that the work of the joint committee was wise in the beginning."

A letter was also sent to the Ford Motor Co., extending the appreciation of the association for the work done by Mr. Lee as representative of the Ford company on the automobile industries committee.

The association some time ago appointed an alien labor committee, with Albert Champion as chairman, assisted by W. C. Rand and George Edmonds, which committee is ready to submit plans and suggestions for educational co-operation on the part of all members of the association. This matter is of such importance that the complete plan is to be laid before the membership at the next meeting.

The show committee of the association, under the direction of William E. Sweet, chairman, is investigating the attitude of tractor manufacturers toward the Motor & Accessory Manufacturers' Assn. with a view to assisting in tractor shows just as the association has assisted with automobile shows.

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Plan Annapolis-Washington Highway

WASHINGTON, March 18—A bill providing for immediate construction of a concrete highway from Annapolis to Washington via Camp Parole, Chesterfield, Buena Vista and Bladensburg has been presented by Senator Mezerott. This road, if completed, will provide the remaining necessary link to connect Washington with the fertile produce regions of eastern Maryland by motor truck.

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To Call Sub-Chasers "Eagles"

WASHINGTON, March 16—Secretary Daniels decided to-day to name the submarine fighters being manufactured by Henry Ford "Eagles." They will constitute the "Eagle class," and will be styled Eagle No. 1, Eagle No. 2, etc.

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S. A. E. to Standardize Turnbuckles

DAYTON, OHIO, March 18—A meeting of the Society of Automotive Engineers was held at the Miami Hotel here recently to discuss the standardization of turnbuckles. It was decided that careful and prompt action be taken to adopt a uniform standard as a means of speeding up airplane production. The S. A. E. recently decided on a standard overall dimension for turnbuckles, and later complete standardization was attempted by the International Aircraft Standardization Board. When the Signal Corps endeavored to use these specifications several inconsistencies were found. As a result, the meeting of the S. A. E. was called, and work will start immediately on new standardized specifications.

Among those present at the meeting were: F. W. Caldwell and R. V. Hutchinson, of McCook Field and the Dayton-Wright company; J. V. Costello and J. L. McClelland, of the Signal Corps; F. E. Cardulla, of the Curtiss company; Paul G. Timmerman, of the Engel Aircraft Co.; G. H. Weun, Albert H. Hilton, Jr., and E. E. Russell, of the Dayton Metal Products Co.; A. M. Orr, of the National Airplane Co., and R. D. Oldfield and J. C. Wilkie, of the Western Automatic Machine Co.

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Lee Tire Sales Increase—Expenses Decrease Profits

CONSHOHOCKEN, PA., March 19—The Lee Tire & Rubber Co. in its report for 1917 shows a large decrease in the balance available for dividends as compared with 1916. In 1917 this balance was $22,589, while in 1916 it was $237,337. Some of this decrease is attributed to extraordinary expenses in acquiring a sales organization and establishing branches in New York, Chicago, Boston, St. Louis, Atlanta, Indianapolis, Milwaukee, Buffalo and Providence.

The net income account and consolidated balance sheet, as of Dec. 31, 1917, compares as follows:

	1917	1916
Net sales	$4,073,895	$3,587,769
Expenses	4,015,308	3,340,863
Oper. profit	$58,587	$246,906
Income from rentals	3,102	4,163
Total profit	$61,689	$251,069
Interest and taxes	39,100	13,722
Balance for dividend	$22,589	$237,337
Dividends	.....	225,000
Surplus	$22,589	$12,337
Previous surplus	16,395	4,058
Total surplus	$38,984	$16,395

	1917	1916
Assets—		
Plant and equipment	$1,346,704	$1,206,229
Patents, etc.	403,300	400,300
Stock Lee Tire Sales Co.	500	500
Deferred charges	27,781	28,541
Cash	155,960	258,560
Accounts receivable	557,714	349,777
Trade acceptances	13,474	.....
Notes receivable	5,842	8,415
Current Account Sales Co.	.....	112,313
Inventories	1,576,730	1,601,442
Working funds at branches	9,142	.....
Total	$4,094,147	$3,966,078
Liabilities—		
Declared capital	$750,000	$750,000
Notes payable	1,025,000	1,000,000
Accounts payable	125,911	75,814
Rent received	500	.....
Res. for deprec., etc.	231,661	191,661
Res. for tire claims	38,500	38,633
Income tax	.....	9,983
Working capital	1,883,591	1,883,591
Surplus	38,984	16,395
Total	$4,094,147	$3,966,078

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3 Investigations for Airplanes

Coffin Trying to Run Down Derogatory Rumors—Marshall Working with Super-War Council

WASHINGTON, March 18—Three investigations are under way to discover why the aircraft program is 90 days behind its schedule, as claimed by the Senate Military Affairs Committee.

One is being conducted by Howard E. Coffin, chairman of the aircraft board, who is determined to run down the various reports and rumors; another by H. Snowden Marshall, chairman of the committee appointed by the President, who is working with the super-war council, and a third is being made by Gutzon Borglum, New York sculptor, who has a mysterious part in the situation.

It is reported that President Wilson has already received a secret report from Mr. Borglum regarding the delayed program, which says that Borglum carried a letter from the President to airplane manufacturers and, in fact, to all concerned, to aid him in obtaining complete data.

Mr. Marshall's duties will include the investigation of the whole matter of delayed production. Mr. Coffin is working more specifically to run down reports and rumors of troubles in making the Liberty motors, which are believed in the main to be unfounded.

Mr. Coffin left Washington last Friday to make a complete tour of all the plants, and his report will be checked up later with the two others as well as those of officers of the Signal Corps whose duties include supervision of any mechanical or production irregularities which might develop.

There have been some suggestions of a profiteering ring which had enmeshed the aircraft program, but these rumors are said to be without justification. The Signal Corps and the aircraft board are both emphatic in requests that if there is any suggestion of profiteering it should be disclosed.

The most authentic reports of the Liberty motors are very optimistic. It is said that the Curtiss type of plane in which the engines have been tested are small compared with the immense battle plane now in process of construction. It is also reported that even the motors themselves which have been used for experimental purposes are relatively small, and yet experiments with these motors and planes have had results far in excess of the hopes of experts.

Liberty Airplane Arrives in Washington

WASHINGTON, March 19—The Liberty airplane engine which was shipped to Washington arrived yesterday and was tried out in a Curtiss plane under the direction of Major A. J. Smith. It is expected that many flights and tests will be made next week. Apparently there is going to be some competitive testing. Colonel Chas. F. Lee, using an Avon machine, is here, and Lieutenant Georges Flaschaire of France is en route to Washington with a high-powered French machine.

Women Working on Liberty Engines

WASHINGTON, March 19—Employment of women machinists in the factories producing Liberty airplane engines is proving satisfactory, according to the Aircraft Production Board. At present several hundred women are working on lathes, drill presses and other machines for converting rough castings into finished parts.

No More Civilian Airplane Instructors

WASHINGTON, March 18—The War Department has made a new ruling that civilian instructors will no longer be used in aviation schools and only commanding officers will do the instructing.

Form Chicago Aviation Club

CHICAGO, March 16—The Aero Club of Chicago, a new aviation association, was formed here last week. It is composed chiefly of former members of the Aero Club of Illinois, which is inactive at present. Its headquarters have not been announced yet. Officers are: President, James A. Zanug; first vice-president, Wallace B. Blood; secretary, Ralph Fulher, and treasurer, Heber Jorgenson.

Hale & Kilburn Surplus $159,961

PHILADELPHIA, March 18—The first annual report of the Hale & Kilburn Corp., successor to Hale & Kilburn Co., shows total assets of $7,374,739 and current liabilities of $1,832,512. The surplus was $159,961, as compared with $24,614 in 1916 and $1,569 in 1915. The consolidated balance sheet follows:

Assets

Plant and equipment	$12,188,331
Capital stock of Central Realty Corp.	400,000
Miscellaneous investment	10,951
Patents and good will	2,500,000
Cash	95,299
Receivables	1,167,307
Inventories of raw materials, work in process etc.	1,016,850
Total assets	$7,374,739

Liabilities

Preferred stock	$2,282,266
Common stock	1,750,000
Serial 5- to 15-year notes	750,000
Accounts payable	567,512
Notes payable	825,000
Ground rent	50,000
Miscellaneous reserve	390,000
Surplus	159,961
Total liabilities and surplus	$7,374,739

A. J. Brosseau, H. J. Fuller, Arthur Lea, Charlton Yarnall and George Foster will succeed O. H. Culter, S. M. Curwen, Thomas Newhall, A. M. Kittredge, H. W. Davis and H. D. Gibson. There is still a vacancy on the board, and Alba B. Johnson, voting trustee of the company, will nominate a director to fill it.

To Ship 1200 Planes a Month

U. S. Will Send Them to Allies in Parts—Mechanics Already There for Assembling Work

WASHINGTON, March 18—From 1200 to 1500 finished airplanes will be delivered every month to the Allies beginning Sept. 1, according to announcement made here yesterday. The planes will be shipped in parts and assembled in France or England, where mechanics have already been sent in special units for this purpose.

Recruiting for the non-flying branch of the aviation service has been temporarily suspended, as more men have volunteered than are needed at present. The progress made in aviation in this country is, according to army officials, greatly in excess of their hopes. One thousand men have been arriving daily at Kelly Field, Tex., for the past month, and additional barracks had to be constructed for them.

American-built battle planes, it is said, will be in France by July in sufficient quantities to insure adequate air protection of the sectors held by American troops. Figures on the aviation situation were placed before the full membership of the House Military Committee yesterday by Acting Secretary of War Crowell. It was disclosed that the aviation program is somewhat behind schedule, with production about 60 days delayed. Statements were made to the effect that there has been too much optimism and too many over-optimistic predictions, and if it were not for these the work of the Aircraft Production Board would already have been recognized as an extraordinary achievement.

The foreign contracts, which were to have provided the initial fighting equipment for General Pershing's air forces, were said to be still further behind the program.

Estimates of the time required to get a completed battle plane from the factory in the United States to the front in France have been placed at 90 days. The War Department is now endeavoring to cut that period in half, and this will be one of the main duties of the new committee headed by Snowden Marshall, which was announced last week.

New York S. A. E. to Meet March 28

NEW YORK, March 16—The next meeting of the Metropolitan Section of the S. A. E., to be held on March 28, will have as its topic the Steam Vehicle—Its Past, Present and Future. Papers on the subject will be read by John Sturgess, of the Stanley Motor Carriage Co., and Abner Doble, of the Doble-Detroit Steam Motors Co. The meeting will be held in the assembly room of the Automobile Club of America, Fifty-fourth Street, and will be preceded by a dinner of the section.

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Tractor Men Form Organization

26 Manufacturers Meet in Chicago and Perfect Semi-Permanent Conference

CHICAGO, March 15—Twenty-six manufacturers of tractors met at the Congress Hotel yesterday and organized an "informal and voluntary" association of tractor manufacturers under the name of the National Conference of Tractor Manufacturers. The conference was called by Daniel F. Charmichiel, of the New Age Tractor Co., Minneapolis. Clifford Thorne, attorney for the Square Turn Tractor Co., Chicago, acted as secretary.

The Chicago meeting grew out of a conference of a few of the tractor manufacturers which was called to meet recently at Washington, D. C., by A. Violette, of the Wayne Tractor Co., Detroit, Mich.

A semi-permanent organization was perfected, with the direction of the affairs of the association vested in an executive committee consisting of D. F. Charmichiel, Minneapolis, chairman; F. H. Cozzens, New York, vice-chairman; W. B. Gleeson, Minneapolis, secretary; G. S. Albaugh, Chicago, treasurer, and A. Violette, Detroit.

In accordance with a resolution introduced by Albaugh, and which was passed unanimously, a Tractor War Service Committee was appointed, consisting of James R. Collins, Peoria; D. F. Charmichiel, Minneapolis; A. Violette, Detroit; W. R. Gleeson, Minneapolis; H. D. Lauson, New Holstein, Wis.; G. S. Albaugh, Chicago; F. R. Beeman, Minneapolis; F. H. Cozzens, New York; J. M. Robinson, Peoria; John Hurlbut, Detroit; D. Fitchian, Waterloo, Iowa; R. T. Evans, Hudson, Ohio, and H. W. Adams, Minneapolis.

According to Chairman Charmichiel, the purposes of the conference are to eliminate some of the unfair practices which have crept into the tractor trade, to stabilize the business of building tractors, to provide an organization in which all shall have the right to a free expression of opinion and which shall not be dominated by a single personality, to gather statistics regarding the tractor industry to be presented to the Government in substantiation of the contention that the tractor industry is an essential, and thus to win the confidence of the Government and secure a greater measure of preferential treatment.

It is hoped to secure the active cooperation of all of the tractor manufacturers in the country, all of whom will be asked to join the association, and to offer the combined efforts of the industry to the Government to work in harmony with the agricultural department and the food commission to the end that the tractor industry may be stimulated and sustained and that the food production capacities of the country may be increased.

The following companies were represented at the conference:

The Peoria Tractor Corp., Peoria, Ill.; Stinson Tractor Co., Minneapolis; Beeman Garden Tractor Co., Minneapolis; Gilson Mfg. Co., Port Washington, Wis.; Strite Tractor Co., New York; Gile Tractor & Engine Co., Ludington, Mich.

Acme Harvesting Machine Co., Peoria, Ill.; National Tractor Co., Chicago; the John Lauson Mfg. Co., New Holstein, Wis.; Interstate Tractor Co., Waterloo, Iowa; Appleton Mfg. Co., Batavia, Ill.

Common Sense Gas Tractor Co., Minneapolis; Leonard Tractor Co., Jackson, Mich.; Topp-Stewart Tractor Co., Clintonville, Wis.; Lang Tractor Co., Minneapolis; Reed Foundry & Machine Co., Kalamazoo, Mich.

Square Turn Tractor Co., Chicago; Elgin Tractor Corp., Piqua, Ohio; New Age Tractor Co., Minneapolis; Wayne Tractor Co., Detroit; Illinois Silo & Tractor Co., Bloomington, Ill.; F. C. Austin Co., Inc., Chicago; Gray Tractor Co., Inc., Minneapolis; Leader Tractor Co., Des Moines; Andrews Tractor Co., Minneapolis; Evans Mfg. Co., Hudson, Ohio.

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Pierce-Arrow Earnings About $11 a Share

BUFFALO, N. Y., March 18—The Pierce-Arrow Motor Car Co. in its annual report to stockholders, to be issued in a few weeks, will show a surplus of $3,550,000, after deduction of war taxes and depreciation reserve. When allowances for an 8 per cent dividend on the $10,000,000 preferred stock are made, the earnings equal $11 a share on the 250,000 shares of common stock outstanding.

In 1916 profits were equal to $13.08, without any deduction for taxes. The balance sheet shows that current assets exceed current liabilities by $12,000,000.

—

White Company Earns $3,800,000

CLEVELAND, March 20—The White Co. earned profits of $3,800,000 in 1917, according to a preliminary report. This is after all deductions, including reserves set aside for taxes, are made, and equals $12 a share on the 320,000 shares of stock (par value $50) outstanding, or three times the present rate of dividends. The balance sheet shows current assets of nearly $15,600,000 and current liabilities of $2,600,000, leaving a working capital of $13,000,000. The White Co.'s report will be given out just prior to the annual meeting of stockholders, which is scheduled for April 8.

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Daylight Saving Bill Passed

WASHINGTON, March 19—Congress has passed the daylight bill and it has been signed by the President. The bill is designed to save time, light and fuel. It will also supply an additional hour for home gardening by city and suburban dwellers. Clocks will be turned one hour ahead at 2 o'clock in the morning of the last Sunday in March and will be turned back one hour at the same time on the last Sunday in October.

J. I. Case Co.'s Profits Doubled

Earnings Amount to $18 a Share on Common—35 Per Cent Increase in Sales

RACINE, WIS., March 20—The J. I. Case Threshing Machine Co. shows gross sales of $17,657,753 in 1917, an increase of $4,066,854 over 1916. Net income increased from $2,658,997 in 1916 to $4,066,854 in 1917. The surplus for the year, after deducting all fixed charges, reserves, preferred dividends, etc., amounted to $1,506,273, or $18.14 a share on all outstanding common stock. This is almost double the 1916 earnings.

The net income account and balance sheet, as of Dec. 31, 1917, compare as follows:

	1917	1916
Gross sales	$17,657,753	$13,047,257
Net operating income	4,066,854	2,658,997
Interest	726,540	737,389
Depreciation	290,933	273,887
Federal taxes	275,000	.....
Contingent reserves	.....	.....
Extra charges	*417,608	.....
Balance	$2,356,773	$1,647,721
Preferred dividends	850,500	850,500
Year surplus	†$1,506,273	$797,221

*Premium on bonds bought, $143,315; and $274,293 war losses abroad.

†Equal to $18.14 a share on $8,300,000 common stock, as compared with $9.60 a share in 1916.

The balance sheet of the J. I. Case Threshing Machine Co., as of December 31, 1917, compares as follows:

Assets

	1917	1916
Property account	$11,820,915	$11,801,030
Inventories	12,814,180	9,881,337
Customers' notes	8,512,455	12,766,829
Accounts received	1,121,173	397,641
Investment in Case de France Co.	519,637	362,387
Due account prop. sold	175,000	.....
Liberty and other bonds	263,969	.....
Miscellaneous realty	182,704	202,370
European funds	1,759,997	1,281,375
Cash	*1,492,167	821,630
Deferred charges	568,597	663,266
Total	$39,230,796	$38,177,866

Liabilities

	1917	1916
Preferred stock	$12,150,000	$12,150,000
Common stock	8,300,000	8,300,000
Funded debt	6,012,000	9,000,000
Real estate mortgage	.....	.....
Bills payable	2,225,000	750,000
Accounts payable	1,332,441	1,017,625
Federal tax reserve	275,000	.....
Accrued interest, etc.	580,245	282,851
Contingency reserve	2,300,000	1,500,000
Depreciation reserve	1,298,117	1,125,670
Surplus	8,356,109	4,051,719
Total	$39,230,796	$38,177,866

*Includes $497,000 deposited with trustee under terms of trust deed.

Foreign trade showed a marked increase, most of the orders coming from the allied governments, subject to cash payment in this country.

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Wave of Prosperity in Cleveland

War Industries in Full Swing—Exceedingly Productive Season Reported

CLEVELAND, March 19—Cleveland is experiencing a wave of business prosperity, as its war industries are organizing themselves into full swing and its commercial business barometer is rising rapidly. A large group of automobile, truck and parts manufacturers are located in Cleveland and without exception they report an exceedingly productive season.

The White Co. is utilizing only a small part of its productive facilities for passenger car work. The demand is comparatively small for a car of this price, but truck business is especially good. The company is busy with war truck production. Little of this is United States war business, due to the fact that the company is heavily involved in transacting business with the Allies, particularly France. It is making, however, some trucks for the United States.

Malleable Putting Up Plant

The National Malleable Castings Co. is putting up a large new plant and within 30 days will be in production here. The old plant will be continued due to the great amount of orders, most of which are of war contracts. Castings for barrels of trench mortar shells and also small castings for hand grenades are being turned out in large quantities by the company.

The Willard Storage Battery Co. is producing about 60,000 batteries a month. This is slightly less than a year ago, on account of reduced passenger car production. Nevertheless, the decrease is relatively small because of increased sales by dealers throughout the country. The business is gaining rapidly, and if the present increases continue, it will soon be on the same basis as a year ago, according to reports.

The Chandler Co. is well under way with its large tractor building, as was reported recently in AUTOMOTIVE INDUSTRIES. It is believed that this business will not be in full swing for 2 or 3 years, although production may start about August.

Martin Corp. Building

A large plant is being erected for the Glen Martin Aircraft Corp., which, it is expected, will be one of the leading aircraft companies in the vicinity of Cleveland. A great interest is taken in the matter by citizens of Cleveland, who aspire to have Cleveland known as an airplane manufacturing center.

The Jordan Motor Car Co. is doing good business throughout the entire country, particularly in the South, where express shipments are being made whenever it is possible to get express equipment. This, fortunately, has been possible during the last few weeks, although predictions are that it will become increasingly difficult to obtain this. The production aimed at is about 50 a week by April. Cars are being driven overland to Chicago and points in the Middle West. It is impossible to drive South, but express shipments heretofore have taken care of deliveries to this part of the country. Jordan has 153 orders on hand for immediate delivery.

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Winton Prices Increased

CLEVELAND, March 18—The Winton Co. has increased the factory prices of its 33-hp. cars $200 and its 48-hp. cars $350. The new prices compare as follows:

Model 33 hp.	Old Price	New Price	Increase
Roadster	$2950	$3,150	$200
Cloverleaf	2,950	3,150	200
Touring car, 4- and 5-pass.	2,950	3,150	200
Touring car, 6- and 7-pass.	3,000	3,200	200
Coupelet	3,265	3,465	200
7-pass. touring, with permanent top	3,600	3,800	200
4-door convertible sedan	4,000	4,200	200
Limousine	4,200	4,400	200
48 hp.			
Roadster	$3,500	$3,850	$350
Cloverleaf	3,500	3,850	350
Touring car, 4-, 5-, 6- and 7-pass.	3,500	3,850	350
Limousine	4,500	4,850	350
Sedan	4,750	5,100	350
Limousine landaulet	4,750	5,100	350

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Marmon Prices Increased

INDIANAPOLIS, March 19—Factory prices of open models of Marmon cars were advanced $200 yesterday. The prices are:

Model	Old Price	New Price
7-Pass. Touring Car	$3550	$3750
4-Pass. Roadster	3550	3750
5-Pass. Touring	3500	3700
Chassis with cowl	3250	3450

There has been no change in the price of the closed cars.

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Price of Grant 6-Passenger Raised

CLEVELAND, March 19—The Grant Motor Car Co. has advanced the price of its 6-passenger models from $1,055 to $1,095, an increase of $40.

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Studebaker Commercial Cars Higher

DETROIT, March 20—Prices of all Studebaker commercial cars have been increased $100. The advanced cost of materials and increased manufacturing charges are assigned as reasons.

New prices of the Studebaker commercial cars follow:

Model	Old Price	New Price
½-Ton		
Panel delivery	$985	$1085
Express	980	1080
Station wagon	985	1085
Chassis	945	1045
1-Ton.		
Stake body	1450	1550
Express	1400	1500
16-Pass. bus	1600	1700
Hearse chassis	1500	1600
Chassis	1300	1400

Increasing Business for Detroit

Manufacturers Reorganizing Traffic Bureaus to Cope with Freight Situation

DETROIT, March 20—Manufacturers in this city and the surrounding territory report good business development. Although the freight situation is relieved to some extent, it is by no means back to normal. Most manufacturers, however, have had less difficulty in shipping cars during the last few weeks. The percentage of drive-aways is increasing from day to day, and many manufacturers are increasing their production.

Traffic departments have been reorganized to cope with the new situation. If the old methods were practised at this time the number of freight cars obtained would be even less than the number procurable now. Some companies have crews continually scouring sidings for empties. The minute they see a car being unloaded they make arrangements to obtain it for their company and usually these cars are loaded with automobiles without being moved.

Despite mild weather and heavy rains, which have made the roads troublesome to drivers, dealers are begging to drive away cars. One dealer came from Kansas with five women and a man to drive cars from the Briscoe plant.

The Maxwell company has adopted a new plan, which makes it possible for one man to drive two cars. The company has found that sending out 10 cars with 5 drivers is most satisfactory. Each car trails another.

The Federal Motor Truck Co. states that the East is waking up to the use of the truck and good business is reported in that section. During the Boston show the company sold more than one truck a day.

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A. A. A. Changes 2 Committee Heads

NEW YORK, March 20—Clifford Ireland has been appointed chairman of the Legislative Committee of the American Automobile Association, succeeding O. I. Yellott, who has resigned. Mr. Ireland has been head of the Touring Board and his place there has been taken by Carl G. Fisher.

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No Vote of Confidence

In a news item appearing in AUTOMOTIVE INDUSTRIES of Feb. 21 relative a meeting of the National Automobile Chamber of Commerce and the Motor and Accessory Manufacturers Assn. on Feb. 14 there is a misstatement. This item says: "A unanimous vote of confidence was given Christian Girl for the manner in which he is carrying on his work."

No vote of confidence was asked and no vote of confidence was given.

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Urge Widest Possible Use of Trucks

Council of National Defense Asks Help of States—Centralized Highway Control Essential

WASHINGTON, D. C., March 19—The first Government expression concerning the broader use of motor trucks and building roads suitable for them has come from the Council of National Defense, which states that it favors the widest possible use of motor trucks for highway transportation as well as the removal of regulations restricting and discouraging the present use of highways for this purpose. The statement issued by the Council of National Defense is:

"The Council of National Defense approves the widest possible use of the motor truck as a transportation agency, and requests the State Councils of Defense and other State authorities to take all necessary steps to facilitate such means of transportation, removing any regulations that tend to restrict and discourage such use."

Depression in Road Building

Since Nov. 1, 1917, when Priority Order No. 2 was issued through the Council of National Defense, prohibiting the use of open-top railroad cars for the transportation of road-building materials, the road-building movement in general has been under a cloud of depression, and this is the first broad ray of sunshine that has come. The Quartermaster's Department by driving overland war trucks from Detroit and Buffalo to the number of nearly 500 has demonstrated the super-essential characteristic of highways in war times. The development of the rural express systems in Maryland has brought to the attention of the Government the factor that good highways constitute by preventing the waste of farm products due to getting them to the city not only quicker, but where it is impossible without motor apparatus. The return-load movement in Connecticut has constituted another chapter in the super-essential characteristic of roads in war time. The snow-removal work of Pennsylvania has demonstrated how road-maintenance cost is reduced by snow removal and how mountain highways are converted into useful channels of transportation during winter months when the carrying capacity of railroads is off and when the carrying capacity of highways is needed.

At present the highway situation of the nation, so far as appropriations is concerned, rests almost entirely in the hands of W. G. McAdoo in that he occupies the dual position of Secretary of the Treasury and Director of Railroads. As Secretary of the Treasury he has complete control of every appropriation made for highways. These appropriations are passed upon by what is known as the Capital Issues Committee, which must approve of every bond issue of $100,000 or over for highway construction. Through his position as railroad dictator Secretary McAdoo entirely controls the transportation of road-building materials. As soon as he took charge of the railroads Priority Order No. 2, prohibiting the shipment of road-building materials in open-top railroad cars, was rescinded.

Centralized Authority Essential

What is really needed in Washington today is some centralized authority on highways. While Secretary McAdoo holds the key to the situation he should have some representative or some committee which would constitute a centralized authority on everything relating to the highways. There are many activities for such a centralized committee.

There is the attitude toward transportation of road material which generally must be carried on railroad cars.

There is the necessity of the nation deciding on what constitutes a suitable road for modern highway traffic.

There is the necessity for such a centralized committee that would have authority to state what constitutes a permissible load to be carried on highways.

There is the necessity for such a centralized committee to decide if Federal registration of motor trucks would not be desirable, in fact almost necessary under the new system of highway transportation.

Must Decide Maintenance Percentage

There is the necessity for such a centralized committee to determine what percentage of highway maintenance should be paid by the users of highways and what should come out of the general fund. At present there seems to be no consensus of opinion on this subject and the different States are constituting laws unto themselves in this respect. An example is Maryland, which charges $342 per year registration tax on a 5-ton truck and has a bill before its legislature to double this tax. The State further threatens to again double this tax at a meeting of its legislature 2 years hence, at which time the tax would be four times what it is at present

There is the necessity for such a centralized committee which would define exactly what is an essential, commercial, and military highway under war conditions.

There is the necessity for such a centralized committee to consider the question of snow removal in its broader sense and perhaps recommend what highways must be kept clear of snow during winter months for commercial and military reasons.

There is the necessity for such a centralized committee to determine what appropriation the Federal Government should make for the maintenance of those highways over which its transportation is passing. Great Britain has already found it necessary to make appropriations to local authorities for wear and tear on their highways due to war traffic by motor truck. Different States in the U. S. A. are faced with the same problem today.

There is the necessity for such a centralized committee to determine the carrying capacity of bridges on main highways of military and commercial value. At present some bridges in New York State are not strong enough to carry 5-ton loads of war trucks, and the transportation of supplies for our army in France is being delayed because of this. The problem has already become one of Federal importance more than merely a matter of State importance or importance to some local community in a State.

That there is the necessity for such a centralized committee is indisputably demonstrated by the troubles on the Lincoln Highway on the boundary between Pennsylvania and Ohio, where there is a short linkage of unimproved highway, making it necessary to load the Government war trucks which are being driven from Detroit to Baltimore onto railroad cars to get them over this short stretch.

New York Refused to Remove Snow

That there is the necessity for such a centralized committee is further indisputably demonstrated by the fact that New York State refused to remove the snow from the Buffalo-Albany route, and as a direct result of this motor truck trains from Buffalo to seaport were 8 to 10 days longer making the trip than they should have been, while at the same time General Pershing was sending urgent cables for these very trucks. While in war it is no time to leave it to the whims of a State whether it will remove snow from its highways or not when the issues of a nation are at stake.

That there is necessity for such a centralized committee is further demonstrated by the hopeless lack of co-ordination among highway systems, inland waterway systems, railway systems, trolley systems, and others on which falls the burden of a nation's transportation.

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Changes on Boston Motor Row

BOSTON, March 19—There have been several changes on Boston's Motor Row in the last few weeks. The Shauk & MacMurray Co. has been taken over by the Utterback, Gleason Co., Dort distributer, and has dropped the Columbia car. The Hawley-Cowan Co., Saxon distributer, has been dissolved and its salesrooms rented by the Republic Truck Co. The Hinchcliffe Motor Co., handling the Jordan, has dropped the Kissel line,

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which has not been placed yet. J. H. MacAlman, who handles the Stearns, has added the Liberty, and C. I. Crowell, who headed the Liberty agency, will be associated with him. George Dunham has resigned from the Stearns forces and taken the agency for the Standard eight. The Apperson Motor Co. has been formed to handle that line, and the Murray eight, formerly handled by the McCarthy-Meyer Co., has been taken on by George Leghorn, of the Hupmobile company.

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66,545 Cars and Trucks in Western Canada

WINNIPEG, MAN., March 18—Official figures show that 66,545 motor vehicles were licensed in Manitoba, Alberta and Saskatchewan during 1917. This is an increase of 29,727 or 80 per cent over 1916. The greatest gains were made in Saskatchewan, where 33,562 motor vehicles were licensed last year, as compared with 15,654 in 1916. Alberta registrations jumped from 9,211 in 1916 to 16,000 in 1917, and Manitoba figures show total registrations of 17,393 last year as compared with 11,393 during the previous year.

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Goodrich Company Changes

AKRON, March 16—At the annual meeting of the B. F. Goodrich Co. the retirement of $900,000 of the preferred stock, already authorized by the directors, was authorized by the stockholders. The old officers were re-elected, with the following additions as vice-presidents, H. K. Raymond, W. Rutherford, W. C. Geer and A. B. Jones. Waddill Catchings of Goldman, Sachs & Co., and F. C. Van Cleef were elected directors, succeeding Henry Goldman and F. A. Harding. At the meeting of directors, which followed the annual meeting, H. C. Miller was appointed manager of the tire sales department.

Detroit Leading in War Work

Has $500,000,000 Contracts for Government Trucks—Cleveland Second with Half the Amount

DETROIT, March 19—Detroit has received more than twice as many Government contracts for manufacturing, assembling and equipping motor trucks as any other city in the United States. Orders accepted by 50 manufacturers here aggregate $500,000,000. Cleveland is a weak second, with about $200,000,000 in contracts.

Contracts awarded to Detroit companies represent only part of the war work that is being done in the State of Michigan, as Grand Rapids, Flint, Lansing and many other cities are doing an immense amount of Government work.

Among the Detroit companies to whom contracts have been awarded are: Packard Motor Car Co., 1, 1½ and 5-ton trucks; Continental Motors Corp., Class B motors; Hinkley Motors Corp., Class B motors; Timken-Detroit Axle Co., Class B worm axles; Detroit Gear & Machine Co., clutches; Gemmer Mfg. Co., steering gears; McCord Mfg. Co., National Can Co., Long Mfg. Co., radiators; Detroit Pressed Steel Co., frames; Detroit Steel Products Co., springs; Michigan Malleable Iron Co., steel wheels; Hayes Mfg. Co. and C. R. Wilson Body Co., seat assemblies; Michigan Stamping Co. and International Metal Stamping Co., dashes; Hayes Mfg. Co., hoods, fenders, fan shrouds; Michigan Stamping Co., fan shrouds; Detroit Battery Co., batteries; Edmunds & Jones Corp., lamps; Schweppe & Wilt Mfg. Co. and Detroit Pressed Steel Co., reach rods and spray assemblies; Zenith Carbureter Co., carbureters; Michigan Stamp Co., bumpers; Oldberg Mfg. Co., mufflers; Gemco Mfg. Co., mufflers; National Machine Products Co., rear springs, shackle hub assemblies; Massnick Mfg. Co., parts for steering gears; National Machine Products Co., steering gears; Standard Brass Works, radiator parts; Burton Lowery Co., J. C. Wilson Co., Briggs Mfg. Co. and American Auto Trimming Co., upholstery, and Barey-Nicholson Co., wiring assemblies.

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Detroit Center of Munitions Zone

DETROIT, March 18—Detroit will be the headquarters for one of the munition districts recently designated by the United States Government. The new plan is one of the results of the reorganization of the ordnance department a few months ago. Besides bringing the department into direct association with the industries, so that the work of turning out war materials may be followed up more closely, it also assures quicker payment for work done, better inspection facilities and more accurate information as to progress of the work.

Heretofore manufacturers and their representatives who went to Washington to obtain war orders lost time waiting for appointments with those in charge of the various departments. This will all be eliminated by the establishment of a central clearing house in Detroit.

Fred J. Robinson, of Lowrie & Robinson Lumber Co., and a member of the Detroit Board of Commerce, has been made chief of the Detroit zone.

The action of the Government in establishing a clearing house in Detroit for the ordnance department is in accordance with the efforts made by the Detroit Board of Commerce.

Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co	52	54	..
*J. I. Case T. M. Co. pfd	85	87	+2
Chalmers Motor Co. com	4	6	..
Chalmers Motor Co. pfd	30	40	..
*Chandler Motor Co	84	85	—3½
Chevrolet Motor Co	117	121	—2
*Fisher Body Corp. com	34	36	+1
*Fisher Body Corp. pfd	80	87	..
Fisk Rubber Co. com	50	53	..
Fisk Rubber Co. 1st pfd	98	103	..
Fisk Rubber Co. 2nd pfd	70	75	..
Firestone Tire & Rubber Co. com	94	98	..
Firestone Tire & Rubber Co. pfd	97	99	..
*General Motors Co. com	122½	125	—1
*General Motors Co. pfd	81	82	—1
*B. F. Goodrich Co. com	43	45	..
*B. F. Goodrich Co. pfd	99	100	..
Goodyear Tire & Rubber Co. com	138	141	—1
Goodyear Tire & Rubber Co. pfd	99	100	..
Grant Motor Car Corp.	2	4	+1
Hupp Motor Car Corp. com	3	3½	..
Hupp Motor Car Corp. pfd	78	83	..
International Motor Co. com	18	22	+3
International Motor Co. 1st pfd	50	55	+5
International Motor Co. 2nd pfd	20	25	+3
*Kelly Springfield Tire Co. com	45	46½	+1½
*Kelly Springfield Tire Co. 1st pfd	76	85	..
*Lee Rubber & Tire Corp.	123½	131½	—2½
*Maxwell Motor Co., Inc. com	28	29½	—½
*Maxwell Motor Co., Inc. 1st pfd	59	60	—1
*Maxwell Motor Co., Inc. 2nd pfd	22½	24½	+1½
Miller Rubber Co. com	130	133	—4
Miller Rubber Co. pfd	95	98	+1
Packard Motor Car Co. com	95	100	..
Packard Motor Car Co. pfd	90	93	..
Paige Detroit Motor Car Co.	18	20	..
Peerless Truck & Motor Corp.	16	17	—½
Portage Rubber Co. com	110	112	..
Reo Motor Car Co.	17	19	..

	Bid	Asked	Net Ch'ge
*Saxon Motor Car Corp.	9	9½	—½
Standard Motor Construction Co.	11	12	..
*Stewart-Warner Speed. Corp.	54	56	..
*Studebaker Corp. com.	46	47	..
*Studebaker Corp. pfd.	91	94	..
Swinehart Tire & Rubber Co.	22	35	..
United Motors Corp.	28⅛	28¾	+1⅛
*U. S. Rubber Co. com.	54	56	—1
*U. S. Rubber Co. pfd.	101	102	..
*White Motor Co.	42	43½	—2½
*Willys-Overland Co. com.	18¼	18¾	—¼
*Willys-Overland Co. pfd.	81	82	..

*At close March 16, 1918. Listed N. Y. Stock Exchange.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

Auto Body Co.	..	8	..
Bower Roller Bearing Co.	17¼	18¼	—¾
Chevrolet Motor Co.	117	120	—3
Commerce Motor Car Co.	..	10⅝	..
Continental Motor Co. com.	5⅜	5¾	—⅜
Continental Motor Co. pfd.	..	93	..
Edmunds & Jones com.	..	..	..
Edmunds & Jones pfd.	..	..	..
Ford Motor Co. of Canada	..	216	..
Hall Lamp Co.	14	14⅜	+½
Michigan Stamping Co. com.	12¾	13½	..
Motor Products	..	..	..
Packard Motor Car Co. com.	96	100	+3
Packard Motor Car Co. pfd.	90	90¾	..
Paige-Detroit Motor Car Co.	..	20	..
Prudden Wheel Co.	..	14¼	..
Reo Motor Car Co.	17⅜	17¾	—⅛

INACTIVE STOCKS

Atlas Drop Forge	..	27¼	..
Kelsey Wheel Co.	86	93	..
Regal Motor Car Co.	..	26½	..

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Men of the Industry

Changes in Personnel and Position

Colt Elected Chairman of U. S. Rubber Directorate

NEW BRUNSWICK, N. J., March 20—Samuel P. Colt, president of the United States Rubber Co., was elected chairman of the Board of Directors at the annual meeting of stockholders held yesterday. Samuel Myers, Ernest Hopkinson and J. Newton Gunn were elected directors. Gunn is president of the United States Tire Co.

—

Walter Campbell has been appointed assistant supervisor of materials at the Harroun Motors Corp., Wayne, Mich. He was formerly with the Hupp Motor Car Corp.

—

C. E. Lindsey, formerly manager of the Windsor branch of the Swedish Crucible Steel Co., Detroit, has been promoted to the position of sales manager.

—

R. C. Bridge, who has been associated with the Willard Storage Battery Co. on the Pacific Coast, has been appointed manager of the San Francisco district. He will have headquarters at 1380 Bush Street, San Francisco.

—

C. S. Harper, formerly district manager for the Willard Storage Battery Co. at San Francisco, will operate the Willard service station at Seattle.

—

Frank A. Kapp has become associated with the Associated Blue Book Publishing Co., New York. He was formerly advertising manager of the Mitchell Motors Co., Racine.

—

William P. Barnhart has been made assistant sales director of the United States Motor Truck Co., Cincinnati. He will have headquarters in Washington, where he will handle the business of the Stewart Iron Works and the United States Motor Truck Co.

—

W. F. Thompson has been appointed engineer of J. C. Widman & Co., Detroit, a furniture manufacturing corporation, which is engaging in airplane work.

—

L. R. Johnson, for the past 3 years auditor of the Jones Motor Car Co., Wichita, Kan., has been elected treasurer of the company.

—

Crosby White, formerly associated with A. J. Picard & Co., has been appointed traveling sales manager of J. H. Faw, Inc., New York.

Benjamin S. Rosenberg has been appointed manager of the New York office of the United Smelting & Aluminum Co., Inc., New Haven. He was formerly connected with Post Van der Burg & Co.

—

E. L. Lick has resigned as assistant manager of the car order department of the Willys-Overland Co. to become manager of the car order department of the Simons Sales Co., Toledo.

—

J. H. Teagan has been appointed export manager of the Hupp Motor Car Corp., Detroit, to succeed Charles Denby, who has entered government service. Teagan was formerly Denby's assistant.

—

O. S. Tweedy, manager of general branch sales of the U. S. Tire Co., has resigned, and has been elected vice-president of L. A. Young Industries, Inc., Detroit. He will leave the U. S. Tire Co. on April 15, and start active work in Detroit May. 1.

—

Liberty Engine Under Test

WASHINGTON, D. C., March 20—It is stated here that a 50-hr. test is being made of a Liberty airplane engine at Camp Bertner, Lake Charles, La., and officials of the Aircraft Production Board and the Aviation Section of the Signal Corps are awaiting results. It is expected that several trials and tests will be made here within the next two weeks of the Liberty airplane engine which arrived here a few days ago and is in a Curtiss plane.

—

Earning Power of Truck Service

NEW YORK CITY, March 20—An example of the earning possibilities of a motor truck in the parcel post rural delivery service was given at the annual dinner of the Motor Truck Club in this city last night by James I. Blakeslee, Fourth Assistant Postmaster General, of Washington. He has charge of this work, and looks to the time when there will be parcel post motor service over practically all the roads of America.

On a parcel post route from Philadelphia to Oxford, Pa., a round trip of 110 miles, a 1½-ton truck had made this trip every day all winter without a single exception. Mushroom growers at Oxford are shipping 1½ tons of mushrooms to Philadelphia each day. In the first 3 days the truck earned $30 per day charging parcel post rates for the work. This truck, in this service, can earn $12,000 a year and the service cost for this will be $4,200 a year.

Previous to starting this truck route, the mushrooms were shipped by railroad from Oxford to Philadelphia, a distance of 120 miles, whereas by motor truck the distance is only 55 miles.

Mr. Blakeslee cited many other examples to show that the earning powers of the motor truck in parcel post service, where it also carries first class mail, is so great that there is no question but that the entire service will be motorized as quickly as appropriations can be secured.

New Companies Formed

Latest additions to ranks of Automotive Industries

L. A. Young Interests Made Into One Company

DETROIT, March 20—L. A. Young Industries, Inc., has been formed to consolidate the interests in which L. A. Young, of Michigan, has been interested. The Detroit Wire Spring Co. will be the nucleus of the company, according to O. S. Tweedy, vice-president of the corporation. Other companies will also be consolidated but the names will not be announced until stock arrangements have been completed.

—

Ross Company to Make Trucks

SAGINAW, MICH., March 19—A new organization, to be styled Nelson B. Ross Motor Truck Co., has been formed in Saginaw. The firm is capitalized at $300,000 and will make heavy trucks. The paid-in capital is $175,000.

—

Furniture Company Making Truck Bodies

NORTHVILLE, MICH., March 19—The Globe Furniture Co. of Northville is now producing truck bodies, mostly of the stake type. The production averages 3 bodies a day.

—

Government Would Standardize Screw Threads

WASHINGTON, March 18—A bill was introduced in the House a short time ago providing for the appointment of a commission for the standardization of screw threads. It is provided that the commission shall consist of seven members to be appointed by the Secretary of War (one, a commissioned army officer), by the Secretary of the Navy (one, a commissioned naval officer) and by the Secretary of Commerce (five, of which one shall be the director of the Bureau of Standards, two from nominations made by the S. A. E. and two from nominations made by the A. S. M. E.)

The commission is to serve without pay and establish certain screw standards, which are to be submitted to the Secretaries of the Army, Navy and Commerce, and if approved by them shall be put in use in all plants controlled by the Army and Navy and, so far as practicable shall be used in all manufactured articles ordered by these departments. Hearings on the bill, which was introduced by Mr. Tilson, were given before the Committee on Coinage, Weight and Measures on March 5 and 7. The idea is to formulate complete screw standards with different tolerances. The bill, it was said, is chiefly a war measure.

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Industrial Review of the Week

A Summary of Major Developments in Other Fields

Steel Production Made Rapid Stride Last Week

Steel production with some companies has made a considerable stride forward in the past week, Steel Corporation plants apparently coming closer to normal capacity than the majority of independent producers. A 10 per cent increase over the February rate represents the average condition. The situation as to cars and motive power is still a serious one and promises to continue so.

Iron and steel manufacturers entered the price conference with the War Industries Board at Washington Wednesday knowing that they would be asked to make reductions on some products, particularly pig iron. Producers of foundry iron strongly oppose lower prices, and a compromise may be made by reducing basic iron $1, or to $32, and Bessemer iron, which is 10 per cent higher, from $36.30 to $35.20. There is a probability, too, of some downward revision in scrap, in certain forms of which competition has already brought reductions from the Government basis.

On some finished products which have been considered out of line the Government will also seek reductions. How strongly these will be pressed depends upon the extent to which Washington considers the output of smaller high-cost plants to be essential to the carrying out of its program. On the score of securing the largest possible output of pig iron and steel from the available coke, current priority decisions tend more and more to throw smaller iron and steel plants into idleness, and the development of this policy is being watched closely throughout the industry.

No material or general readjustment of existing prices for rolled products is looked for, and the steel men contend that the uncertainties of the situation, which are already affecting demand, should be removed by making the new prices effective for at least six months.

Apart from the special plea of two large consuming interests for a reduction in Southern pig iron, because they located plants in the South to get the benefit of its low pig-iron costs, manufacturing buyers of iron and steel figure in no formal way in the present Washington conference.

Somewhat conflicting statements are made as to the extent to which Government and general business needs will take up steel-making capacity in the remainder of the year.—*Iron Age.*

—

No Present Change in Steel Prices

WASHINGTON, March 20—Existing prices for iron and steel are to be maintained for at least the next three months. This statement comes as a result of the conference between the War Trade Board and the representatives of the iron and steel industry which met in Washington yesterday.

—

$100 Increase on Columbia Cars

DETROIT, March 19—The Columbia Motors Co. has increased the prices of its models $100. They are:

Model	Old Price	New Price
5-Pass. touring	$1350	$1450
4-Pass. roadster	1495	1595
Sedan	2395	2495

The company will start the manufacture of trailers before the end of the month. The building formerly used as a storehouse will be turned into a trailer assembling shop.

—

Slight Advance in Oldsmobile Prices

LANSING, MICH., March 20—There has been a slight increase in the price of Oldsmobile models, as follows:

Model	Old Price	New Price
8-Cylinder touring	$1467	$1495
6-Cylinder roadster	1185	1195
6-Cylinder touring	1185	1195

—

Five Scientists to Test Garabed

WASHINGTON, March 20—Garabed T. K. Giragossian, the inventor of the new so-called virgin force which he calls Garabed, has submitted a list of nineteen scientists to Secretary of the Interior Franklin K. Lane. Secretary Lane has selected ten scientists from this list from which Giragossian will finally choose five to act as witnesses for the official test of the free energy generator. The names of the scientists together with all details of the tests are kept secret.

—

Detroit-Pittsburgh in 3 Days

DETROIT, March 18—A fleet of trucks were driven from the Standard Motor Truck factory to the Pittsburgh distributer, the Wilmer Sales Co., in 3 days' time.

A New Service

Herewith AUTOMOTIVE INDUSTRIES *supplies for the benefit of its readers a general summary of important developments in other fields of business. This is rendered possible by the editorial co-operation of leading industrial publications which are recognized authorities.*

By compressing the general industrial situation into this form we hope to give our readers a clear and comprehensive idea of up-to-the-minute developments which they could otherwise secure only with considerable expenditure of time and effort.

Tone of Coal Market Generally Satisfactory

The tone of the coal trade is generally satisfactory. With the moderating weather, dealers are noticing a tendency toward an easier market. Domestic consumers are not so urgent regarding deliveries, though demand in all lines is still ahead of the supply.

In face of the repeated urgings of the Fuel Administration that householders stock their next winter's coal early, the demand from this class of buyers is disappointing. This may be attributed to the fact that the public generally seems to feel that the price of coal will come down on April 1 and, therefore, hesitates to place orders at the old figure. Also, dealers do not seem anxious to force sales until some sort of assurance is had that they will receive sufficient coal to take care of a strong early demand, as the quantity of coal now in storage is not great.

The improvement in rail movement during the last two weeks has failed to continue. The lines are again congested and there has been an appreciable falling off in the number of cars supplied to the mines. Few operators report more than a 50 per cent car supply, with the majority of shippers down to 25 per cent and lower. This means that the country will be faced with an even more serious fuel shortage next winter, unless the Government takes immediate preventive steps.

Consumers will likely have to pay more for their coal during the coming summer than they did the past winter, owing to the fact that the Interstate Commerce Commission has granted the railroads a freight rate increase of 15 per cent on bulk commodities, including coal. This increase, which will apply to all shipments east of the Mississippi River and north of the Ohio and Potomac Rivers, will mean an increase of from 18 to 30 cents a ton on the domestic sizes.—*Coal Age.*

—

G. M. Ratifies Stock Increase

NEW YORK, March 20—Stockholders of the General Motors Corp. have ratified the proposal to increase the capitalization of the company to $200,000,000; the action, suggested when the Chevrolet Motor Co. was made a division of the General Motors Corp., was taken at a special meeting to-day. The new issue will consist of $50,000,000 six per cent preferred and $150,000,000 common. The following directors were elected: P. D. du Pont, A. G. Bishop, W. P. Chrysler, R. H. Collins, W. L. Day, H. F. du Pont, Irene E. du Pont, W. C. Durant, J. A. Haskell, L. G. Kauffman, J. H. McClement, C. S. Mott, J. J. Raskob, F. W. Warner, and E. B. Linden.

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Packard Truck Trains for Soldiers

DETROIT, March 16—Sixty Packard trucks are being driven from the Detroit factory daily, carrying two companies of soldiers. Six Dodge cars are also assigned to each company. The truck trains go via Toledo to the seaboard. Last week the total drive-aways from the Dodge Brothers factory alone amounted to more than 2400 cars.

—

Chevrolet Annual Meeting Postponed

NEW YORK, March 19—The annual meeting of stockholders of the Chevrolet Motor Co., which was to have taken place yesterday, has been deferred. It is understood that the postponement was necessitated by the recent decision to absorb the General Motors assets. The new date will be fixed shortly.

—

Reo Benefit Assn. Elects Officers

LANSING, March 19—The Reo Benefit Assn. has re-elected Jesse L. Stanley president. Clare Warner is vice-president; Don Gardner, secretary; Charles Coy, treasurer, and Fred Ackley and Herman Troy, trustees. The disbursements of the association for the year were $22,927.95, and the receipts of the benefit store were $55,261.30. The association assisted in many cases of sickness and injury to employees of the company.

Ohio Puts Aside $1,000,000 for Tractors

COLUMBUS, OHIO, March 19—State officials of Ohio are preparing a plan to purchase $1,000,000 worth of farm tractors and furnish them to farmers. The assistance of bankers and manufacturers has already been enlisted, and the state has set aside the money for the purchase. This will be loaned out to several country banks, which will finance farmers who require tractors.

An extensive plan for educating farmers in the use of tractors has also been worked out by the state. A school was opened on Feb. 11 on the state fair grounds here, and additional schools are being provided in several county seats.

Pennsylvania's Example of War Roads

(*Continued from page* 601)

The heavy war trucks which are coming over the road for that department are now being carried around this bad road on railroad flat cars. Such transportation is not available for privately owned trucks.

And yet this road was in fair condition a few weeks ago when it was frozen. It will be perfectly passable again as soon as the warmer weather has dried it out. When authentic information is received that this stretch of road has thoroughly dried out, no one need hesitate to drive over the road from the Great Lakes to New York by way of Pittsburgh and Philadelphia.

The State of Pennsylvania has done wonders in road-building during the last few years. The road from Philadelphia to Pittsburgh is practically a boulevard all the way, particularly the western portion, which has been completely rebuilt. The water-breaks on the mountain roads, once the terror of tourists, have all been eliminated, and the roads are drained by a modern system of culverts. There remain the usual bad spots on the outskirts of the towns, between the points where the State highway ends and the city pavement begins. Not only has the State of Pennsylvania constructed its main roads well, but it also maintains them in good order. The State owns a fleet of White dump trucks which constantly patrol the main roads. As soon as a hole is discovered, in goes a shovelful of gravel. As we had occasion to observe, the chauffeurs are expert axe-men as well, and when a tree is blown across the road it is quickly removed.

In New Jersey the roads of that State are not much to be proud of. There are stretches of fine roads, alternating with stretches of badly worn-out roads. The roads between Jersey City, across the Hudson from New York City, and Trenton are subjected to the wear of numerous heavy motor trucks in transit between New York and Philadelphia, but where the roads have been properly built, they show no signs of wear. The road leading into New Brunswick, built a number of years ago, is as good as it ever was, while the old water-bound macadam roads have gone to pieces.

Why is it that the State of Pennsylvania, which has done so much to build up its highway system and which has constructed a good road from Philadelphia across the State to Pittsburgh, and thence to Beaver Falls, should tolerate such road conditions as those existing beyond Beaver Falls?

Why is it that the counties of Ohio which have built so many miles of fine roads, including a good road from Cleveland to New Springfield, should neglect the few miles of road southeast of the latter town?

The answer is that each State has looked on its highway system as being purely a State problem. There is no town of any size in Pennsylvania northeast of Beaver Falls, so why build a road to a jumping-off place on the State line? Similarly, they reason in Ohio, "We will connect our own cities, but why spend money in improving a road to a little hamlet on our eastern boundary line?"

Fortunately, this condition of State insularity is disappearing. Pennsylvania has already declared its intention of improving its share of this stretch of road during the coming summer, and Ohio now sees the importance of taking care of its part of the road. In the meantime, now, while the frost is coming out of the ground, and next summer, when the road gangs get to work, the shortest and in every other respect the best highway for motor transportation between the Middle West and the Atlantic seaboard is practically blocked.

It is obvious that two points in our road-building and road-maintaining program must be emphasized as they never have been before.

First.—Each State must build and maintain its roads, not only from the State point of view, but also from a national point of view. It must examine into the question as to how its system of state highways fits into the general scheme of national arteries of transportation. If it has not linked up its State system of good roads with the system in each adjoining State, it must do so at once.

Second.—Each State must be made to see not only the necessity, but also the ultimate economy, of keeping snow off its roads in winter. If snow covers the roads during four or five months of the year, that means that every motor vehicle traveling over the roads during that period is using tire chains. It means further that every time there is a thaw, the water, instead of running off the road, is trapped by the snow and is held on the road to be subjected again and again to freezing and thawing with resulting disintegration of the road surface. If the snow is removed promptly from the road, tire chains are not necessary on the vehicles using the road, and the road is freed from the destructive action of recurrent thawing and freezing. The net result of keeping snow off the roads is a tremendous saving in road maintenance. This is not merely a theoretical consideration, but has been proved this year on the Philadelphia-Pittsburgh highway. This road, as already noted, has been kept free from snow, with the result that, despite the abnormally heavy traffic, the road is in need of fewer repairs this spring than in any previous year.

Any road was formerly considered a good road from the motoring point of view if it was maintained in satisfactory condition during the touring season—say from the middle of April to the first of December. It was taken as a matter of course that in the remaining four and one-half months of the year the winter snows and the spring thaws would render it more or less impassable. To-day, under war conditions, no community can boast of having good roads unless its roads are open for motor traffic twelve months in the year. If the highways are to supplement, as they must supplement, the railroads of the country in meeting the transportation needs of the times, the roads must be kept in condition all the year, just as are the railroads.

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Current News of Factories

Notes of New Plants—Old Ones Enlarged

United States Rubber Purchases Alco Plant

PROVIDENCE, R. I., March 18—The United States Rubber Co. has purchased the plant of the American Locomotive Co. here, which consists of about 10 acres of land with extensive buildings, and adjoins the Revere plant of the United States Rubber Co. It is understood that the purchase price was about $500,000.

According to President Colt, the company will immediately equip part of the plant for the manufacture of truck tires. Another part will probably be used for making balloons for the United States Government.

The plant was originally built by the American Locomotive Co. for the manufacture of Alco cars, which enterprise was abandoned in 1912. Lately it has been used for munitions work.

—

International Motor to Build Annex

PLAINFIELD, N. J., March 9—The International Motor Co. has prepared plans for the erection of a 4-story building adjoining its plant on West Front Street. There will be 85,000 sq. ft. of floor space in the annex, most of which will be used as a factory and the remainder as a stock room.

—

New Winther Model Completed

KENOSHA, WIS., March 18—The Winther Motor Truck Co. has completed the first model of a new type of quadruple drive motor truck designed especially for army service, and the car is now in the hands of Government engineers for exhaustive tests.

—

35 Per Cent Gain in Goodyear Sales

AKRON, OHIO, March 18—Sales of the Goodyear Tire & Rubber Co., according to estimates, will aggregate $150,000,000 for the 10 months ending Oct. 31, 1918, a gain of 35 per cent over 1917. Gross business is about 40 per cent heavier than a year ago, and three-quarters of this is represented by tire sales. Non-tire products turned out by the company last year amounted to $25,000,000, and this year will probably reach $35,000,000, or approximately 16 per cent.

—

Canadian Branch for Monarch Tractor

WATERTOWN, WIS., March 18—The Monarch Tractor Co., Chicago, Ill., with main works here, has organized the Monarch Tractor Co., Ltd., of Canada, to handle its business in the Dominion and to own and control a branch plant to be erected there at once. The Watertown works also will be enlarged to better enable the company to meet the demand for tractors.

—

Commerce Gets $2,000,000 Contract

DETROIT, March 16—The Commerce Motor Car Co. has received a government contract for more than $2,000,000 worth of Commerce trucks. To carry the heavy inventory the company has authorized the sale at par of $100,000 of treasury stock. This will be offered to stockholders in the ratio of one for every three shares held.

—

Detroit Pressed Steel Has Signal Corps Order

DETROIT, March 18—The Detroit Pressed Steel Co. has received an order from the Government for 19,000 steel wheels for the Signal Corps. Production on this order started 30 days ago, and the first delivery will be made this month. It is expected the order will be completed by the end of May.

—

30 Duplex Trucks a Month

LANSING, MICH., March 18—The Duplex Truck Co. will increase its production to 300 trucks a month for the remainder of the year.

—

Addition for Ladish Drop Forge

CUDAHY, WIS., March 18—The Ladish Drop Forge Co. will erect a new drop forge shop. This will be ready June 1.

—

Dividends Declared

The Edmund & Jones Corp. has declared the regular quarterly dividend of 1¾ per cent on preferred stock, and 25 cents a share on the common stock, payable April 1 to stock of record March 20.

—

The Keystone Tire & Rubber Co. has declared the regular quarterly dividend of 2 per cent and an extra dividend of one-third of 1 per cent on preferred stock, and a regular quarterly dividend of 3 per cent on the common stock, payable April 1 to stock of record March 22.

—

The Air Reduction Co. has declared regular quarterly dividends of $1 on the common stock and 1¾ per cent on the preferred stocks, payable April 15 to stock of record March 30.

—

The Reo Motor Car Co. has declared the regular quarterly dividend of 2½ per cent on common stock, payable April 1 to stock of record March 15.

—

The Pennsylvania Rubber Co. has declared a regular quarterly dividend of 1½ per cent on common stock, and 1¾ per cent on preferred stock, payable March 30 to stock of record March 15.

—

Capital Increase

GREENVILLE, MICH., March 18—The Tower Motor Truck Co. has increased its capital stock from $100,000 to $200,000.

Plans Already Completed for Ford's Tractor Plant

DETROIT, March 18—The permanent tractor plant of Henry Ford & Son will be located on the Ford property directly opposite the blast furnaces. It will employ approximately 25,000 men. The Dearborn plant was used as an experiment station and 50 different models were built before the present perfected tractor was decided upon.

The permanent plant will include a foundry, 120 x 225; stock room, 30 x 100; heat treating room, 40 x 145; assembly shop, 44 x 165; assembly shop, 44 x 105; pattern shop, 50 x 105; gas producer plant, 70 x 45; machine shop, 285 x 75; another machine shop, 225 x 90.

—

To Make Manning Carbureters

JANESVILLE, WIS., March 18—The Manning Carburetor Co., organized some time ago at Janesville, Wis., by Elmer J. Manning, Ft. Atkinson, Wis., and H. B. Warne, Janesville, has completed experimental work on a carbureting device designed and patented by Manning. The company is ready to engage in regular production. The carburetor will be marketed under the style Manning.

—

Government Gets 1500 More Packards

DETROIT, March 16—The Packard Motor Car Co. has just delivered 1500 more trucks to the United States Government, making a total of 3500. The remainder will be delivered as fast as they can be produced.

—

Electric Plant for Topp-Stewart

CLINTONVILLE, WIS., March 16—The Topp-Stewart Tractor Co., which recently completed and placed in operation its new tractor plant in Clintonville, Wis., is constructing a large hydro-electric power plant on the Embarrass River, about twelve miles north of the city. It will furnish current for the operation of this and other Clintonville industries. The investment will be about $100,000.

—

Curtiss to Redeem 6 Per Cent Notes

BUFFALO, March 16—The Curtiss Aeroplane & Motor Corp. will redeem on March 29 all of its 6 per cent serial gold notes dated Jan. 1, 1917, at the price of 102½ per cent of the principal amount and accrued interest. Redemption will be made at the office of the Central Trust Co., 54 Wall Street, New York.

—

J. H. Faw Moves

NEW YORK, March 16—J. H. Faw, Inc., accessory manufacturer, is moving from 41 Warren Street to larger quarters at 37 Warren Street.

—

Addition for Buda Co.

HARVEY, ILL., March 19—The Buda Co. is erecting a 4-story addition for assembling and testing truck and tractor engines.

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Signal Corps Needs Many Electrical Men

WASHINGTON, D. C., March 18—The Signal Corps, United States Army, has announced that it can use the services of a large number of men having electrical training. They are needed especially in connection with the radio communication systems in use in the military service.

All classes of electrical men—wiremen, expert electricians, storage battery men, telegraph and wireless operators, and men with electrical engineering training and experience are wanted. The opportunity offered is exceptional because of the great interest and importance of this branch of the service, which has been most aptly characterized as the nerve system of the army.

Application blanks for service in the radio work of the Signal Corps may be secured by addressing the Office of the Chief Signal Officer, Land Division, Training Section, Washington, D. C. Men of draft age may make application and if qualified will be inducted into the army, at their request, for service in this branch of the Signal Corps. After enlistment or induction, all personnel will be sent to one of several radio schools for six weeks to three months of intensive training in one of the three general branches of the radio work for which their previous experience qualifies them. Some of the personnel completing these courses will be commissioned, and the opportunity for advancement for all graduates will be dependent on the individual ability.

—

Brookings Heads Price-Fixing Committee

WASHINGTON, March 16—Robert S. Brookings, commissioner of finished products of the Council of National Defense, has been appointed chairman of the price-fixing committee of the council. He retains his position as commissioner of finished products, but this department will be operated temporarily by Charles M. Peak, appointed vice-commissioner, and who also has charge of the conversion of non-war industries.

—

Opposed to Smaller Salary for Aviators

WASHINGTON, March 18—The Senate Military Committee unanimously disapproved of the repeal of laws providing for extra allowances to aviators. The reduction was recommended by General Pershing and Secretary Baker. It was shown that reliable army hazards statistics were not available and British and French aviators told the committee of the conditions and danger of their work.

—

Restrict Bonus Law for Aviators

WASHINGTON, March 18—Secretary Daniels has announced that in the future Navy aviators will be required to make a certain number of actual flights before being entitled to the usual 50 per cent bonus.

—

$75,000 Appropriated for Standardization

WASHINGTON, March 16—The urgent deficiency appropriation bill, totaling over a billion dollars, passed by the Senate yesterday, contains, among others, the following appropriations:

For engineer department operation in the field, including purchase of material, construction of storehouses, purchase operation, maintenance and repair of horse-drawn and motor-propelled, passenger-carrying vehicles and for ordinary engineer depot expenses; $17,000,000.

To enable the Bureau of Standards to provide scientific assistance necessary in the development of instruments, devices, materials and standardization and testing of supplies for the War and Navy departments; $250,000.

To enable the Bureau of Standards to cooperate with the War and Navy departments and the Council of National Defense for the standardization and testing of standard gages, screw threads and standards required in manufacturing in U. S. and to calibrate and test these; $75,000.

Licenses Now Required for All Enemy Trading

WASHINGTON, March 16—The War Trade Board has determined that branches of corporations and other American concerns established in neutral territory or in territorial countries associated with the United States in the war shall obtain an enemy trade license from the War Trade Board before performing contracts which involve trading with an enemy or ally of enemy. As announced in January the War Trade Board has authorized such American concerns in foreign countries to perform all legal obligations enforcible in the courts of the country where such branches are established, notwithstanding that such performance should involve trading with an enemy or ally of enemies. This authorization, however, has been rescinded and all such branches must hereafter obtain a special enemy trade license as outlined above. Two exceptions to this are (1) that foreign branches of American houses are licensed to deal in enemy commercial paper when refusal may result in failure to collect a debt or may be a violation of local law, and (2) that branches of American banks are authorized to receive enemy paper for collection under such circumstances.

—

300 Per Cent Increase in Oil Price

WASHINGTON, March 18—Statistics of the oil industry gathered here show sharp advances in the price of crude oil in the last 3 years. Since 1915 the price of Pennsylvania grade oil, which is typical, has increased from $1.35 to $4, a gain of 300 per cent. In 1915 United States crude oil production was 11,000,000,000 gallons, and in 1917 13,250,000,000. Most of this increase was used for domestic purposes, the amount exported being almost stationary for the last 3 years. Practically all of the gasoline exported is for the war needs of the allied nations.

Calendar

ASSOCIATIONS

April 15-19—Little Rock, Ark., United States Good Roads Assn. Sixth Annual Session.
June 5-12—Hot Springs, Va., National Assn. Automobile & Accessory Jobbers.
June 17-19—Dayton, O., Society Automotive Engineers, Annual Midsummer Session.

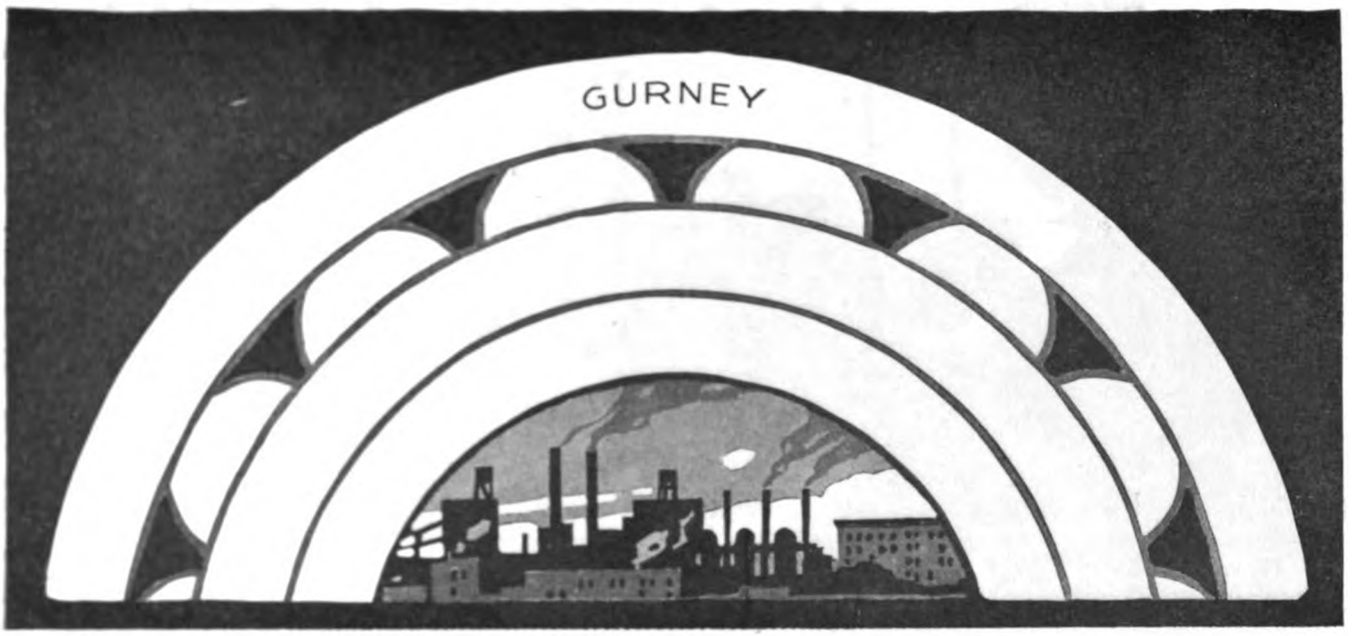
SHOWS

Mar. 19-23—Vancouver, B. C., Western Canada Automobile Show Assn., Horse Show Bldg. D. A. Hamilton, Mgr.
Mar. 20-22—Houlton, Me., Second Annual, Houlton, Motor Car Dealers' Assn., Bangor St. Exhibition Hall. J. D. Luther, Mgr.
Mar. 20-23 — Holdredge, Neb., Second Annual of Southwest Nebraska.
Mar. 20-23—Greensboro, N. C. First Annual. John Kelly, Mgr.
Mar. 20-23 — Trenton, N. J., Trenton Auto Trade Assn., Second Regiment Armory. John L. Breck, Mgr.
Mar. 25-30—Rochester, N. Y., Tenth Annual. Rochester Auto. Trades Assn., Exposition Park. C. A. Simmons, Mgr.
Mar. 25-30 — Bridgeport, Conn., Fourth Regiment Conn. Home Guard State Armory and Casino. B. B. Steiber, Mgr.
Mar. 27-29—Fort Fairfield, Me., Reed's Garage. R. F. Reed, Mgr.
Mar. 30-April 6—Hartford, Conn., Eleventh Annual, Hartford Automobile Dealers' Assn., Inc. State Armory. B. F. Smith, Mgr.
Mar. 30-Apr. 6 — Atlantic City, N. J., Second Annual. Garden Pier. S. W. Megill, Mgr.
Mar. 30-Apr. 6—Chicago, Ill. Second Annual Chicago Used Show. Chicago Auto. Trade Assn. Coliseum.
Apr. 1-6—York, Pa., York Auto Dealers' Assn. T. F. Feiffer, Mgr.
April 3-6—Ogdensburg, N. Y. Second Annual, State Armory.
Apr. 6-8 — Green Bay, Wis., Brown County Automobile Trade Assn.
Apr. 6-13 — Red Bank, N. J., Monmouth County Auto. Dealers' Assn., Armory, E. C. Von Kattengell, Mgr.
Apr. 8-13—Reading, Pa., Reading Automobile Trade Assn.
Apr. 9-13—Stockton, Cal., Third Annual San Joaquin Auto Trade Assn. Samuel S. Cohn, Mgr.
Apr. 16-20—Deadwood, S. D. City Auditorium.
Apr. 17-19—Davis, Cal., Tractor Demonstration. University of California.
Apr. 17-20—Calumet, Mich., Upper Peninsular Show, Copper County Automobile Dealers & Garage Owners' Assn., Coliseum.
May 3-7 — Lima, Ohio. Ohio State Automobile Asn.
Sept. 23-28 — Chicago, National Accessory Show for Fords, Coliseum.

ENGINEERING

June 19-22 — Berlin, N. H. American Institute of Chemical Engineers.
June 26-28 — Buffalo, N. Y. American Society of Heating and Ventilating Engineers.
Sept. 2—Cripple Creek, Colo. American Institute of Mining Engineers.

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Bigger Balls—and more of them—give Gurney Bearings greater capacity

A number of years ago a German Professor named Stribeck published the formula which is commonly used for figuring the permissible loads on a ball bearing.

Stribeck's formula shows that the capacity varies directly as the number of balls used and as the square of the ball diameter, but it remained for a Yankee—F. W. Gurney—to invent a method of assembling bearings that would take full advantage of the laws stated by Stribeck and give the world a bearing of the greatest capacity in the smallest size.

The Gurney Bearing has more balls or larger balls, or both, than other annular bearings. When compared with other annular bearings it is found that the load capacity for the Gurney bearings figures out from 44% to 75% greater than other bearings of the same size.

Comparative tests of different types of bearings made by distinterested parties have proved that these theoretical figures are supported by the actual performance of the bearings under load. In many cases this additional load capacity permits savings in a machine design that are worth more than the total cost of the bearing.

Our Engineers will be glad to cooperate with your designers in making such savings on your product.

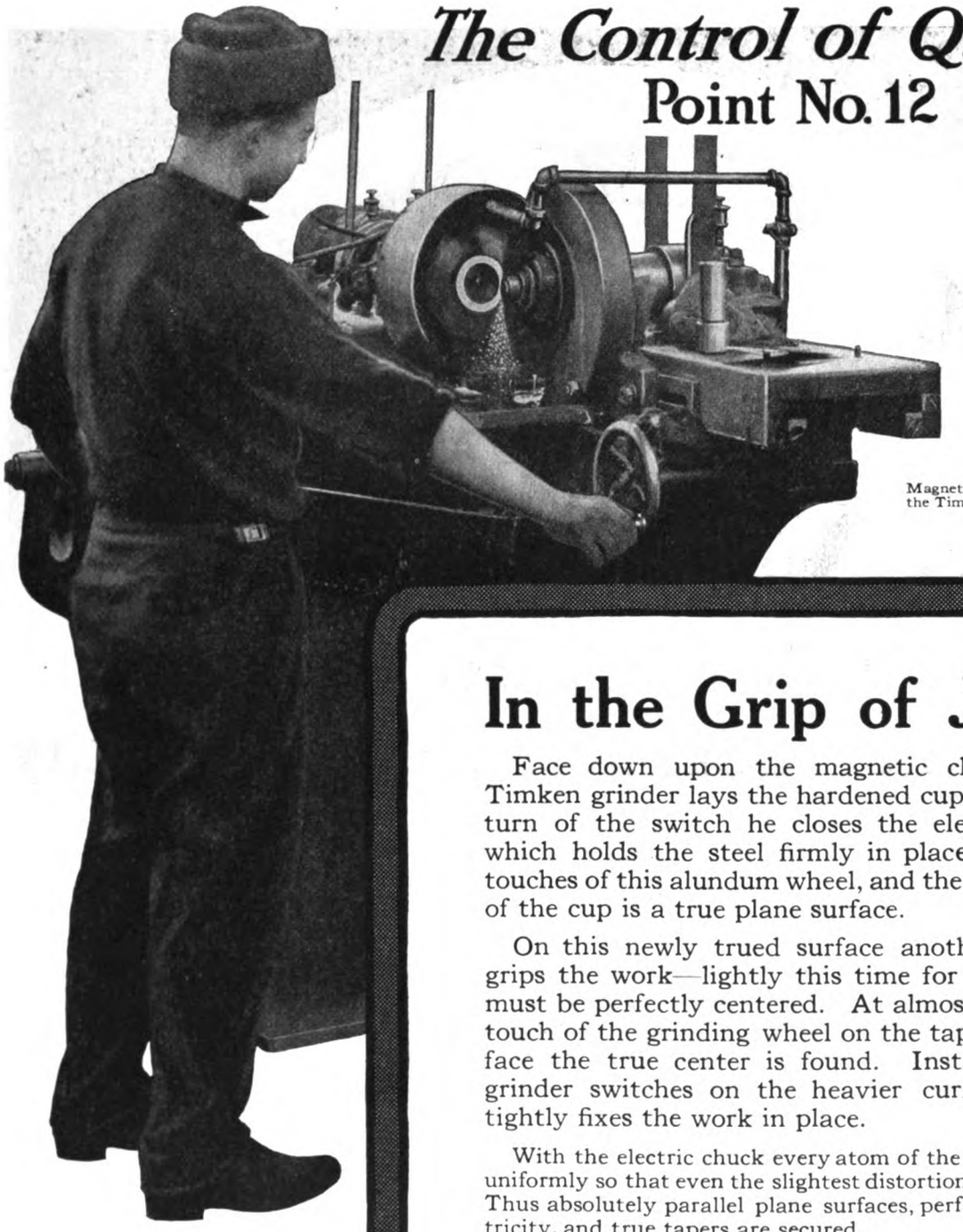
GURNEY BALL BEARING CO.

CHICAGO, ILL. CONRAD PATENT LICENSEE JAMESTOWN, N.Y. NEW YORK, N.Y.

176

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The Control of Quality
Point No. 12



Magnetic chuck in use in the Timken Grinding Room.

In the Grip of Jove

Face down upon the magnetic chuck, the Timken grinder lays the hardened cup. With a turn of the switch he closes the electric grip which holds the steel firmly in place. A few touches of this alundum wheel, and the back face of the cup is a true plane surface.

On this newly trued surface another chuck grips the work—lightly this time for the piece must be perfectly centered. At almost the first touch of the grinding wheel on the tapered surface the true center is found. Instantly the grinder switches on the heavier current that tightly fixes the work in place.

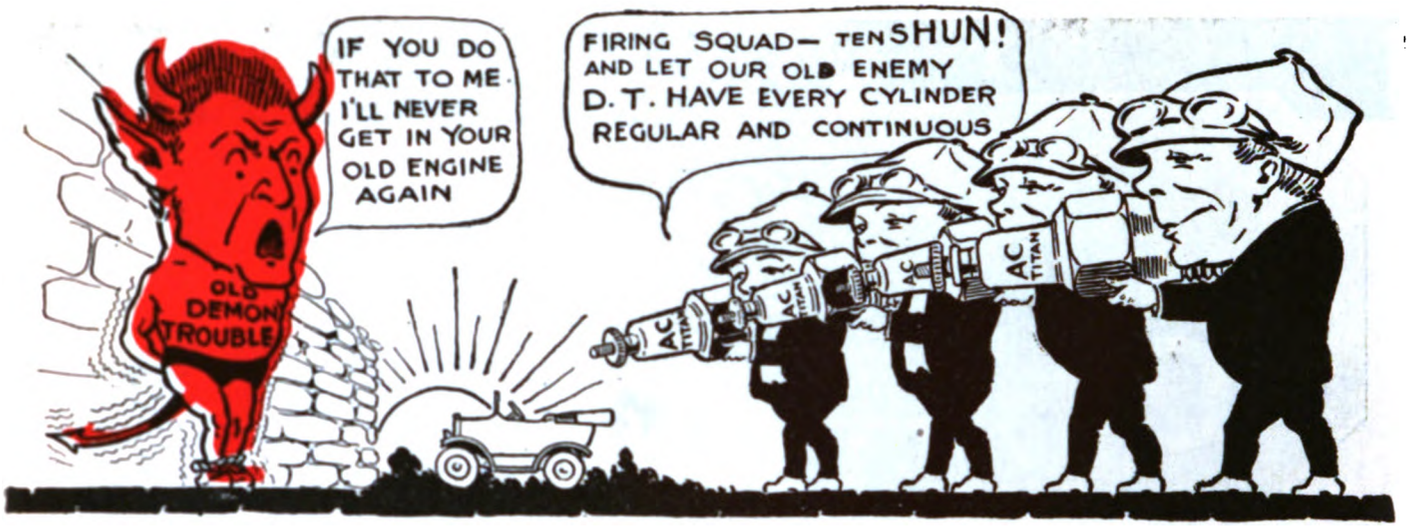
With the electric chuck every atom of the steel is held uniformly so that even the slightest distortion is avoided. Thus absolutely parallel plane surfaces, perfect concentricity, and true tapers are secured.

Just a small point, but necessary to preserve the extreme accuracy so essential to the control of Timken Quality.

THE TIMKEN ROLLER BEARING CO.
Canton, Ohio

TIMKEN BEARINGS

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Here's the most effective way to get rid of old Demon Trouble—use the sure "rapid-firing" AC Spark Plugs. They are made for all types of motors and their action in the "throttle down" and in the quick "pick-up" will give you a new ideal of swift, smooth going.

After strenuous tests the manufacturers listed decided on A C. Can *you* afford to disregard their judgment?

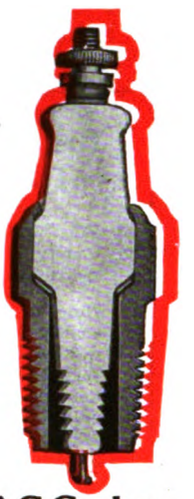


⅞ in. Regular AC Titan

Albert Champion means

AC SPARK PLUGS

The Standard Spark Plug of America



AC Carbon Proof
For Fords Overlands and Studebakers

LOOK FOR AC ON THE PORCELAIN
They Are Made For All Types of Motors

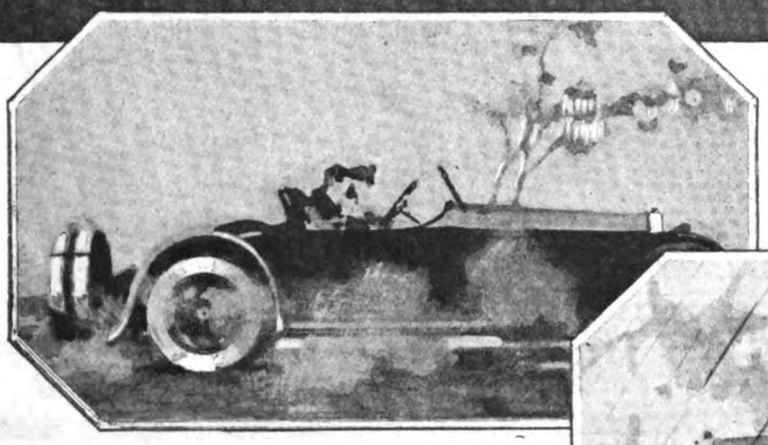
Ford, Overland and Studebaker owners, how often must you clean your plugs? This new AC is exactly what its name implies—*Carbon Proof.* Progressive dealers owe it to their trade to advise AC equipment exclusively.

CHAMPION IGNITION COMPANY
SOLE MANUFACTURERS, FLINT, MICHIGAN

These Manufacturers Use AC as Standard Equipment

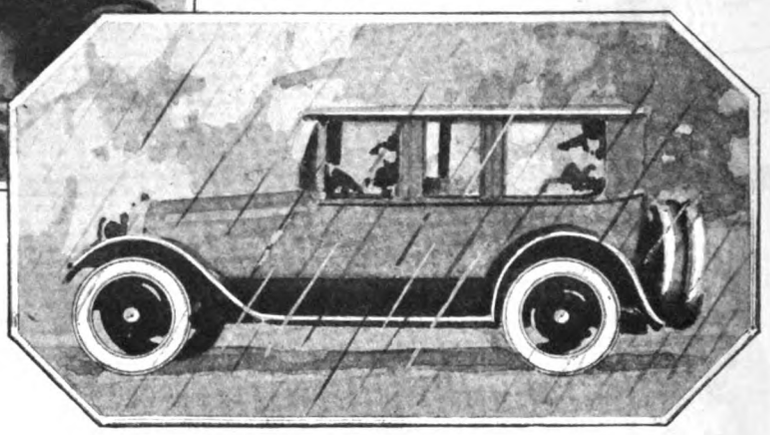
Cadillac	Pilot	Lexington-Howard	Dorris	Gabriel Trucks	Stewart Trucks
Pierce-Arrow	Buick	Scripps-Booth	McLaughlin (Canada)	Moreland Trucks	Wisconsin Motors
Packard	Oakland	Crane-Simplex	American-La France	Wilcox Trux	La Crosse Tractor
Marmon	Oldsmobile	Stearns-Knight	Davis	Sterling Trucks	Advance-Rumely Tractor
Hudson	Nash	Saxon	Sanford	Republic Trucks	Buffalo Motors
Chalmers	Kissel Kar	Stutz	Hatfield	Diamond T Trucks	Continental Motors
Hupp	Premier	National	Maytag	F-W-D Trucks	Deere Tractors
Chandler	White	Stephens	Duesenberg Motors	G. M. C. Trucks	Northway Motors
Haynes	Delco-Light	Jackson	Dodge Brothers	Sandow Trucks	Rutenber Motors
Chevrolet	Murray	Apperson	Old Reliable Trucks	Signal Trucks	Sterling Motors
Dort	J. I. Case	Anderson	Titan Truck	Brockway Trucks	Smith Motor Wheel
Cole	Jordan	Locomobile	Ford Tractors	Samson Tractor	Van Blerck Motors
Reo	Liberty	Daniels	Acme Trucks	Menominee Trucks	Wallis Tractors
Paige	McFarlan	Westcott	Netco Trucks	Federal Trucks	Waukesha Motors
Peerless	Paterson	Singer	Gramm-Bernstein Trucks	Riker Trucks	Gemco Light

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"After months of dust—

—and rain."



Bring This Experience To Your Problems.

What we call a "Better-the-Finish" Laboratory is maintained by us for the special benefit of our customers.

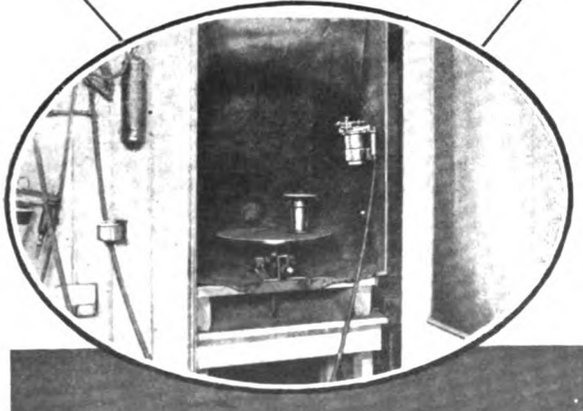
Here your individual problem will be studied from every possible angle. Tests will be made under methods similar to your working conditions. When a solution is arrived at, the particular finish produced will meet your needs exactly, and any suggested change in method will be improvement or economy.

Manufacturers who have used this service have saved money as well as improved their products.

Let us see if we cannot improve your finishing methods—at no cost to you.

Manufacturers handling government work should bear in mind that our experience in co-operating with firms handling similar work is at their disposal.

Corner of B.T.F. Laboratory Showing Spray Brushes and Hood, with Outlet for Sucking Away Fumes.



What of the Finish on Your Cars After Six Months on the Road?

Will it look well—does it stand up, after months of dust, and rain, and road oil?

Appearance sells the car when new. Will its appearance after months on the road sell another?

This is not necessarily a matter of the number of "coats" applied, added expense to the manufacturer, etc. It is a matter of materials and methods.

HILO

Enamels—Japans—Varnishes

A proper selection of materials, a correct plan of applying them, frequently means a saving—certainly of time and labor, sometimes of money as well.

But it means a great deal more than that—it means a finish that can be depended upon, a protective finish that will firmly adhere to the metal, that will be unaffected by dust, rain or oil, as well as retain the smooth, attractive appearance that gives the car a reputation for lasting excellence.

Write for our Bulletin No. 1, on Black Enamels and Japans. It contains information that will help you, whether you buy from us or not.

MOLLER & SCHUMANN CO.

54 years making HILO Enamels, Japans, Varnishes

1-11 Gerry Street Brooklyn, N. Y.

Branch Office: 110 N. Desplaines Street, Chicago, Ill.

[Pacific Coast Representative: The Brininstool Co., Los Angeles, Calif.

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WISCONSIN AXLE

WORM DRIVE

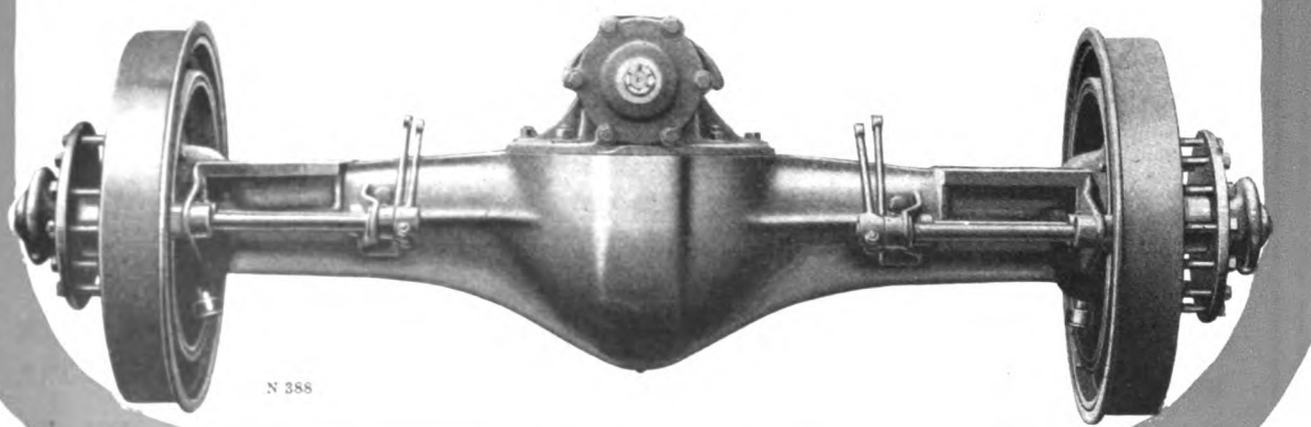
The advantage in placing your season's contract for Wisconsin Axles now is the assurance of positive—and, if desired—immediate delivery.

Many manufacturers are protecting themselves against a possible axle shortage later, by arranging for their entire season's supply while it is still available.

Sales Representative of
B. Hayes Machinery Corporation
Oshkosh, Wis.

Engineering & Sales Corporation
122 South Michigan Avenue, Chicago, Ill.

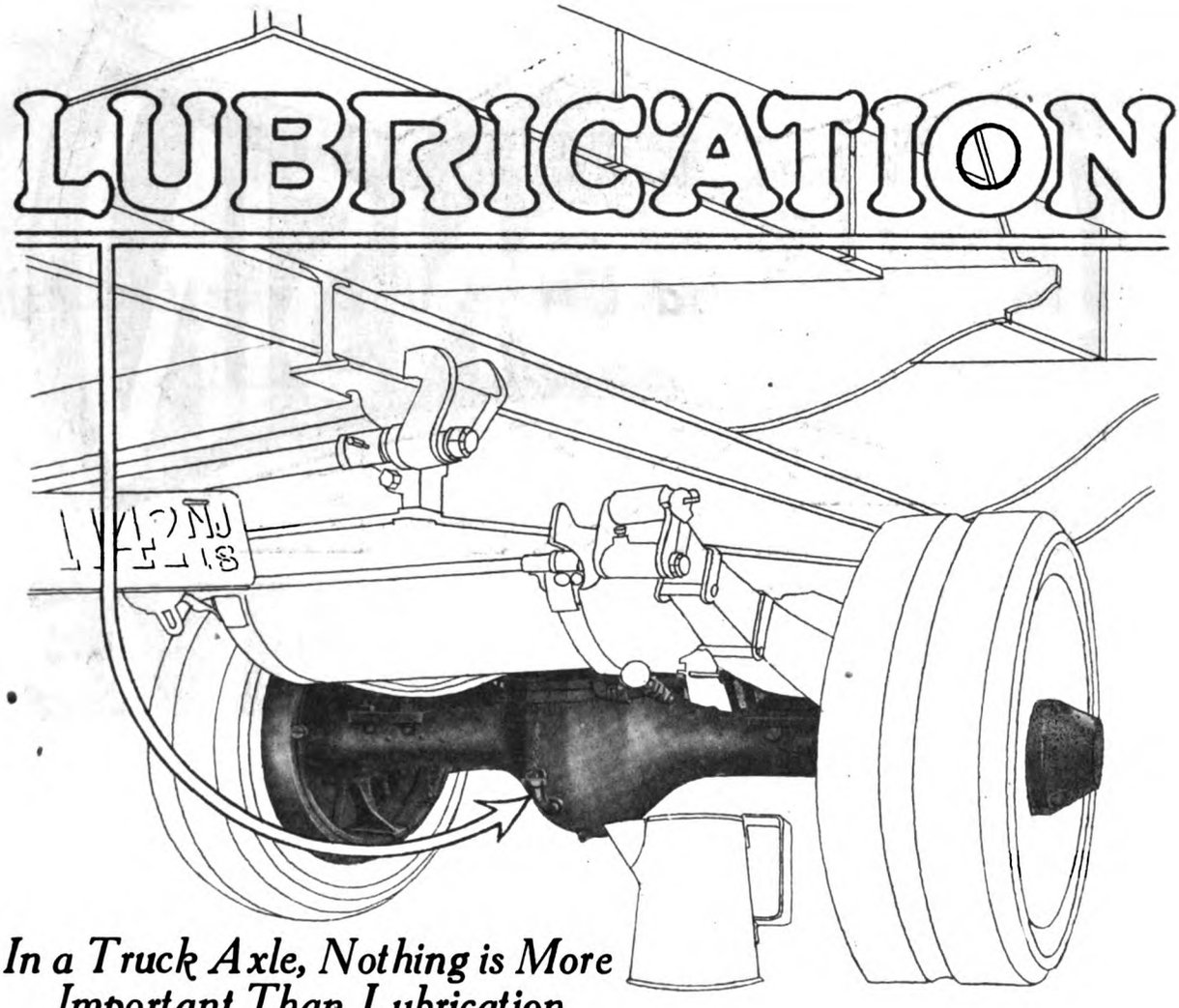
4 Models — 2½, 2, 1½ and 1 ton Capacity.



N 388

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LUBRICATION



In a Truck Axle, Nothing is More Important Than Lubrication

ONE of the Big Advantages of the Sheldon Worm Drive is the perfect mechanical enclosure of the mechanism running in a bath of oil.

Even the wheel bearings enjoy this plenitude of lubricant; for it is automatically conveyed to the central housing, and, since proper closures are provided, there is absolutely no danger of lubricant saturating the brakes.

In speaking of the very thorough manner in which the lubricant is distributed on the SHELDON axles, attention may also be called to the efficient protection afforded the mechanism against the entrance of dirt, water, grit, etc.

Provision is made for lubrication through a big filler cap, which is so easy of access that there is small likelihood of its being neglected, or overlooked, by the driver.

SHELDON

WORM GEAR AXLES

SHELDON AXLE & SPRING CO. *Makers of springs and axles for heavy duty service for more than fifty years.* WILKES-BARRE, PA.

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ATTENTION

To Dealers in and Users of Brake Lining for Automobiles and Belting

IN the case of the Scandinavia Belting Company, Plaintiff, against the Asbestos & Rubber Works of America, Inc., of New York City, Defendant, the District Court of the United States for the Southern District of New York has recently entered an injunction in our favor enjoining the Defendant, the Asbestos & Rubber Works of America, Inc., from selling or offering for sale belting or brake lining, not of Plaintiff's manufacture, under the names or designations Scandinavian Woven Lining, Ford Scandinavian Woven Lining, Ford Scandinavian Brake Lining, Scandinavian Weave, Scandinavian Type, Scandinavian and the abbreviated form of the word Scandinavian, to-wit, Scand., or under any word or words of like import.

We take this opportunity to again warn the public from buying or selling any belting or brake lining not of our production under any one of the foregoing names.

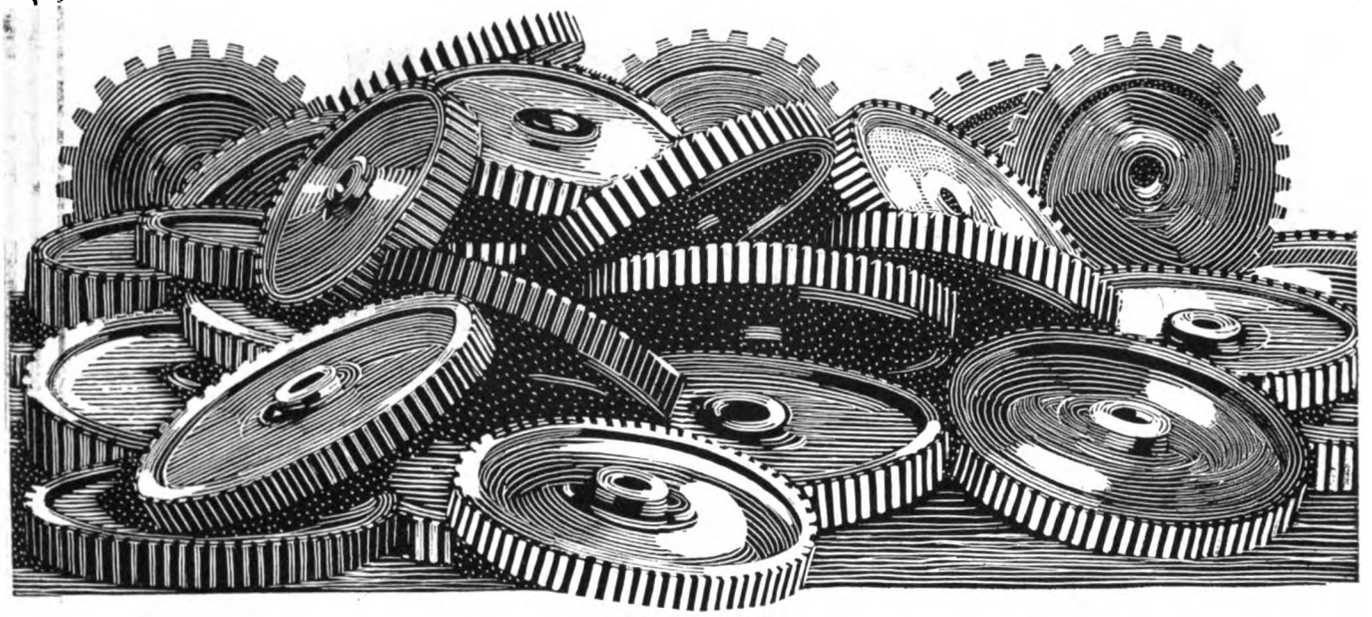
The Scandinavia Belting Company

106-108 Reade Street, New York City

NEW YORK BOSTON CLEVELAND EASTON PITTSBURGH CHICAGO
ATLANTA SAN FRANCISCO LOS ANGELES PORTLAND (Oregon)

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It Used to Take All of These



Night and day, seven days a week, the machinery of a big middle-west plant* struggled against the overwhelming demands upon its capacity.

Production—more production—still more production—that was the only way out.

In such a situation, equipment which in normal times appears good enough is likely to show up in its real weakness, unable to stand extraordinary strain.

In this case it was the bronze gears on drill presses being used for heavy work. To the men in charge of these presses, it seemed as if the gears required constant changing. Sometimes they lasted but three days, sometimes four, seldom more than five.

And, of course, every gear change cost the time of man and machine, which meant both decreased output and increased costs.

Then a *Lynux* representative suggested that they give *Lynux* 91 Gear Bronze a trial at this difficult job.

Today instead of changing gears every four or five days, they change them only once in three months or more.

One gear is doing the work that twenty-five used to do.

There's one stop now where there used to be twenty-five.

There's one minute lost where there used to be twenty-five.

There's one gear to pay for where there used to be twenty-five.

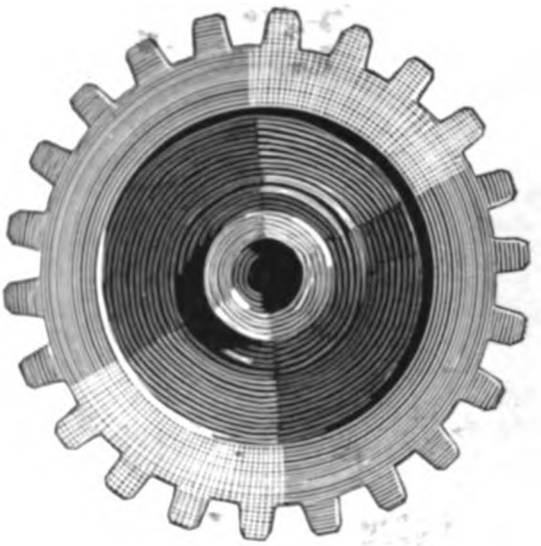
What *Lynux* 91 Gear Bronze may add to the life of *your* gears depends upon your own conditions. But this you can be sure of—that with a tensile strength of 75,000 to 100,000 pounds to the square inch, *Lynux* 91 is a superior bronze for heavy-duty.

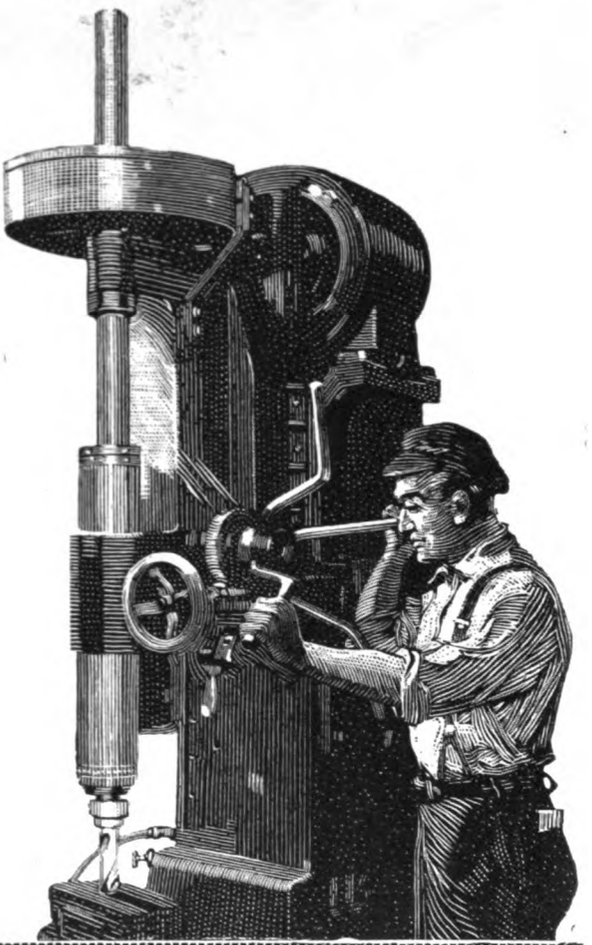
*Name on request.

LYNUX
BRONZES

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to Do What this One Now Does





Lynux 91 Gears Cost *Less*

Lynux 91 gears cost less because they can be made with cast-teeth, which saves milling cost. They are lighter than ordinary bronze gears because the metal itself weighs fully 12 per cent less and an additional weight reduction is effected by coring the teeth.

The exceptional quality of *Lynux* 91 is largely due to the highly scientific methods employed in *Lynux* foundries, which have put brass and bronze casting in this country on a new plane.

Lynux foundries are equipped to turn out practically every kind of brass and bronze casting, from an ounce to a ton.

Lynux Bushings and Bearings are widely known for their excellence.

Let us send you our monthly mailings on subjects that interest the buyer of brass and bronze. Address Dept.47, Cleveland, Ohio.

Are you familiar with LYNITE, that remarkable group of aluminum alloys? If not, ask us about it. LYNITE is the ideal metal to use where lightness is required.

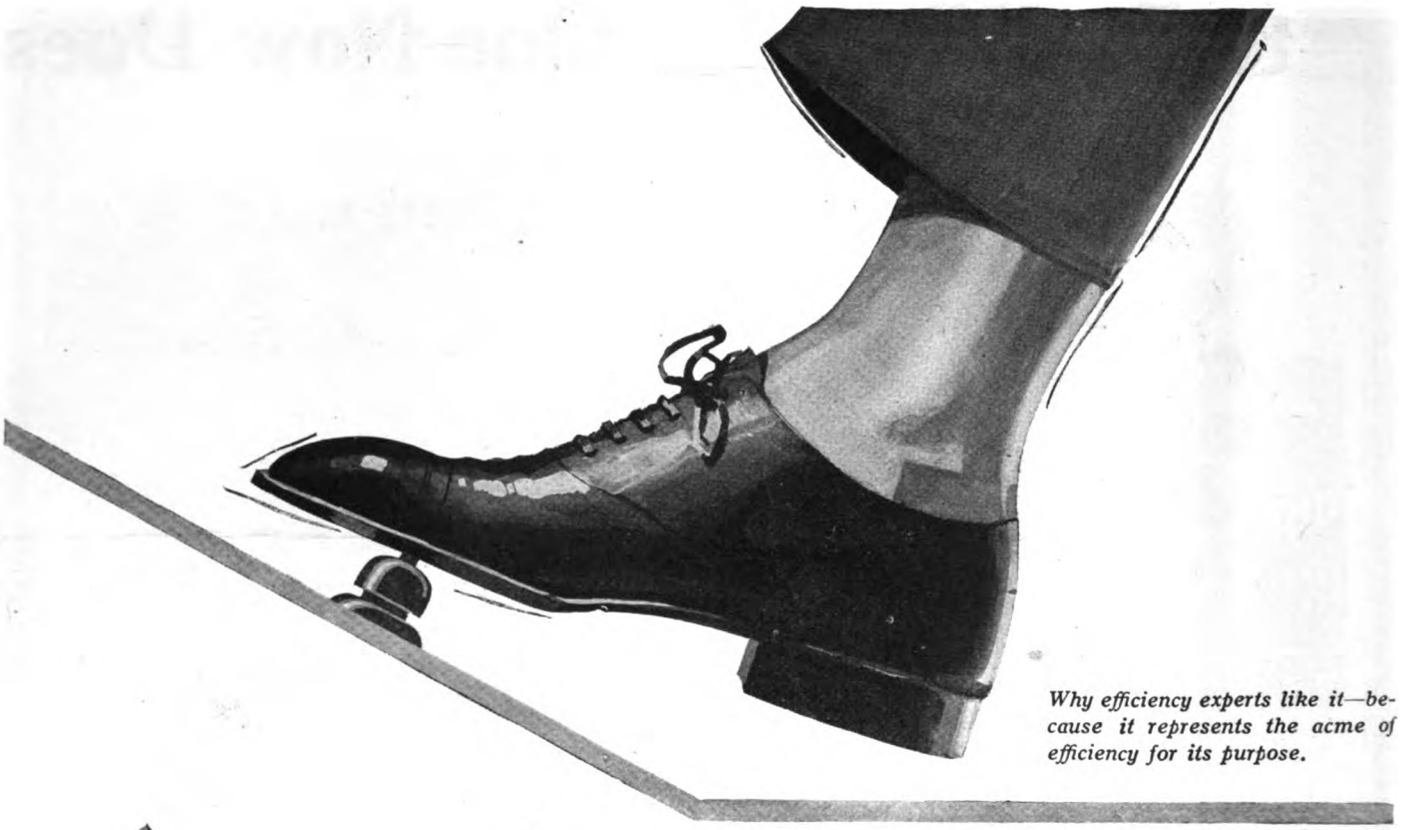
THE ALUMINUM CASTINGS COMPANY

LYNITE and LYNUX Castings

Cleveland Detroit Buffalo Manitowoc, Wis. Fairfield, Conn.

GEAR BRONZE

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Why efficiency experts like it—because it represents the acme of efficiency for its purpose.

Auto-Lite

Starting, Lighting & Ignition



The One Thing All Can Agree Upon

You may prefer a different body style, a different number of cylinders or a different priced car than your neighbor owns.

But there is one fundamental necessity for all cars the vast majority agree upon.

They want the electric Auto-Lite System.

They want it because they trust the judgment of engineers who equip their high-priced cars with Auto-Lite.

And because the world's largest car builders use Auto-Lite.

And because its work is so important that builders of lower-priced cars are willing to pay more for the better service Auto-Lite gives rather than risk inferiority.

And because they know it must be superior, otherwise Auto-Lite would not be the largest in the world with a daily output of 1800 systems.

Be sure the next car you buy has Auto-Lite equipment.

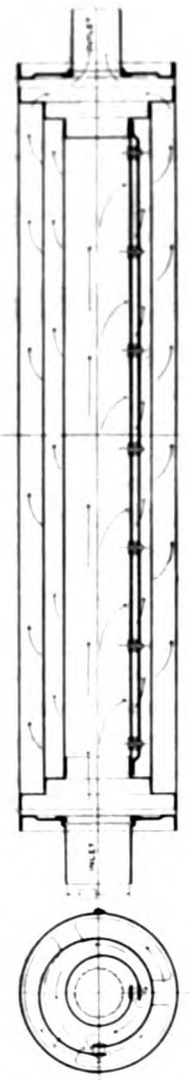
The Electric Auto-Lite Corporation

Head Office and Factory:
Toledo, Ohio

Detroit Sales Office:
1507 Kresge Bldg.

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IS YOUR CAR MAXIM – EQUIPPED ?





The **Maxim Silencer** solves the muffler problem definitely. No 1918 car will be complete without one.

Motorists are waking up to the fact that poor mufflers are quite a handicap to their motors.

Thorough tests have proved the increase in power and decrease in fuel consumption that follow the installation of an efficient silencing device.

The MAXIM SILENCER

Everybody knows of the **Maxim Silencer** for trucks and passenger cars. You don't have to introduce it to your customers. They will **ask** for it.

Add to the sales value of your cars by installing a Maxim Silencer. **Do it now!**

Write for full particulars and terms, etc.

G.P.&F.SERVICE

"KNOWING HOW SINCE '81"

Geuder, Paeschke & Frey Company

1422-1700 St. Paul Ave. MILWAUKEE, WIS.

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"—and 360 of these little tots, their souls wrung with the torture of denial, turned away—*to die.*"

There they were, in front of our Relief Station, some sitting, some leaning against the wall—for they were weak, these tiny sufferers. Of our scant supply of food there remained but enough for 70, with 430 yearning, craving stomachs waiting in hopeful anticipation. And, oh God, the look of agony that went up from those 360 who were turned away unfed! They trudged off, so wearily, so painfully, so hopelessly—where?—***wherever there was a place to lie down and die.***

And that night a government cart rolled down the streets on a gruesome errand. * * *

Yes, this is true, and typical of the plight of 400,000 other little mites in Armenia and Syria, victims of the religious fanaticism of their Moslem masters. Torn from their homes (and such happy homes they were!) with relentless brutality during the recent campaign of murder and pillage conducted by the Turks, they were forced by these German-led troops to flee across the desert, while fathers and older brothers were butchered, mothers and sisters outraged.

This is Armenia, this is Syria, once the fair home of a cultured and prosperous people, now a symbol of Turkish ruthlessness—a shambles. To this not even the tragedy of Belgium is comparable. And all that is left to the two million and a half survivors is starvation, unless—and this part is ***wholly up to you***—unless the work of relief, so ably started, is given sufficient financial support to continue. However little you have, of that little you can spare ***something*** to help lift the cloud of desolation that hangs so heavily over this hapless land.

The Price of One Cigar a Day Will Save One Life

Seventeen cents a day ($5 a month) will keep one child properly nourished. No American business man can refuse so slight a sacrifice in so noble a cause —and it's America ***alone*** that can help. Give what you are able to: all you can—but give this little ***at least.*** Pledge yourself to the maintenance of one child—more if you can. Remember, there is a little life ***dependent on you!*** Whether you send $1, $5 or $100, every penny you donate will go for relief, as all campaign expenses are met privately.

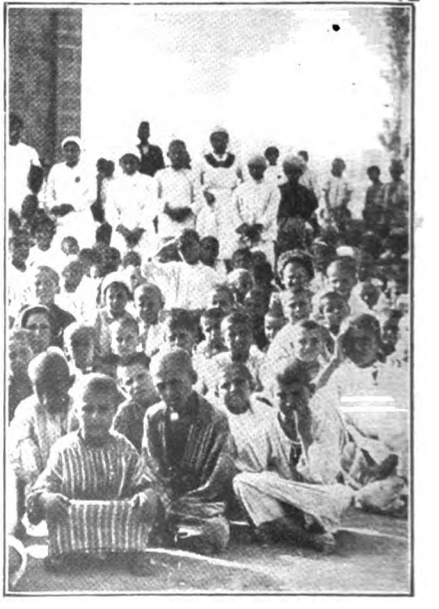
Send all money and make checks payable to

CLEVELAND H. DODGE

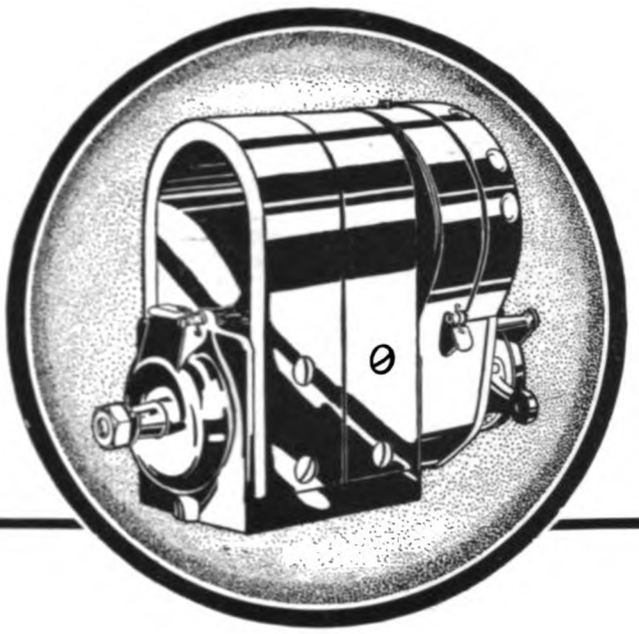
Treasurer, Armenian and Syrian Relief

1 Madison Avenue, New York City

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When Mr. Schwab Discusses Steel—

he is sure of an interested audience.

When Mr. Edison discusses electrical innovations, we listen to him with respect.

When Signor Marconi speaks of wireless, every word has weight.

Whenever recognized authority expresses itself, we can rely upon its opinions and judgment.

So, when the motor manufacturers who are known to maintain the highest structural standards adopt Eisemann Magnetos as standard equipment, isn't it conclusive evidence of superiority?

In the truck field, where the hardest tests come, 81 manufacturers have done so. Most of the recognized leaders are included in that number.

THE EISEMANN MAGNETO CO.

Sales and General Offices: 32 Thirty-third Street, Brooklyn, N. Y.

Chicago, Ill., 910 So. Michigan Avenue
Detroit, Mich., 802 Woodward Avenue

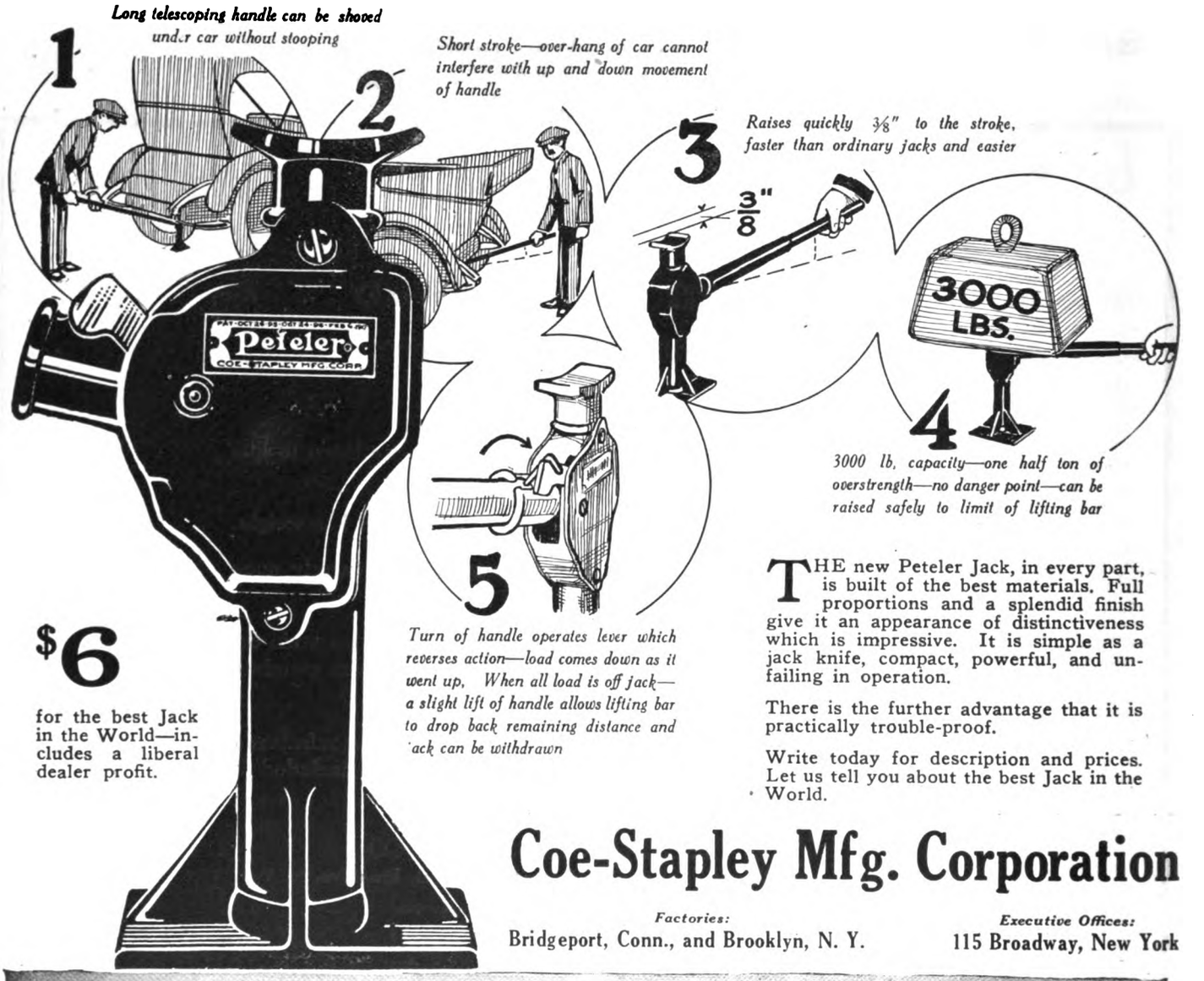
THE

EISEMANN

MAGNETO

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5 Big Reasons Why The Peteler AUTO JACK is the Best Jack in the World



$6 for the best Jack in the World—includes a liberal dealer profit.

THE new Peteler Jack, in every part, is built of the best materials. Full proportions and a splendid finish give it an appearance of distinctiveness which is impressive. It is simple as a jack knife, compact, powerful, and unfailing in operation.

There is the further advantage that it is practically trouble-proof.

Write today for description and prices. Let us tell you about the best Jack in the World.

Coe-Stapley Mfg. Corporation

Factories: Bridgeport, Conn., and Brooklyn, N. Y.

Executive Offices: 115 Broadway, New York

COE-STAPLEY

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SUNDERMAN
Vacuum Carburetor



Model F

PRICE

$6 F. O. B. Newburgh

For Ford, Metz and Saxon Four

TWO million cars now running in this country need this model F Sunderman Carburetor.

It contributes—**actually** contributes—many times its cost every year to the owner who installs it on his car in the saving on gasoline.

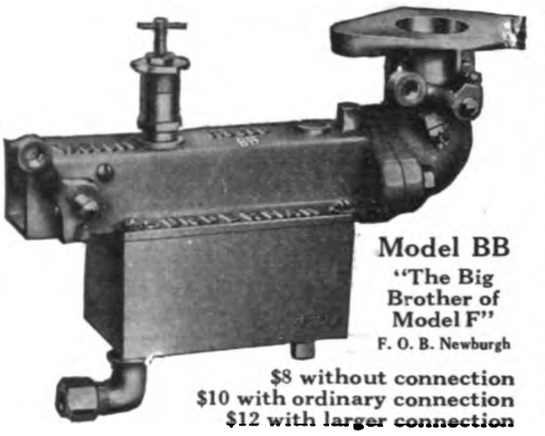
It saves from 30% to 50% on **any** car, and on the Ford, Metz and Saxon Four the average is nearly 50% always, with a saving beyond that point frequently reported.

It gives more power to all cars—and to **these** cars a power their designers never even hoped for. It gives them a flexibility that is a joy to the driver of eights and twelves, but which the driver of a small car never before experienced.

It gives them a **getaway**—a pick-up, a rugged hill-climbing ability—that were never bought with the car.

Now is the time to buy this carburetor—you should put it on your car this month and let it begin to make good for you right away.

SEE YOUR DEALER NOW—OR WRITE US DIRECT TODAY



Model BB

"The Big Brother of Model F"

F. O. B. Newburgh

$8 without connection
$10 with ordinary connection
$12 with larger connection

THE development of Model BB Sunderman Carburetor is the simple, logical outcome of the tremendous demand that has been created by satisfied users of our Model F. The latter has scored a success so great that its utility as a universal carburetor cannot be challenged.

For Larger Cars

Model BB embodies every feature of Model F, but the float has been redesigned, enlarged, and its position changed to make its installation easier on the great variety of large cars. The jets are encased in a mesh screen (patent applied for) which serves to strain the gasoline at the intake.

This model also serves still further to gasify the charge because of the higher lift due to the change in position of the float chamber, and the result is a mixture so easily explosible as to make starting easier than ever.

This carburetor—Model BB—will make that used car you're going to buy step out like a 1918 winner.

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SUNDERMAN CORPORATION

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Steel for Service

Increased Production Schedules

mean an increased strain upon every machine. If each machine is not well designed, or if any part is not made of the best materials obtainable, serious trouble will develop sooner or later.

Gears are an important part of each machine. If they fail the machine is idle until a like gear can be obtained from the storeroom or from its manufacturer and put in place in the machine. Meanwhile your production schedule is tied up.

Many manufacturers are using gears made from

Carnegie Rolled Steel Blanks

in order to protect their increased production schedules against delays due to breakdowns or too frequent renewal of gears.

Severe industrial use has proven that gears made from Carnegie Rolled Steel Blanks wear three to seven times as long as cast steel gears. Such gears cost slightly more but their long life and protection against breakdowns make for real economy in the long run.

Safeguard your increased production schedule by using gears made from Carnegie Rolled Steel Blanks.

Carnegie Steel Company

General Offices: Pittsburgh, Pa.

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Look for the GTD trade mark when you want the best Taps and Dies

Every garage and repair shop should be equipped with "LITTLE GIANT" Combination Screw Plates. Furnished both in U. S. and S.A.E. Standards.

Each die is contained in its own collet and adjusted to size. There is also a Bit Brace Die Holder for cleaning up battered threads in out-of-the-way places.



If you are a manufacturer, garage or repairman—or a car owner who makes his own repairs—you can be supplied from our big established line.

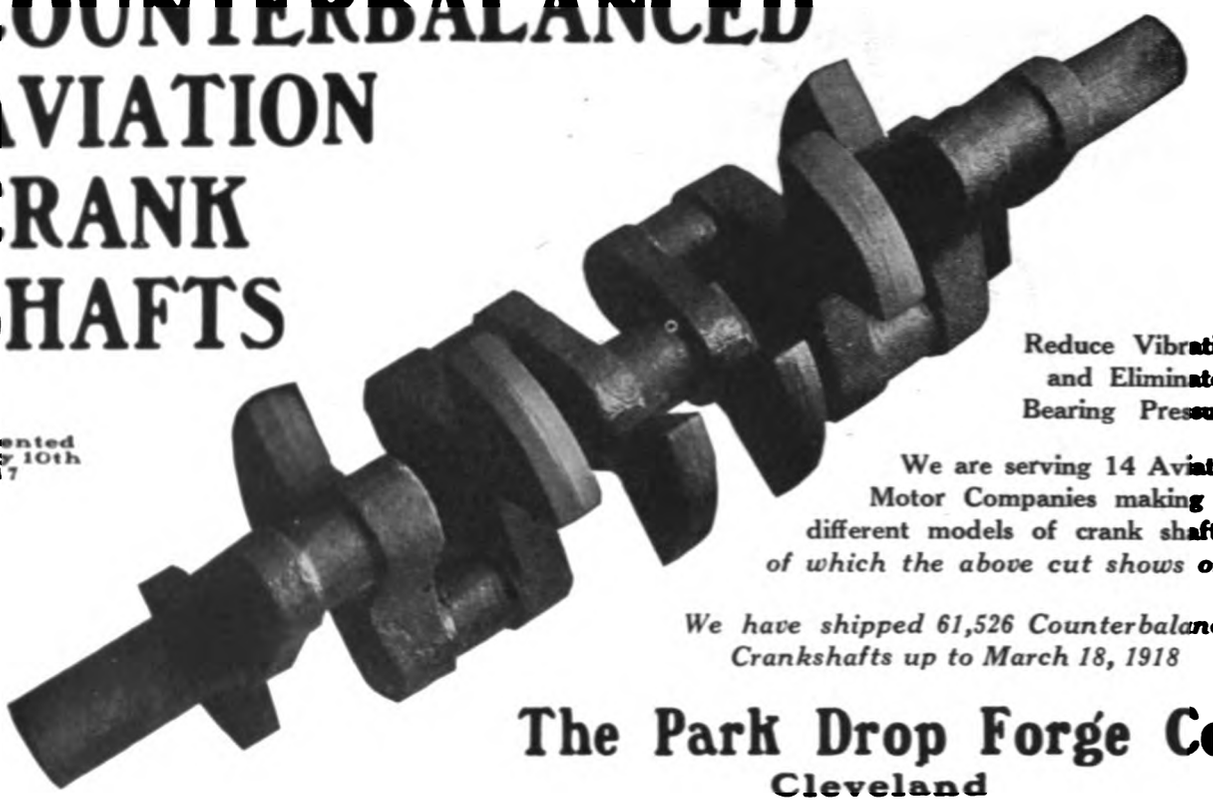
Write today for the No. 37 Catalog

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Greenfield Mass.

New York, 28 Warren St.
Chicago, 13 S. Clinton St.
Canadian Factory: Wells Brothers Co. of Canada, Ltd., Galt, Ontario.

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COUNTERBALANCED AVIATION CRANK SHAFTS



Patented July 10th 1917

Reduce Vibration and Eliminate Bearing Pressure.

We are serving 14 Aviation Motor Companies making 18 different models of crank shafts... *of which the above cut shows one.*

We have shipped 61,526 Counterbalanced Crankshafts up to March 18, 1918

The Park Drop Forge Co.
Cleveland

"WHITNEY"
COTTER TYPE
TRANSMISSION CHAIN
For MOTOR TRUCKS and TRACTORS

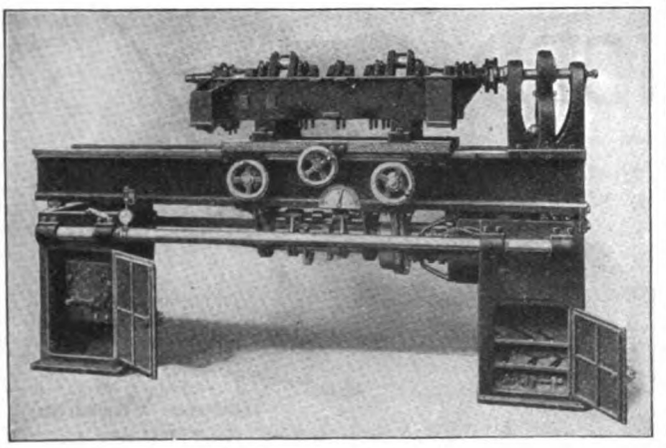
Our years of experience in chain making combined with the care taken in the various processes of manufacture and our rigid system of inspection make "Whitney" Chains accurate, strong and reliable.



"Whitney" Chains are "doing their bit" on the battle fronts of Europe, where dependability is the all-important factor and where failure may spell disaster.

THE WHITNEY MFG. CO., Hartford, Conn.
Chains **Keys and Cutters** **Hand Milling Machines**

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"carwen-balanced"- what it might mean

Try to measure in fighting terms the value of completely eliminating crankshaft vibration from all our airplanes at the front. It would mean—

Less fatigue for the pilots;

Less distraction for the observers;

A better chance to sight both guns and bomb-dropping devices;

Less racking for 'planes and motors, and fewer mechanics to keep them going.

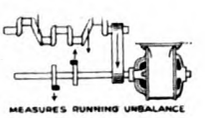
In effect, a substantial increase in our air force, through the heightened efficiency of each unit.

And it would cost less money, less skilled labor, less priceless time, than the cut-and-try methods once necessary.

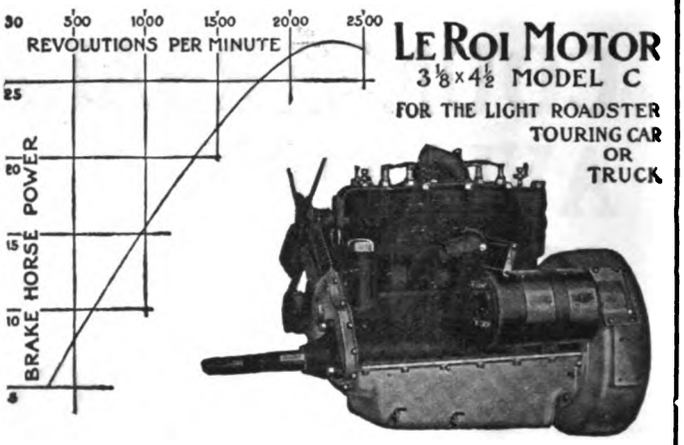
The entire process of balancing a motor crankshaft by the Carwen method takes approximately twenty minutes. The result is mathematically precise.

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Erie Ave. at Richmond St.
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Makers also of Carwen Ball Bearings

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Dynamic Balancing Machine
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FOR THE LIGHT ROADSTER TOURING CAR OR TRUCK

Used by leading manufacturers of best-known American-made light trucks.
The business of manufacturing Le Roi Engines, formerly conducted by Milwaukee Machine Tool Co., is now carried on by

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The Definitely Located Three Area Contact



Gives More Than Three-fold End Thrust Capacity

The Internationally Standardized Schatz "Universal" is the safest, longest-lived, smoothest-running and, by 300% to 400%, the most efficient of all annular ball bearings in carrying end thrust loads.

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Gt. Britain: 37 Sheen Road, Richmond, London

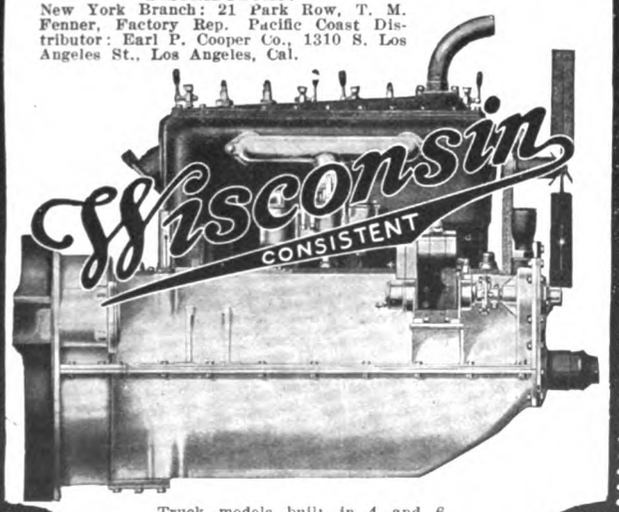
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On the battlefields of Europe and Asia, Wisconsin Motors are giving the same consistently dependable service that has made them champions of the world on road and speedway.

What better evidence could be had of their fitness for heavy truck service?

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Truck models built in 4 and 6 cylinders. Write today for specifications.

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The Hoover Steel Ball has, through force of merit, supplanted the high grade steel balls formerly supplied to the world only by Germany, and has brought supremacy in this industry back to the United States, where it originated.

The romance of the steel ball industry makes a deeply interesting tale of the triumph of American financial, industrial and scientific preparedness and progressiveness. This story, told in a book, "The Evolution of the Steel Ball Industry," will be sent on request.

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The Indispensable Requisite

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The E & J Spotlight has been approved by more drivers than any or all of the others.

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Page 81 This Number

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Transmits Starting Power on 153 Makes of Automobiles

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Keeps your motor young with a perfect film of oil around *all* working parts
Greater viscosity—perfect heat resistance—two to three times more mileage—

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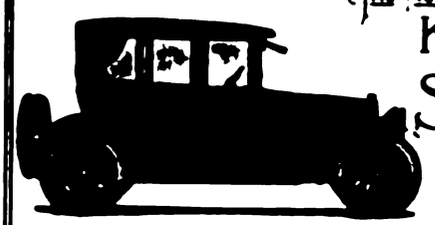
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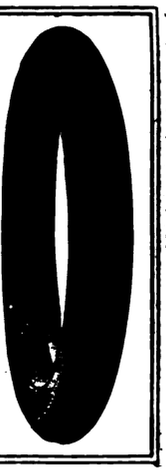
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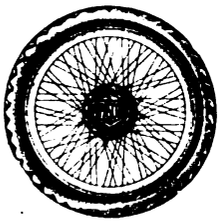


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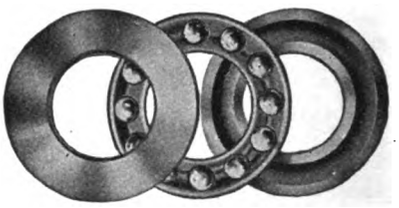
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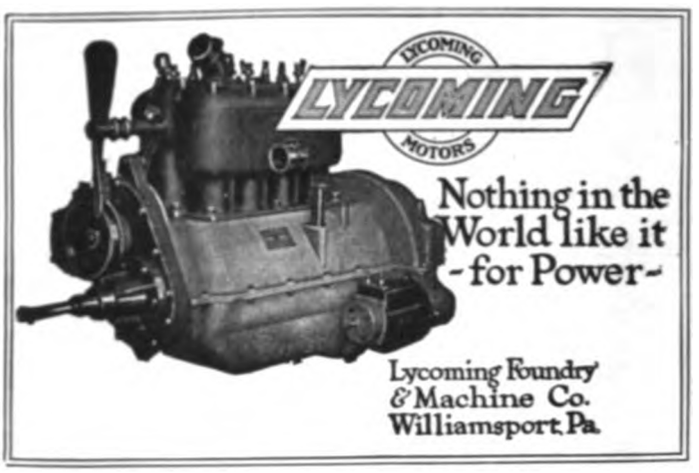


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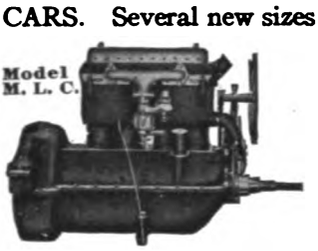


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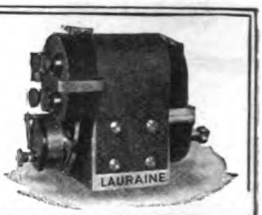
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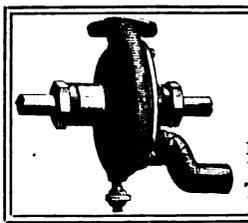
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There's not a pressed steel part used by the automotive industry that we're not equipped to make—and make *right*. We also do annealing, case hardening, nickel plating and electric and oxy-acetylene welding.
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33 x 4	15.55	3.35	7.50	1.70	7.80
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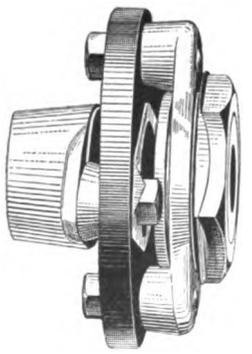
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Standard Magneto Couplings?



If they are not, you are needlessly wasting time in setting your magnetos.

FLEXITE Couplings are instantly adjustable and permanently locked.

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MOTOR EFFICIENCY
50 CHURCH STREET
NEW YORK

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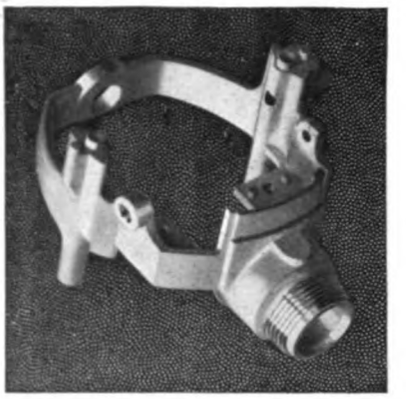
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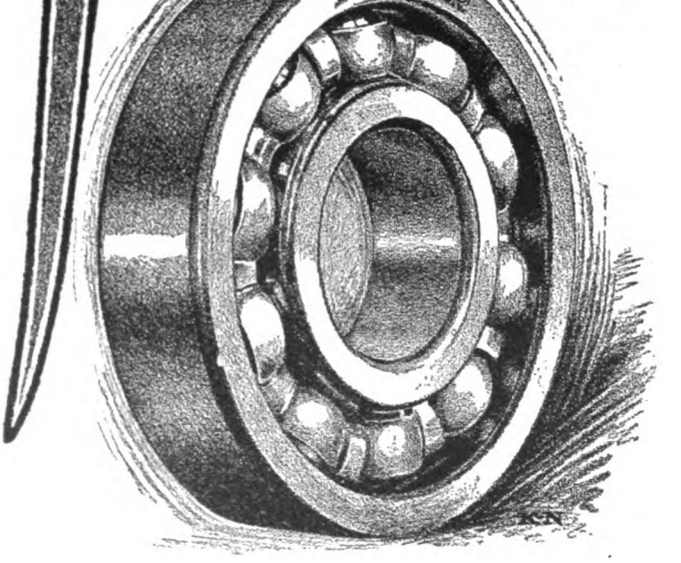
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Dependable Ball Bearings
THE FAFNIR BEARING CO.
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AGATHON Chrome Vanadium

AGATHON Vanadium *AGATHON High Carbon*

AGATHON Special Analyses

AGATHON
ALLOY STEELS

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The CENTRAL STEEL Co.

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OHIO

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J. E. Dockendorff & Co., 20 Broad St., New York, General Export Agents.

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Right is more precious than peace, and we shall fight for the things which we have always carried nearest our hearts —for democracy, for a universal dominion of right by such a concert of free peoples as shall bring peace and safety to all nations and make the world at last free.

—Woodrow Wilson, 1917

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Tillotson
CARBURETOR

IN THE illustrations below we have endeavored to bring out the chief points of advantage in the Tillotson design.

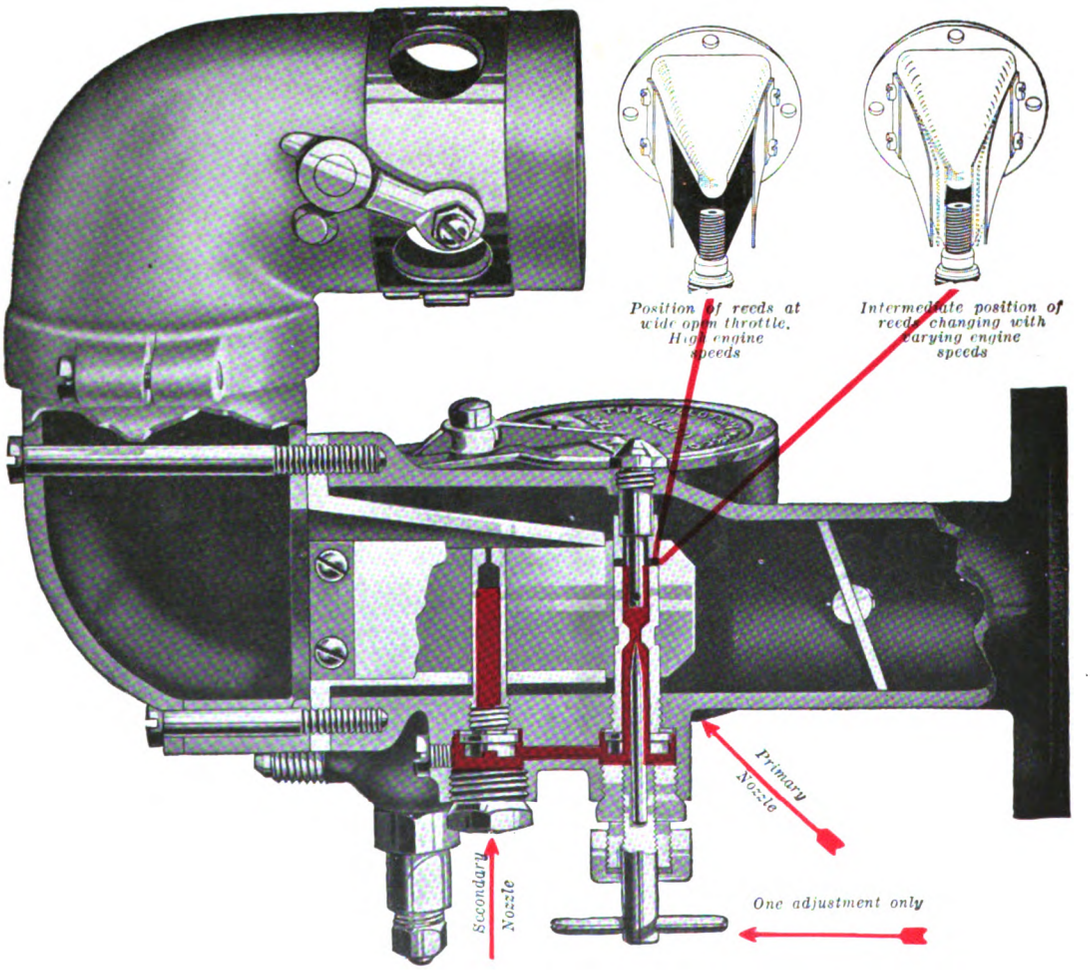
The smaller views of our automatic air valve feature show how the two flexible steel reeds expand and contract so as to maintain at *all* engine speeds the *highest possible vacuum* and *greatest air velocity* at the point where the fuel nozzle is located.

The Primary Nozzle furnishes fuel at *all* speeds, but at the slower engine speeds is the only one called upon. The only adjustment necessary on *any* Tillotson model is the one that regulates the flow of gasoline.

The Secondary Nozzle automatically begins to furnish fuel at the higher engine speeds. It is the reserve supply—always ready but never used except when higher speeds demand it.

We believe we can prove to your absolute satisfaction the superiority of the Tillotson design. Ask for the proof.

The Tillotson Manufacturing Company
Toledo, Ohio



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SEP 17 1938
B

AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Vol. XXXVIII
No. 13

NEW YORK, MARCH 28, 1918

Ten cents a copy
Three dollars a year



Whose Fight is This?

Yours? His?
Or Both?

Better Buy *Another*—

LIBERTY BOND

THIS SPACE AND DESIGN CONTRIBUTED TO THE WINNING OF THE WAR BY Timken Bearings FORMERLY U.S. BALL BEARINGS U. S. BALL BEARING MANUFACTURING CO. CHICAGO ILL.

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Repairs Leaky Radiators Instantly

Stop Those Leaks



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JOHNSON'S RADIATOR CEMENT

Johnson's Radiator Cement blends perfectly with the water until it reaches the leaks—just as soon as it comes in contact with the air it forms a hard, tough, pressure-resisting substance which is insoluble in water and consequently makes a permanent seal.

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Quarts, $1.75 Pints, $1.00 Half-pints, $ .65

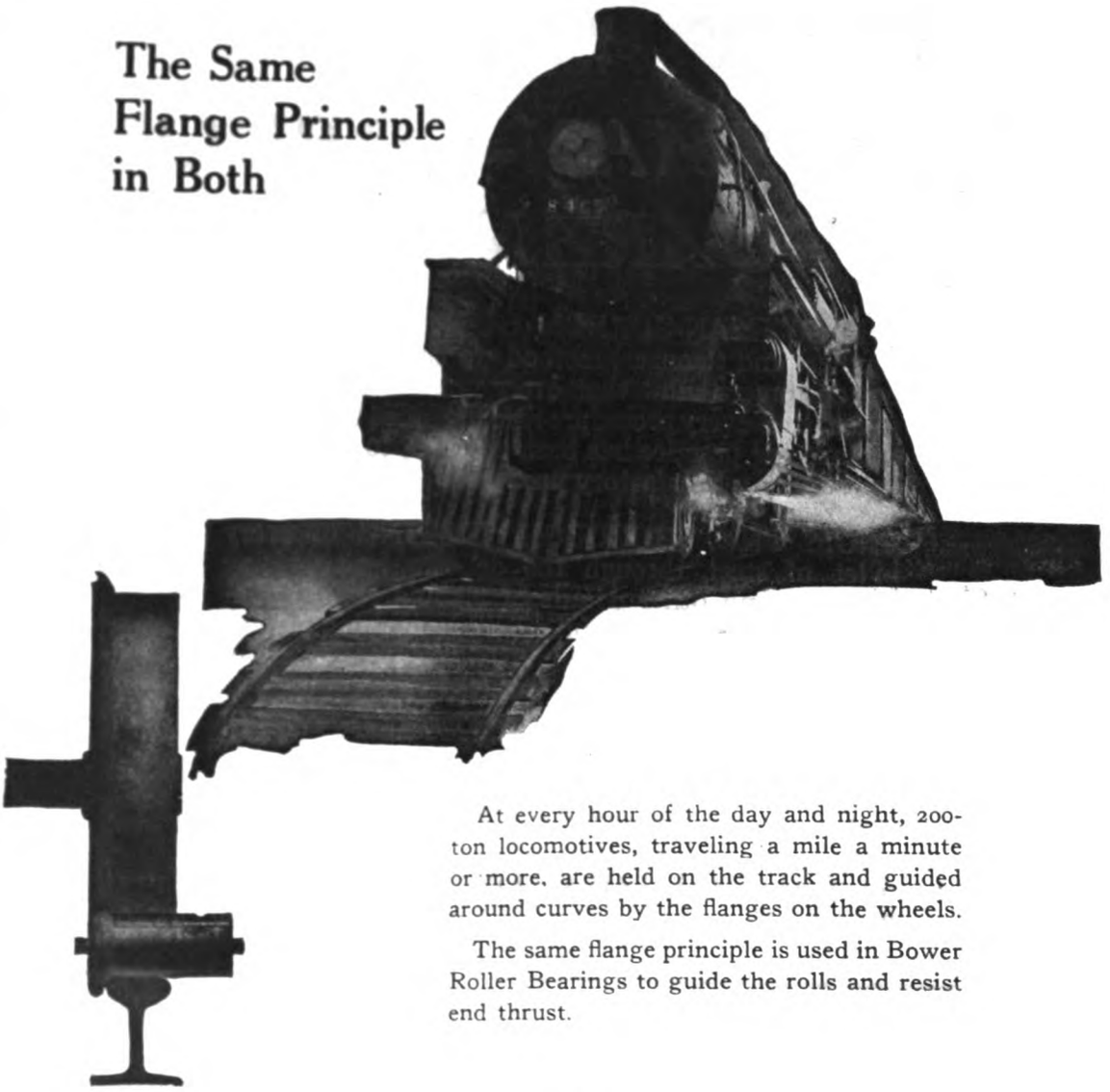
Write for our folder on "Keeping Your Car Young"—It's Free.

S. C. JOHNSON & SON, Dept. A, Racine, Wis.

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The Same Flange Principle in Both



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The same flange principle is used in Bower Roller Bearings to guide the rolls and resist end thrust.

BOWER

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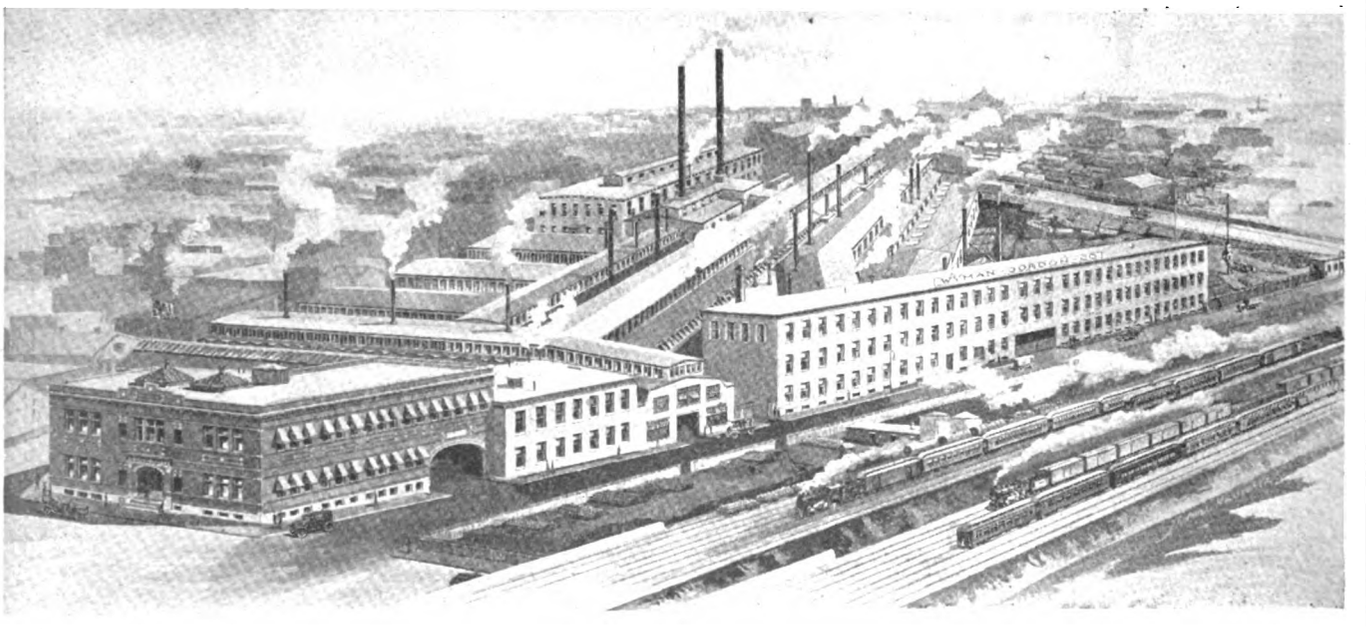
THE WYMAN-GORDON GUARANTEE is the simplest and strongest method we can adopt to let our customers know that every precaution has been taken, that every procedure recommended by modern engineering practice has been adopted, to assure the delivery of a satisfactory product.

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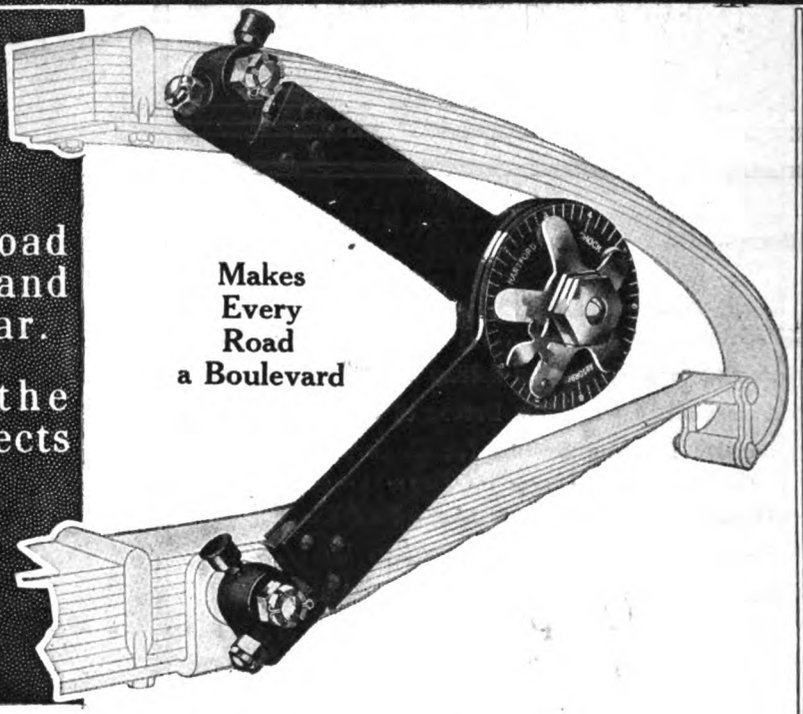
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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XXXVIII NEW YORK—THURSDAY, MARCH 28, 1918—CHICAGO No. 13

Ford Tractor Production Plan Unchanged in Growth

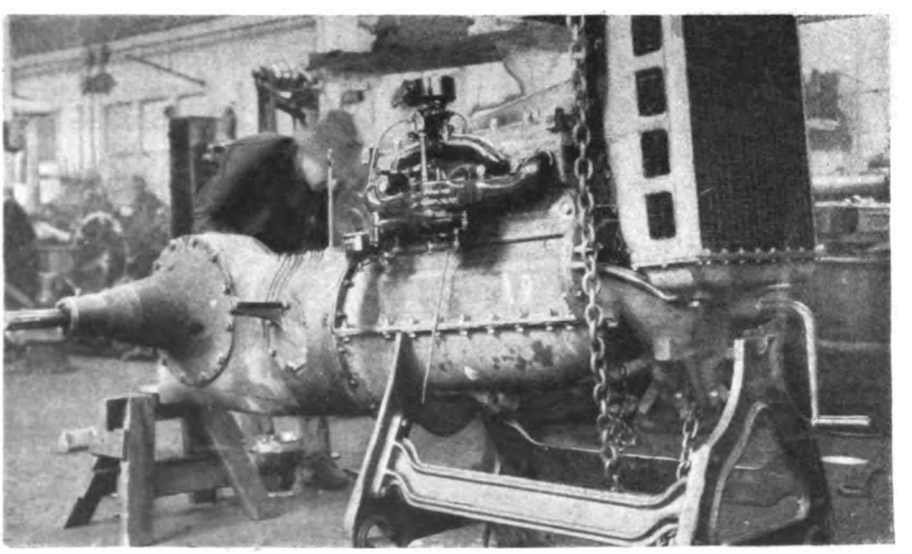
Output to Increase From Eighty-Five Per Day To Two Hundred Per Day in Three Months —Progressive Manufacture and Assembly Maintained in Spite of Rapid Growth

By J. Edward Schipper

FORD tractor production at the present time is eighty per day. It is being stepped up rapidly each week, the planned schedule being eighty-five tractors daily by the end of March, 125 daily by the end of April, 150 daily by the end of May, 200 a day in June, and 300 a day by next December. This clearly represents a growing plant, and a plant which is in full production at the same time it is growing.

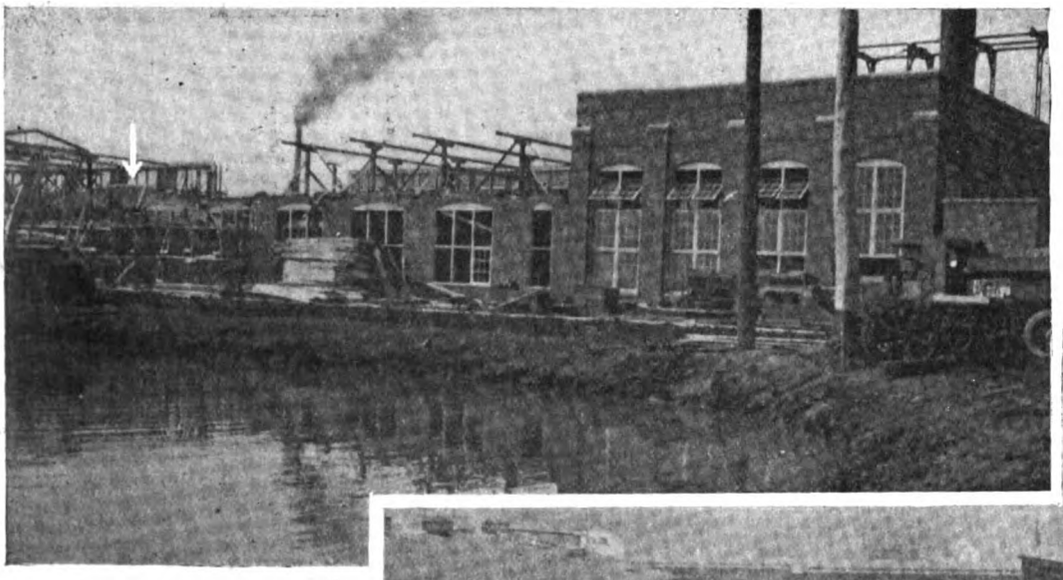
A story of the layout of the plant is necessarily a snapshot of a moving object. The plant does not look the same one week as it did the week before. Departments now found in one building, three weeks from now may be in a building which does not exist at the present time. Nevertheless, there is a fundamental scheme which has not been departed from with all the changing about necessary in a plant producing and growing at the same time.

Just at present a big office building, which will house all the executives, is growing up at the front end of the large, oblong plant occupied by Henry Ford & Son at Dearborn. It is growing up around the small brick building which houses the present inadequate offices. It completely surrounds this little building, but even while the structural work is going on the interior of this little building is not disturbed. Its walls remain standing and form part of the walls of the new building which is going up; that is, the little building ceases to be a building and becomes a room, and when

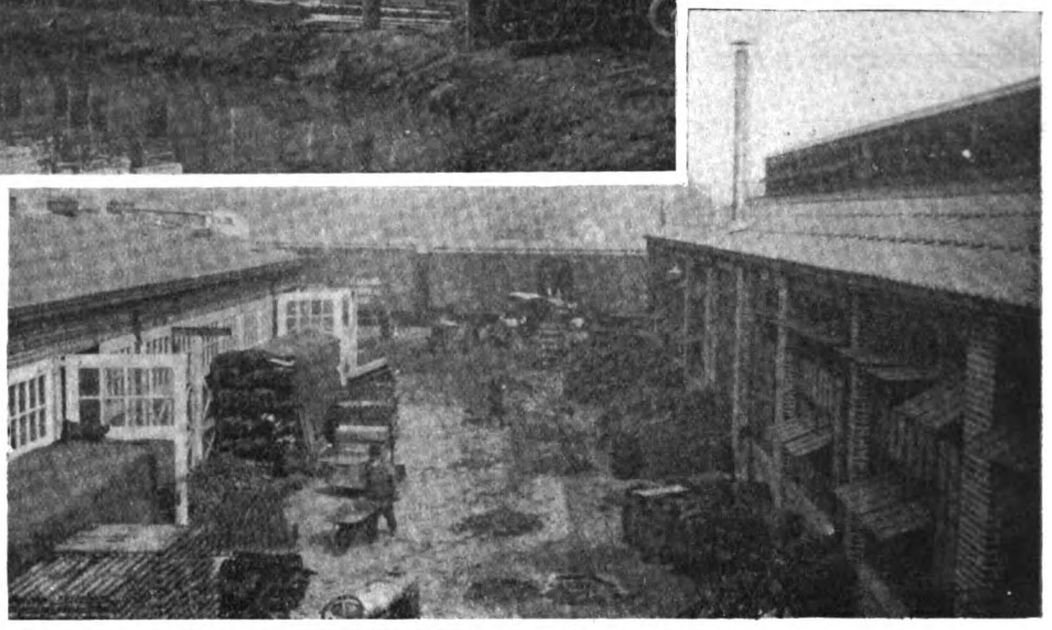


Final assembly of the tractor. This one is just about ready to receive its wheels

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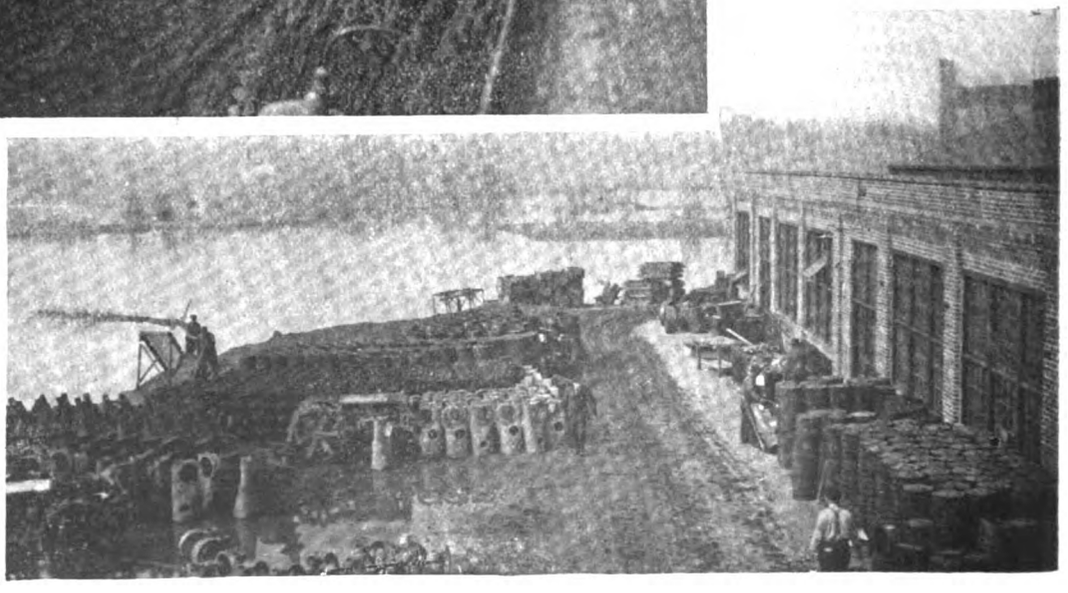
The new office and administrative building which is going up around the little building which formerly filled this purpose. The roof of the little building is indicated by the arrow, and when the new building is complete the roof will be lifted, leaving the interior undisturbed as a room



Bay between two of the buildings now occupied by production stock, but which will soon be roofed over to form a heat treating plant



Some of the stock necessary to maintain a steady production of eighty-five tractors per day. In 10 days an immense warehouse for storing this stock will cover this ground. The lumber for the warehouse is seen in the back ground



Old core sand from the foundry is being used to reclaim more land for the factory building. Some production stock and a few finished tractors which help in working around the plant are shown here on the reclaimed land

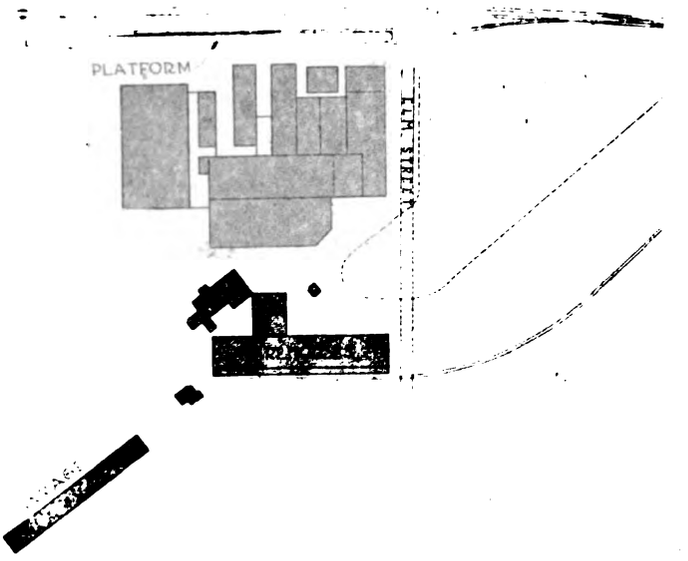
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the new office building surrounding it is nearly completed, the roof will be lifted off the small building and a ceiling placed on instead, so that what now is a complete little unit in itself will become but a small part of the large administrative building.

This example of what is going on with the little office building is only a repetition of what has been taking place with whole factory departments, and yet the basic scheme of production has not been disturbed, but has, rather, been developed during the changes.

How big the plant will be when it is finally completed the officials of the company do not know at the present time, nor does Henry Ford himself. The factory will continue to grow in proportion to the demand for tractors, and as it is impossible to conceive what this demand will be, it is also impossible to conceive the future developments of the tractor plant at Dearborn. Here Henry Ford owns a tract of land of several thousand acres, a large part of which is valuable farm land, plowed, cultivated and harvested by the tractors produced in his plant on the field acreage, so that there is plenty of room for expansion.

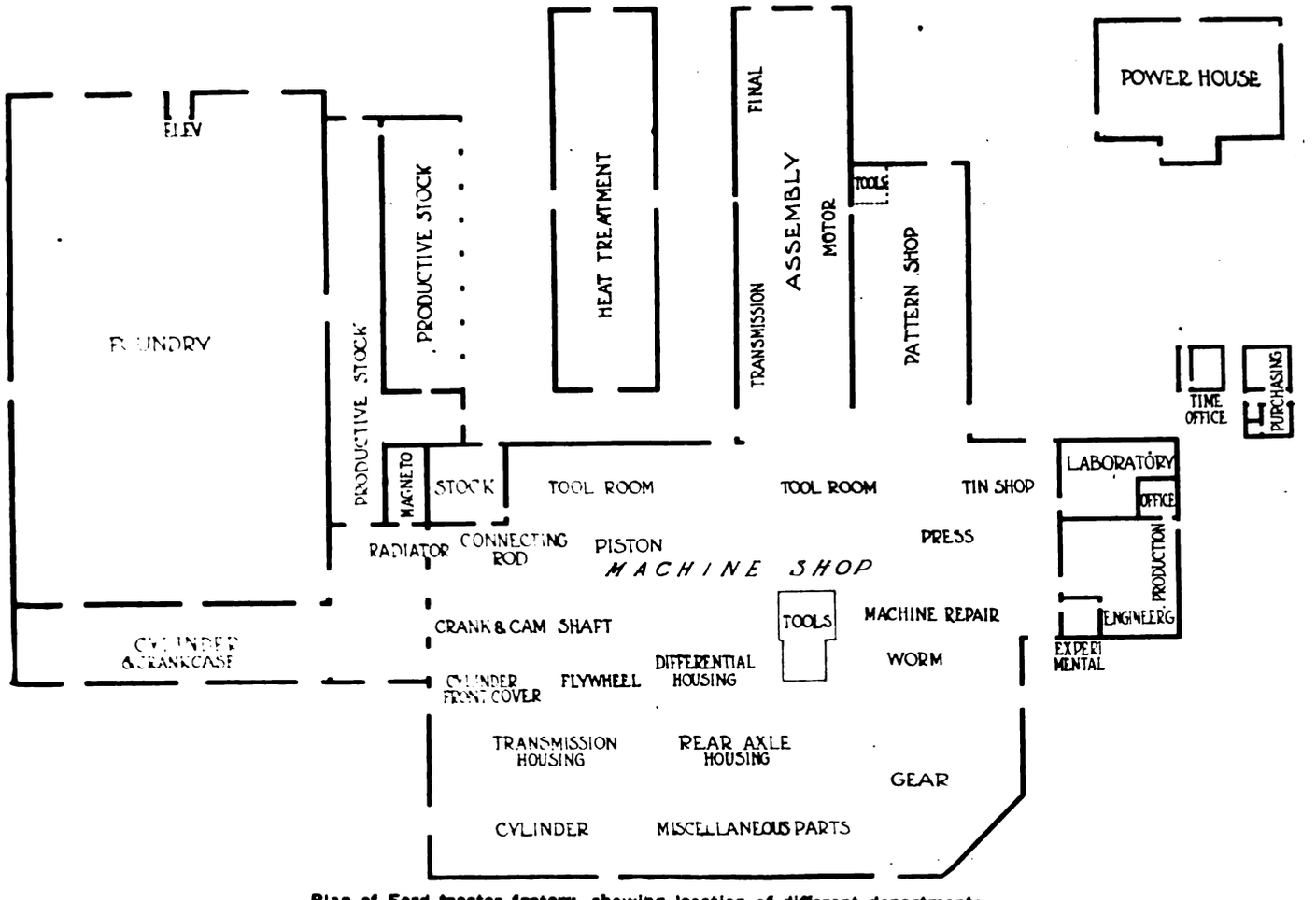
The layout of the plant, as would be expected, is progressive. The elaborate conveyor systems of the Ford Motor Co., which have become famous all over the world, are missing, as the necessity of rearranging the floor space has precluded the possibility of using any elaborate conveyor system at this early date. This will come in time, but at present more elementary methods of conveying materials from one part of the plant to another are used. A large part of the work is done outside at the present time. For instance, the big castings which form the central part of the tractor and act as a housing for the gears and a part of the final drive, are made by



Map of buildings, loading platform and railroad sidings

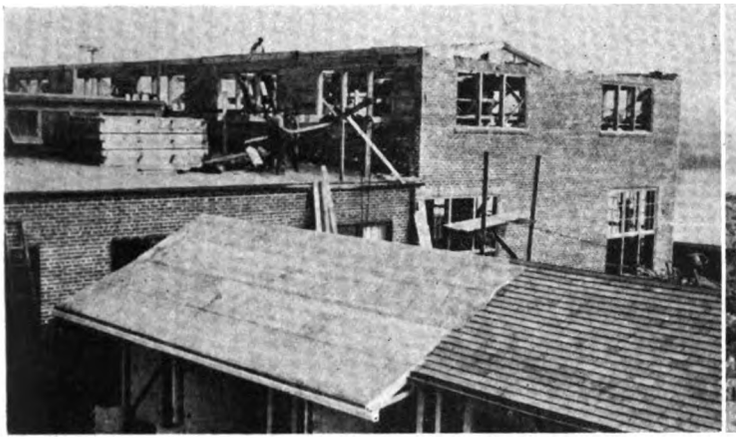
the Ferro Machine and Foundry Co. of Cleveland; and similarly a great many other concerns contribute some of the raw and fabricated stock employed in the manufacture of the tractor. Eventually, all these parts will probably be made under the roof of Henry Ford & Son's tractor plant, and even now, in spite of the fact that production only started about the first of last September, a well-rounded-out manufacturing plant has been developed, with up-to-date methods and machines in every department.

A general layout of the plant is given in the drawing



Plan of Ford tractor factory, showing location of different departments

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It took less than 3 weeks to put up the brick structure shown here. This is part of the new office building



The tractors are useful in hauling the building materials through the mud roads, which would be impassable for an ordinary truck

herewith. This shows the relative positions of each of the buildings and also indicates the location of buildings now under construction and planned for the future. The drawing shows the layout of the machinery and departments of the present Ford tractor plant. The plant runs parallel to the Michigan Central Railroad tracks, which are also shown. As will be noted, there is a double siding with a dock between them, along which the plant extends. Afterward there will be other sidings brought in on the opposite side. The street marked Elm Street on the map is the only entrance. Along this street are arranged the offices, with the plant extending behind them. As the manufacturing arrangements are now laid out, the raw material works up from the back of the plant into the machine shop, which occupies one side, and from there it passes into the assembling department on the opposite side, after which it is led directly to the railroad. A large foundry building at the rear end of the factory is really the starting point of production. A great many of the castings used in the tractor are made in this foundry, and the remainder are bought outside and placed, after their arrival, into the productive stockroom, which is shown adjacent to the foundry building.

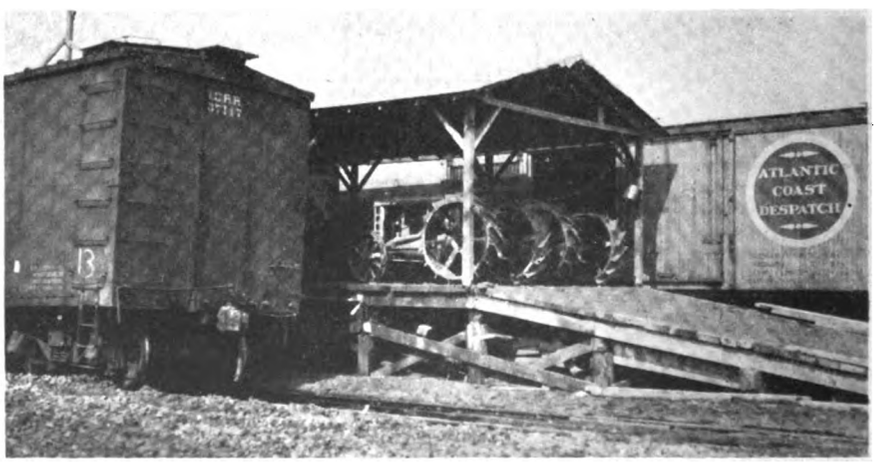
Both the castings produced in the foundry and those which come from outside plants are placed in the productive stockrooms, to be drawn upon for manufacturing purposes. Along one end of the foundry is the cylinder department, which forms the connecting link between the foundry itself and the machineshop. As the map shows, the roughing operations are carried on at the back end of the machineshop, the parts working up progressively toward the front of the buildings and then across into the motor and tractor assembly room. The cleaning operations are performed in that part of the foundry building which is adjacent to the machine-shop, and here the equipment includes snagging and disk grinders, benches, tumbling mills and the cylinder department. In the cylinder department the rough milling operations are carried on, the cylinder blocks being milled at top and bottom and both sides, the cylinder head milled off to shape, and the crankcase likewise, on heavy milling machines.

The cast top tank of the radiator and various medium-sized parts are taken care of in individual departments. It will be noted from the map that the departments are individualized throughout. There is a department for the radiators, another for connecting-rods, transmission housings, cylinders, differential housings, worm wheels, etc. These are clearly indicated on the drawing herewith, which shows the relative arrangement. The tool crib and tool-inspection department is centrally located in the machine-shop, where it is possible to supervise the tools and machinery on the entire floor.

(*Continued on page* 662)



The former administrative building for Henry Ford & Son. This is an old farm house which was converted into an office building and used up to a few weeks ago



Tractors on the loading platform, which extends the length of the plant

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Further Suggestions for Selling Liberty Bonds

Hints for Going About a Liberty Bond Campaign and for Carrying Out in Detail the General Scheme Previously Described

IN carrying out the Liberty Loan Drive in an industrial plant, the benefit of co-operation of the local committee having the work in charge should always be secured. The state or city committee always has available a number of good speakers which it can furnish for this work. It would be an excellent idea for the bond sales executive to have one of these speakers come to the plant each week and make it compulsory to attend a meeting at which this speaker addresses the employees.

It does not suffice to have the men in the organization be the only ones to talk Liberty Loan to the employees. The newspapers of the city in which the plant is located should be apprised of the fact that a Liberty Loan Drive is in progress at the plant. They will be glad to get this news and will publish the results of the drive. They can

Editor's Note—Last week AUTOMOTIVE INDUSTRIES *gave an extensive outline of how to conduct a Liberty Loan campaign. In the following some further hints are given on means for carrying out this work.*



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be kept informed as to what is taking place by putting them on the list to receive the daily bulletin which should be published in accordance with the plan given in AUTOMOTIVE INDUSTRIES last week.

Throughout the factory, score boards should be displayed, telling the percentage of its quota attained by each department. It would be an excellent idea—if the departments are all equally divided—to offer a prize to the members of the winning department, that is, the department which exceeds its quota by the greatest percent. Nothing better could be found for the prize than a book of thrift stamps or a war savings certificate stamp. This would act not only as an incentive but would help swell the receipts of the Government.

If it is not possible to have a speaker address the entire organization at one time, let him divide his time so that he addresses different individuals at different times, or get two or three speakers and divide the organization up between them. There will be no difficulty in securing the speakers, as the local committees are gathering and have already gathered numbers of them to aid them in just such work.

Meeting of Committees

When the committee from the local organization calls at your plant, they will meet, if the plan is followed out, an organization which has already done the work for them. It would then be a simple matter for them to assist the factory committees to sell their own campaign, so that the industrial organization is given full credit for its work, and the employees can feel proud that they are working for a concern which has the interest of the country at heart to such an extent that it will go to the trouble to plan and carry through the drive in such a thorough manner. These are a few suggestions which will come up when the drive is being organized. If they are put into use, every employee of the factory will be approached in several different ways.

First *his eye* will perceive the posters and display cards which will be distributed all over the plant to focus his attention on the drive.

His ear will be caught by the speeches of the 4-minute men and other committee speakers that will be relied upon to a large extent to carry out this drive.

Personal contact will be established by the bond salesman who will call, not once, but many times on each person who is a prospect for the bonds, and this means practically every man and woman in the business organization.

His interest will be aroused by the daily newspaper or bulletin gotten out to spread the spirit of the drive and to indicate its progress.

His sporting instincts will be be aroused by the offer of prizes and by the friendly rivalry with other departments.

His patriotism will be appealed to by the speakers, by posters, and by the implanting of the knowledge that money alone can win the war and that the Liberty Loans are the easiest way to raise the money because they do not take anything from the pocket of the contributor that will not be repaid with full interest in due time.

Automobile Engineering Bureau of Information

COVENTRY is the largest center of the British automobile industry and occupies somewhat the same position in England as Detroit in this country. At the public libraries of such cities there naturally is a strong demand for all sorts of automobile literature, as well as scientific literature having a bearing on the construction of automobiles and parts.

A plan for collecting a comprehensive library of automobile engineering information, and to establish a sort of information bureau for the industry, has been worked out in Coventry and was described in a paper read before the Institution of Automobile Engineers recently by Ernest A. Savage, chief of the Coventry Public Libraries.

Suggestions for Collecting Automobile Literature

In outlining a scheme for collecting and classifying automobile literature the author laid it down that there should be basic books on pure science; text books of summarized practice; periodicals dealing with progressive theory and practice; matter dealing with progressive practice in small material, including trade catalogs, etc.; books on collateral subjects, and guides to literature in the form of bibliographies, indexes, abstracts and digests. Thus, it will be seen that such a Bureau of Information for the Automobile Industry must comprehend all information which can in any way be useful to the industry. The principles of collecting, in the author's opinion, were that the bureau should take into account all material which suggests new processes of manufacture, or developments of them, or gives early news of such processes which help to eliminate technical troubles in manufacturing, which indicates new uses for articles already manufactured, which makes it possible to compare specifications for raw materials and methods of testing, which describes quicker and better methods of production and organization, or which takes account of the organization and aspirations of labor, its welfare and conditions of living. Finally, some provision should be made for the study of science for its own sake. It is suggested that such a bureau should be in the hands of a man librarian with engineering knowledge, or an automobile engineer.

Conceived as a reserve bureau, such a bureau of information should possess ample resources in works of research which could not be bought by any special bureau or by any public library. This bureau should be organized, say the originators of the idea, to serve the whole industry, by forming a library of English and foreign books and periodicals —difficult to obtain when needed—of pamphlets, articles, prints, drawings, and information of all kinds. It should publish a bibliography and a periodical index to scientific literature.

The first thought that arises in connection with such a scheme is cost, but the author does not think it would be high. He contends that all the component parts of the bureau already exist in the number of very large libraries, either wholly belonging to the State or enjoying State privileges, which are not being employed to their full capacity and might reasonably be called upon to found a central bureau of information or lending library.

In support of his case, Mr. Savage quoted the International Institute of Bibliography in Brussels, founded in 1895, with the twofold aim of answering, for moderate fees, all inquiries for bibliographical information and of compiling a universal bibliography. Attached to the Institute is the International Office of Bibliography, which is responsible for a cooperative catalogue or book directory of the Belgian libraries. At the outbreak of the war, the Universal Bibliography consisted of an index of about eleven million cards. There is also the Library of the United Engineering Societies, in New York, to which is attached a bureau of information. Reference was also made to the utility of certain bureaus of commercial information on the Continent and in America in support of the scheme for a Central Industrial Information Bureau in this country, with which would work in some form not defined by Mr. Savage local bureaus in industrial centers, on the lines of that now existing at Coventry.

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Electric Lighting System for U. S. A. Motorcycles

Tests Prove Possibility of Controlling Voltage Without a Battery in Circuit — Graphs Show Voltage Regulation and Relative Steadiness of Light Throughout a Wide Range of Engine Speeds

By P. M. Heldt

IN the development of the U. S. A. motorcycle it was decided to employ magneto ignition and also to fit a small electric generator for generating current for electric lighting. No storage battery is to be used, as it was feared that the motorcycle riders in the field would not be in position to give the necessary attention to the battery and that under these conditions a battery would inevitably give trouble.

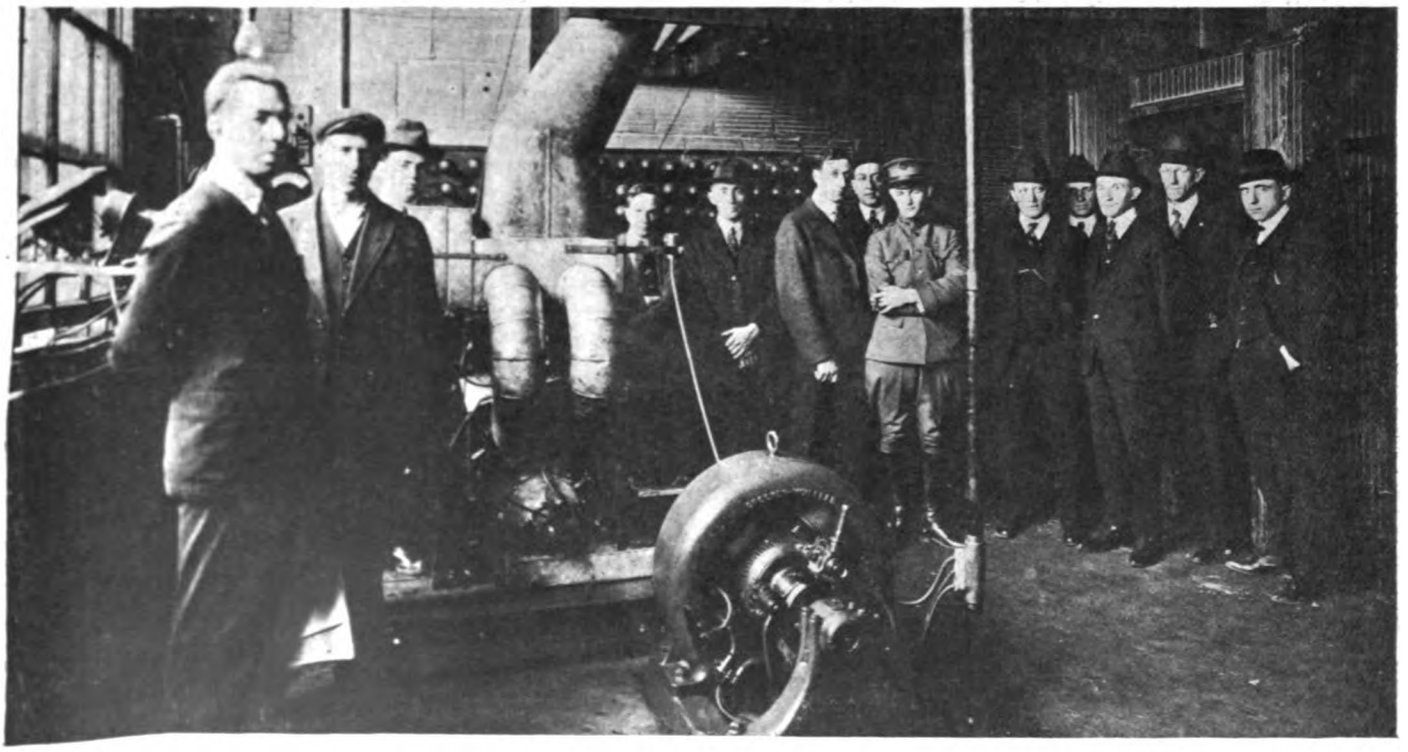
Consequently, the lights will have to be hooked up directly to the generator. Heretofore in practically all automotive electric lighting systems a storage battery has been floated on the line; such a battery has a powerful steadying influence, boosting the line voltage when the generator drops below normal speed and pulling it down when the generator exceeds this speed.

With the battery eliminated the problem of maintaining the voltage sufficiently constant so as to insure a tolerably uniform light at all engine speeds is seriously complicated. Not only must the voltage be maintained approximately constant throughout the generator speed range, but there must be no excessive flicker which might be due to the action of the voltage regulating or control device.

Specifications of the generator desired were drawn up by the Military Motorcycle Standardization Board and submitted to manufacturers of electrical equipment throughout the country during the latter part of January. It was stipulated that the machine must be of round section, not over 3¾ in. in diameter. It was to be clamped to a saddle cast on the crankcase, telescope into the driving gear housing and bolt against this by means of three ¼-in. 28 S. A. E. screws.

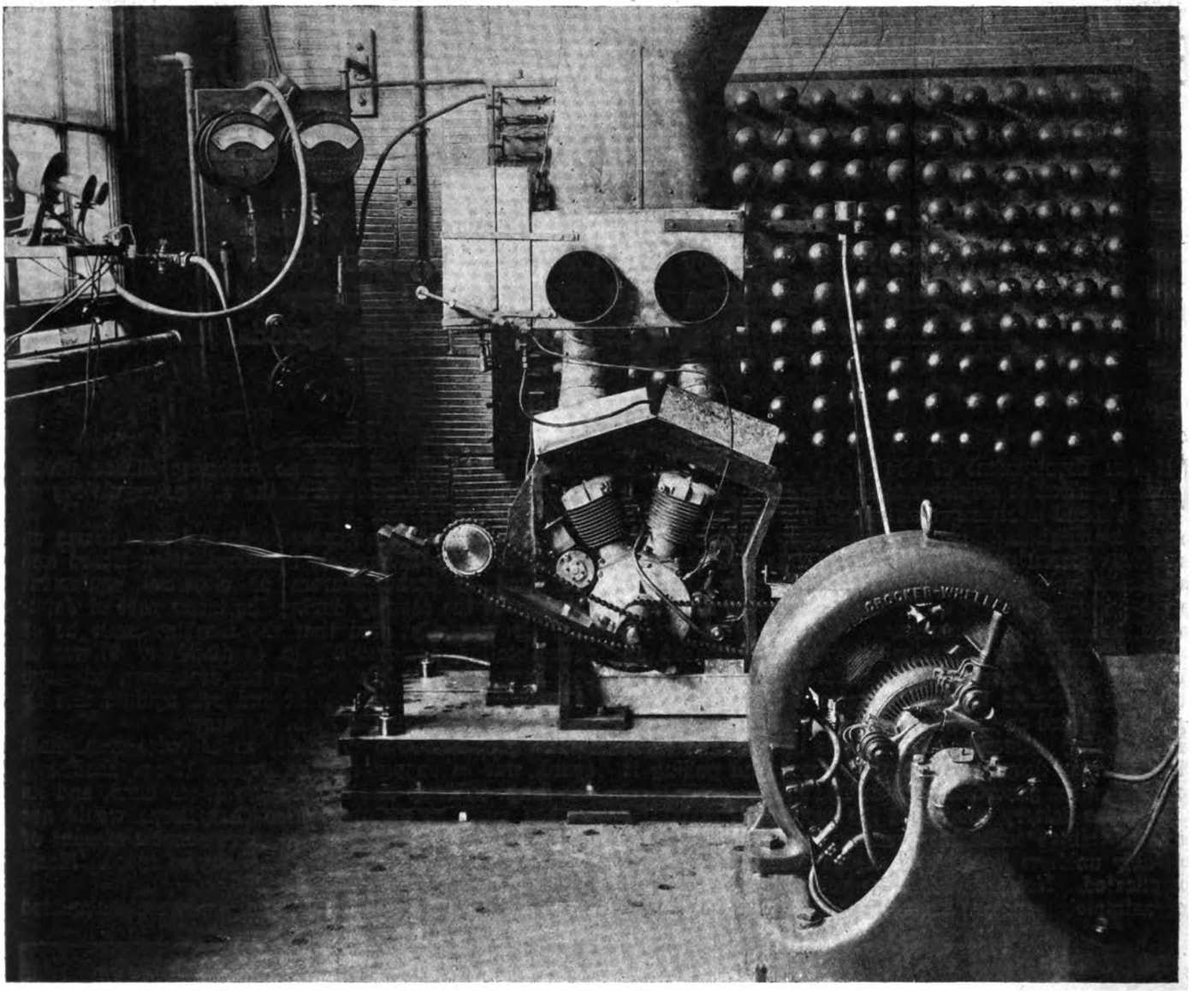
The generator was to be driven at twice crankshaft speed, was to supply current to one 15-c.p. headlamp, one 2-c.p. taillamp and one 2-c.p. side-car lamp, and its voltage must be maintained so that lamps would not blow under any circumstances. A reasonable amount of light must be given at 500 r.p.m. engine speed. Shaft and dimensions were also specified.

Four manufacturers of electrical equipment submitted



Electrical experts and members of the Military Motorcycle Standardization Committee at the tests of electric generators for the U. S. A. motorcycle

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Test set-up for tests of generators for the U. S. A. motorcycle

generators for tests and had representatives on the scene when these tests were made. We will designate the four machines by the letters A, B, C, and D.

Generator A is 3 7/32 in. in diameter and weighs about 6 lb., including its control mechanism, which is inclosed within the generator housing. Control is by a regular voltage regulator, comprising a magnetic vibrator, shunt coil for operating this and a field resistance which is cut in and out by the vibrator. This regulator operates in conjunction with a third brush system. The regulator resistance is located at the commutator end of the generator under the cover. As all of the regulating devices are inside the generator and the latter is wound for a ground return wiring system, there is only a simple binding post or terminal on the outside.

A somewhat different control system is used on generator B, which is 3 7/16 in. in diameter, 6¼ in. in length over all and weighs 7¼ lb. Like type A it is of bipolar construction. The regulating mechanism comprises a vibrator with two contact points. One of these contact points is vibrated by means of a cam, or rather an eccentric on the end of the armature shaft, while the other contact point is drawn away from the vibrating one by an electromagnet energized by a coil connected across the armature. The higher the voltage generated the more the contacts are kept apart by the electromagnet and the less the field resistance is cut out. High speed of the cam also tends to reduce the time of contact and thus to keep down the voltage. This regulator is mounted on the end plate at the commutator end.

Generator C has a straight voltage control. However, the control resistance in the field circuit is divided into two parts and there is a double vibrator, so arranged that when it is actuated moderately only one contact set will open and one part of the resistance be cut into the field circuit, whereas if the actuation of the vibrator is more energetic both contact sets will open and the whole of the resistance will be cut into the field circuit. This generator is of four pole construction with series armature winding so arranged that the two brushes come on top of the commutator. The machine is 3¾ in. in diameter and weighs approximately 10 lb. with regulator.

Generator D is 3 7/16 in. in diameter and weighs 9.8 lb. It is of four-polar construction with series wound armature, one brush being at the side and the other at the bottom. The regulator is of the usual vibrator type and is located in a circular housing on top of the generator, which can readily be removed if desired. As all of the screws holding the end plates in place are lead-sealed, the generator cannot be tampered with. The armature is coil wound and impregnated with Bakelite.

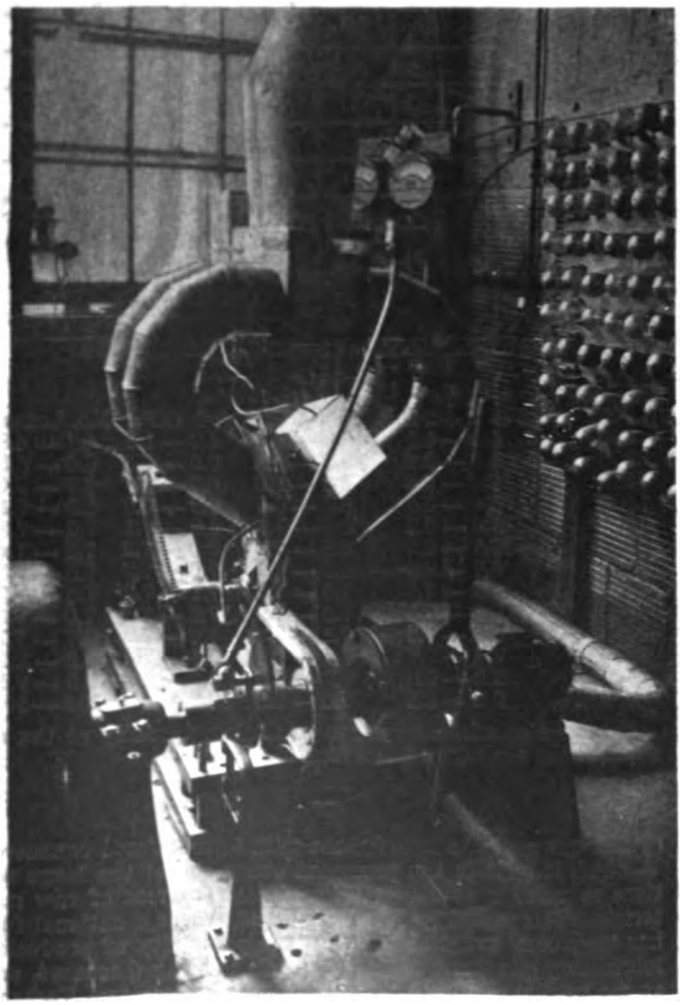
All of the generators are fitted with ball bearings. All

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were successively installed on a U. S. A. cycle motor, connected to a load consisting, first, of one 12-c.p. headlamp and a 2-c.p. taillamp, then of one headlamp and one taillamp and finally of one taillamp only, and the engine with each of these loads was run at various speeds from 500 to 3600 r.p.m. At each speed ammeter readings were taken and the character of the light given out by the headlamp was noted. The ammeter hand would not stand steady but swing more or less and the extreme points reached in its swings were noted.

It may be pointed out that these tests will not be the sole basis for selecting one or more types of generator for use on Liberty motorcycles but are preliminary to extended road tests. The object was to test the generators on the engine to which they are to be fitted throughout the whole speed range and bring to the attention of the makers at the earliest possible moment any possible defects in design, so that these might be remedied before the final tests are begun. It was realized that the design of a variable speed, variable load, constant voltage generator is a comparatively new problem and that perfection would not be attained immediately. The results shown by the tests are, however, quite encouraging and there is no doubt that a thoroughly practical outfit will be secured.

The results of the tests are given in the accompanying tables and curves. In plotting the curves the mean of any pair of voltage readings was taken. On full load very good results were obtained with three of the generators—A, B and C. Generator D, with plain vibrator voltage control, gave a rapidly increasing voltage above 2400 r.p.m. engine speed. The reason is believed to be that from about this speed the vibrator keeps the field resistance in circuit all the time so that the voltage rises with the speed.



Another view of the test stand

Generators B and C also showed up well on the slightly reduced load—headlamp and one taillamp. The voltage of generator A dropped away rapidly from about 2000 r.p.m. engine speed on.

When loaded with only a single taillamp, generators B and C again maintained their voltage quite well throughout practically the whole range of engine speed. At the upper end of this range both increased considerably in voltage, that of generator C reaching 10 volts at 3600 engine r.p.m. This speed would never be attained by the engine in riding, so that this sharp rise in voltage, which is further contingent upon only a single 2-c.p. lamp being in circuit, is of little importance.

The voltage of generator A when applying only one taillamp takes a sharp upward turn at about 2000 r.p.m. engine speed, and this speed could not be much exceeded without burning out the filament. The same trouble occurred with generator D. In the case of generator A, the probable reason is that since its control is based in part on the constant current principle (third brush regulation) when the lamp load is greatly decreased too much current will flow. Generator D probably has too small a field resistance.

The above observations relate to the variation of the voltage with engine speed and generator load. Preferably this variation should be nil, but in practice such a result is unattainable. Too low a voltage, of course, means a dim light, while too high voltage means the burning out of bulbs.

Character of Light

Beside the gradual variations in voltage due to variations in engine speed there are rapid variations which may result from the action of the voltage regulator or from engine vibration. Such rapid fluctuations in voltage result in a flicker or in periodic variations in the intensity of the light, which under certain circumstances may be quite annoying. As the test runs with full lamp load were made, an observer noted the character of the light given out by the headlamp, and in the diagrams the character of the light is denoted by symbols.

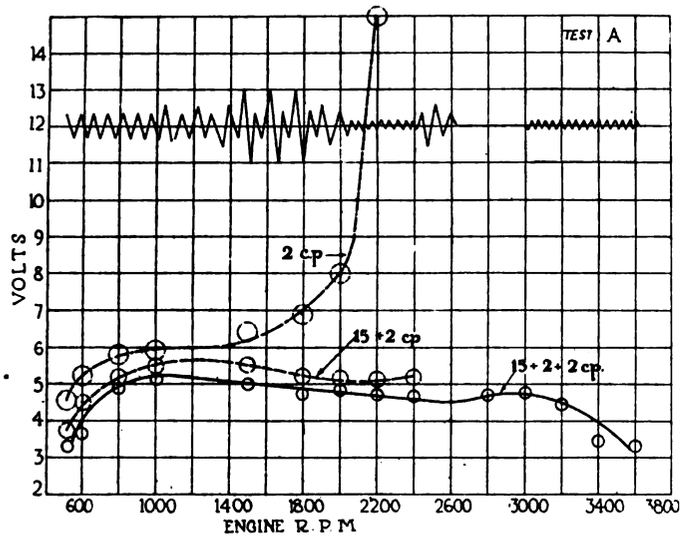
As will be seen from the illustrations, the tests were made on a test stand, the engine driving through a chain to a jackshaft to which an electric generator could be connected by means of a friction clutch.

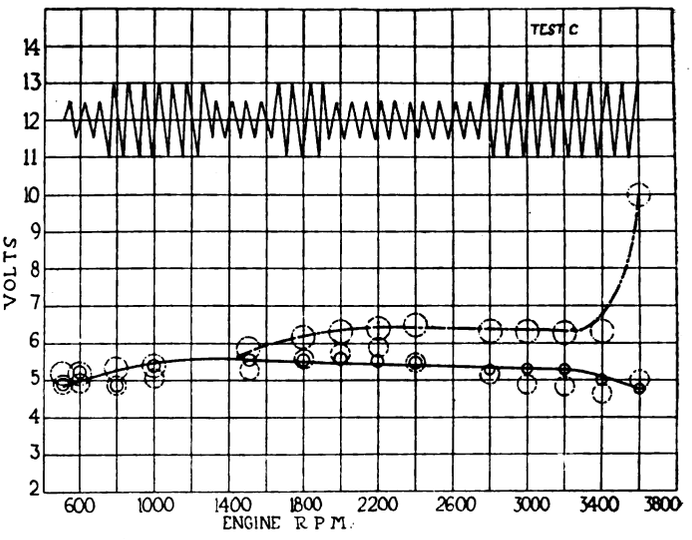
In connection with the set of curves marked D it should be pointed out that the regulator of this type generator was disabled as soon as the tests started and the representative then secured a shock regulator as used by the manufacturer on automobile equipments. The result was that regulation was rather unsatisfactory.

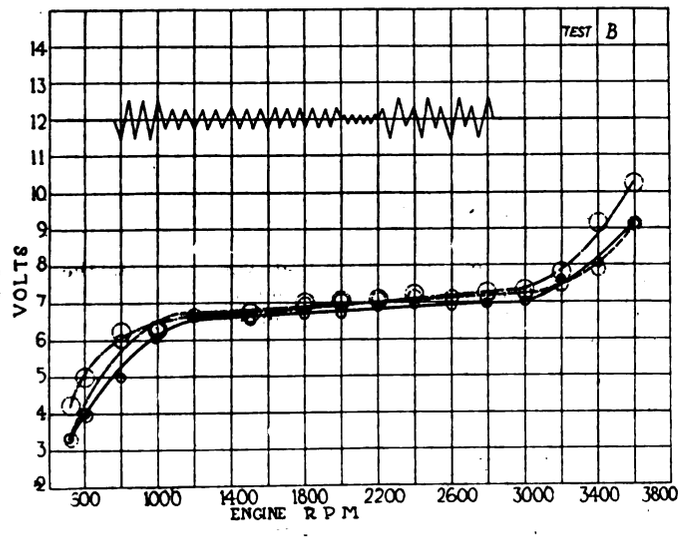
A GENERATOR—VOLTAGE READINGS

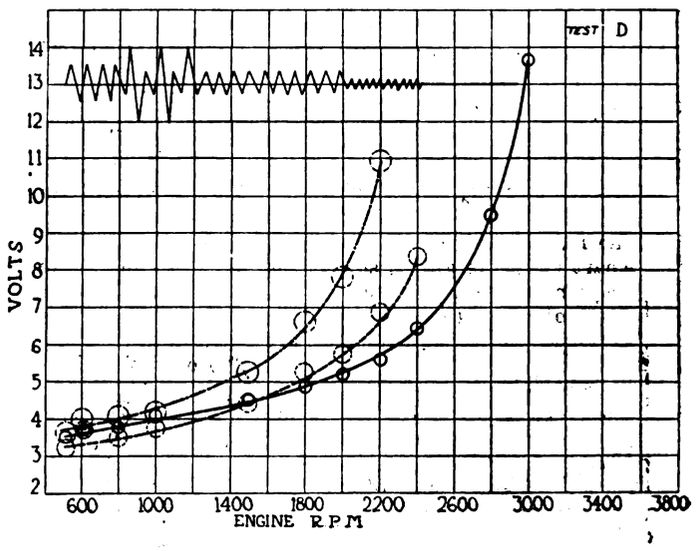
	Load		
Engine R.P.M.	15 + 2 + 2 C.P.	15 + 2 C.P.	2 C.P.
500	3.0 — 3.6	3.5 — 4.0	4.4 — 4.8
600	3.4 — 4.0	4.2 — 5.0	4.9 — 5.5
800	4.7 — 5.3	4.8 — 5.6	5.5 — 6.1
1000	4.9 — 5.4	5.0 — 6.0	5.7 — 6.2
1500	4.5 — 5.5	5.0 — 6.0	6.3 — 6.6
1800	4.4 — 5.0	4.8 — 5.6	6.8 — 7.1
2000	4.4 — 5.2	4.7 — 5.5	7.8 — 8.2
2200	4.3 — 4.9	4.5 — 5.5	15.5
2400	4.3 — 4.9	4.9 — 5.5	burned out
2800	4.5 — 4.8		
3000	4.7 — 4.9		
3200	4.2 — 4.6		
3400	3.4 — 3.7		
3600	3.2 — 3.5		

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Diagrams showing results obtained from the different generators. The same kind of line represents the same load in each diagram

C GENERATOR—VOLTAGE READINGS

Engine R.P.M.	Load 15 + 2 +2 C.P.	15 + 2 C.P.	2 C.P.
500	5.7 — 4.0	5.7 — 4.0	5.7 — 4.5
600	5.7 — 4.5	5.8 — 4.0	5.8 — 4.8
800	5.7 — 4.5	5.8 — 4.0	5.8 — 4.8
1000	5.7 — 4.5	5.7 — 4.4	5.7 — 5.0
1500	5.7 — 5.0	5.7 — 5.0	6.0 — 5.8
1800	5.8 — 5.3	5.7 — 5.4	6.1 — 6.3
2000	5.8 — 5.3	5.4 — 6.0	6.2 — 6.4
2200	5.3 — 5.8	5.7 — 6.1	6.3 — 6.5
2400	5.2 — 5.7	5.3 — 5.8	6.3 — 6.6
2800	5.0 — 5.7	4.7 — 5.6	6.0 — 6.6
3000	5.0 — 5.7	4.4 — 5.4	5.9 — 6.7
3200	5.0 — 5.7	4.3 — 5.4	5.8 — 6.7
3400	4.5 — 5.5	4.0 — 5.3	5.8 — 6.8
3600	4.2 — 5.3		

D GENERATOR—VOLTAGE READINGS

Engine R.P.M.	Load 15 + 2 + 2 C.P.	15 + 2 C.P.	2 C.P.
500	2.5 — 4.5	2.5 — 4.0	3.0 — 4.3
600	3.0 — 4.5	3.0 — 4.5	3.3 — 4.5
800	3.0 — 4.5	2.5 — 4.5	3.5 — 4.6
1000	3.5 — 4.5	3.0 — 4.5	3.5 — 4.7
1500	4.2 — 4.8	4.0 — 4.8	4.7 — 5.8
1800	4.5 — 5.3	4.7 — 5.8	6.0 — 7.2
2000	4.8 — 5.5	5.0 — 6.5	7.5 — 7.9
2200	5.2 — 6.0	6.0 — 7.8	10.7 — 11.1
2400	6.2 — 6.7	7.5 — 9.3	blew
2800	9.0 — 10.0		
3000	13.0 — 14.0		
3200	Lamp out		

B GENERATOR—VOLTAGE READINGS

Engine R.P.M.	Load 15 + 2 + 2 C.P.	15 + 2 C.P.	2 C.P.	No. Lamps*
600	4.2 — 4.1	3.9 — 4.1	4.9 — 5.1	4.7 — 4.8
800	5.0 — 5.2	5.8 — 6.2	6.0 — 6.5	6.0 — 6.5
1000	5.8 — 6.5	6.1 — 6.6	6.0 — 6.7	6.7 — 7.0
1500	6.4 — 6.6	6.4 — 6.8	6.5 — 6.9	6.8 — 7.1
1800	6.6 — 6.8	6.7 — 7.0	6.9 — 7.1	7.0 — 7.3
2000	6.7 — 6.9	6.8 — 7.1	6.9 — 7.2	7.2 — 7.4
2200	6.7 — 7.0	6.9 — 7.2	7.0 — 7.2	7.2 — 7.5
2400	6.8 — 7.1	7.0 — 7.2	7.1 — 7.3	7.2 — 7.5
2800	6.8 — 7.1	7.0 — 7.2	7.2 — 7.3	7.3 — 7.5
3000	6.9 — 7.2	7.2 — 7.4	7.3 — 7.5	7.7 — 7.7
3200	7.4 — 7.7	7.4 — 7.6	7.7 — 7.9	8.2 — 8.2
3400	8.0 — 8.3	7.8 — 8.0	9.0 — 9.2	9.5 — 9.5
3600	9.0 — 9.3	9.0 — 9.2	10.0 — 10.5	10.8 — 10.8

*This series of observations was taken specially at the request of the maker's representative.

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THE war and the interference with international commerce which it entails has prompted every one of the large nations to make a survey of its national resources of raw materials. This is being done in England, where a national fuel has long been sought for. Now the possibility of producing lubricating oils from native materials is being discussed, and at the next meeting of the Institution of Petroleum Technologists a paper dealing with an important aspect of the subject will be read.

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Traction on Bad Roads or Land*

Part III

Classification of Tracklayers—Truck Frames and Track Frame Connections—Methods of Steering Tracklayer Tractors—Power Plants

By L. A. Legros

THE various track systems may be classified as follows:

(a) Feet or sections laid by a wheel; the girdle form, of which Boydell's tractor, the ordinary girdle, and the early Pedrail, are examples.

(b) Chain-track supporting rollers with axes fixed relatively to the truck frame by which they are carried; examples of this are the caterpillar (Holt), Creeping-Grip (Bullock), Tracklayer (C. L. Best), Clayton, Strait, Cleveland, and others.

(c) Chain track supporting through secondary chains of traveling rollers arranged as intermediate chains between the truck or sledge, and the track or lag chain; examples of this are the Log-Hauler (Phoenix) steam tractor for snow and ice, the Centiped (Phoenix) tractor for soft ground, the Allis-Chalmers and the modern form of Pedrail (Diplock).

(d) Chain track supporting by rows of traveling balls, as in the Ball-Tread (Yuba) tractor.

Apart from the girdle, sometimes fitted to hauled vehicles, there is no modern representative of extended application of tractors of Class (a) known to the author.

The chain-track tractors that are constructed and used in the largest numbers, both as to makes and output, are those with rollers revolving on axes fixed to one or more truck frames for each track, Class (b).

It appears that chain tractors for the haulage of lumber were made and used commercially in the United States as early as 1904, and some of these early tractors are stated to have been still at work last year; these vehicles are fitted with the intermediate roller chains of Class (c).

Tractors in which the load is transferred from the chain to the track frame by rows of traveling balls, Class (d), are represented at present, so far as the author is aware, by the single example of the Ball-Tread (Yuba).

Methods of Springing

Four distinct systems of springing have been tried or are in use:

(e) Foot springs: In this method the springs are interposed between the actual foot and the carrying portion. Examples are the old and new forms of Pedrail (Diplock).

(f) Track wholly spring supported, the axle of the track frame being carried on springs: Centiped (Phoenix) and Allis-Chalmers.

(g) Track partly spring supported: Caterpillar (Holt), and Clayton tractor (totally over effective bearing portion).

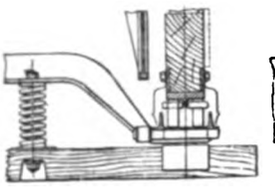
(h) Track pivotally sprung: Tracklayer (Best), Strait tractor (Killen-Strait), and Ball-Tread (Yuba).

Owing to many constructional difficulties direct springing of the feet, Class (e), has not yet taken a prominent place among commercial chain-track tractors.

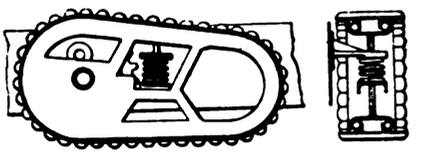
The methods of track springing are intimately associated with those adopted for insuring equable load distribution on the chain.

The method of supporting the vehicle on springs carried on the track axle, Class (f), requires either a chain or a cardan drive to permit driving when the springs are unequally loaded, as when crossing ditches or running on side-lying ground.

In some vehicles of Class (g) the whole of the effective portion of the track is capable of vertical movement, as in the Clayton tractor, in which a link connects the single truck frame to the track frame. In others the truck is in one or more parts controlled by linkwork from the back of driving-sprocket axle, a practice followed successfully by the Caterpillar (Holt).



Modern Pedrail foot and rail (Diplock)

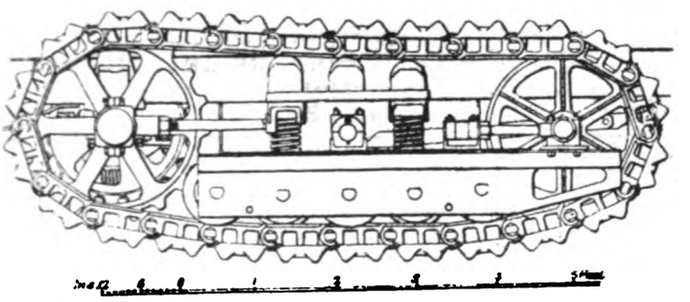


Chain track with rows of traveling balls (Yuba)

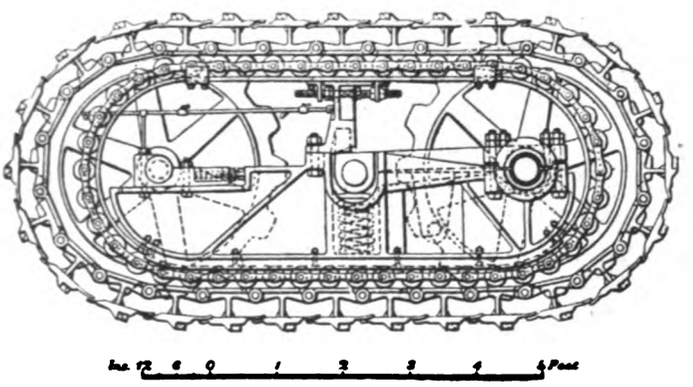
In other tractors having chain-driven sprockets the whole of the track-frame is capable of pivoting about a central axle, an arrangement which is adopted in the Creeping-Grip tractor, or the track-frame may be pivoted and sprung about the axle of the driving sprocket, as in the Tracklayer (Best), and the Strait tractor (Killen-Strait). These two arrangements, though very different in appearance, are both equivalent to partial springing of the track, Class (h).

The various methods adopted for distributing the load of the tractor over the chain-track elements may be classified as follows:

(j) Truck frame and track frame identical; this arrange-



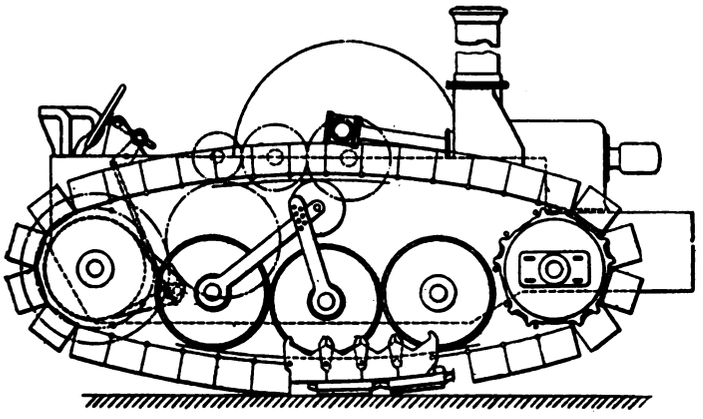
Chain track partly spring supporting (Caterpillar)



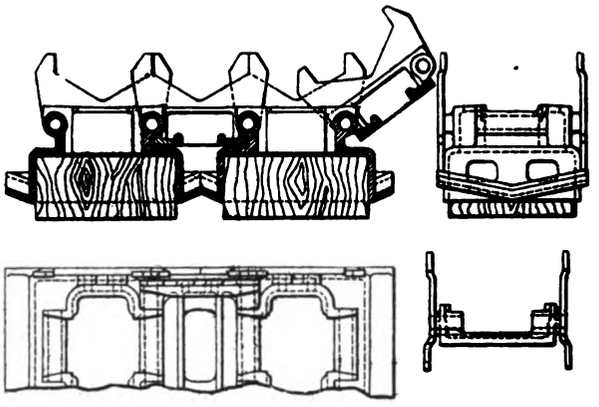
Chain track with secondary train of rollers (Centiped)

*Paper read before the Institution of Mechanical Engineers, on Friday, January 18, 1918.

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Roberts tractor illustrating nut-cracker action



Details of Roberts chain track

ment is adopted in the modern form of Pedrail, in the Strait, Log-Hauler, Centiped, Allis-Chalmers, and Ball-Tread.

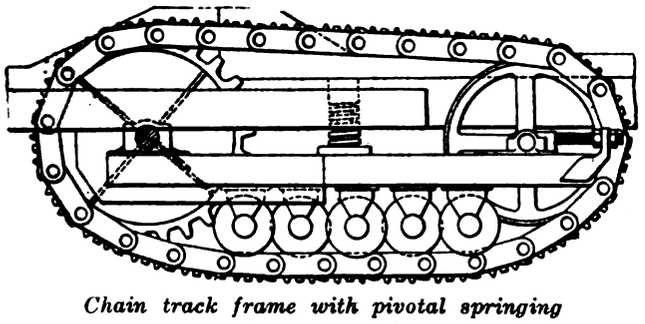
(*k*) Truck frame integral with track frame; this form of construction, which very closely resembles the preceding, is adopted by the Tracklayer, and Creeping-Grip.

(*l*) Truck frame in one piece connected by a link or guides to the track frame; this method is used in the Clayton tractor.

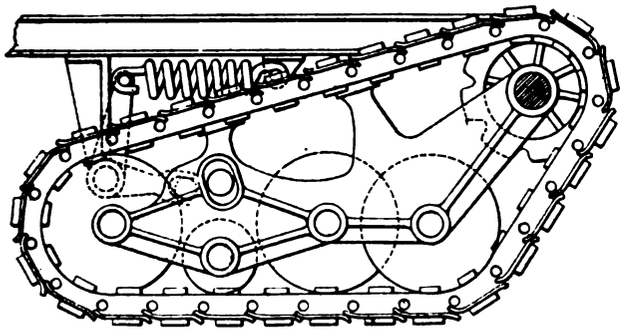
(*m*) Multiple truck frame articulated and connected by links to the track frame; this is adopted in the lower-powered Caterpillar, and enables the load on the chain track to be distributed over irregular surfaces to which the chain track and truck frames can adapt themselves under the action of the springs.

When the track frame is pivoted to the main framing, the whole length of supporting surface of the chain track is capable of adapting itself to long undulations or irregularities; this arrangement is therefore very suitable for use on ordinary ground, snow, ice, sand or marsh. The articulated truck frame, on the other hand, permits a more even distribution of load over the chain-track elements when passing over small irregularities such as stones, rocks, railway ties, rails, etc., and for this reason is better adapted for haulage from railhead into country in which rock crops out.

The arrangements adopted for steering vary considerably. In several models, of which the Centiped and Creeping-Grip are examples, there are steering wheels with steering of the ordinary Ackermann type; in others the practice is to use a single steering wheel, as in the Caterpillar (Holt, 75 hp.), Clayton and Ball-Tread (Yuba). The steering wheel of the Clayton is fitted with an elevating gear, so that it can be raised out of action for turning small circles. In the Strait there is a small steering chain track; in some of the lower-powered tractors—Caterpillar (Holt, 45 hp. and 18 hp.), Baby Creeping-Grip (16 hp.) and F. C. Austin (35 hp. and 15 hp.)—the tractor is carried entirely on the two tracks, and steering is effected by releasing the clutch on the inside of the curve to be taken, and driving only on the outside of the curve. In the Burford-Cleveland a brake is applied to one side and the other is driven at increased speed through the differential gear. With some tractors, the Ball-Tread (Yuba), for example, it is possible to turn the machine about its own axis, by reversing the driving direction of one of the chain tracks.



Chain track frame with pivotal springing about rear axle



Chain track frame with pivotal springing about end bearing

It is obvious that there are four methods available for securing steering of tractors carried on two chain tracks only; one by the use of the clutches alone; another by supplementing the clutch action by that of a brake acting on the appropriate side; a third by the use of the brake on one side and the action of a differential gear; and the operation of an independent reversing gear to each track gives a fourth method. In the majority of the designs under consideration it is possible to turn the machine in a circle of about 15 ft. to 20 ft. radius, and in some of the small tractors the turning circle is only 6 ft. radius.

In the Log-Hauler (Phoenix) steam-driven tractor, for use on snow and ice, runners are fitted for steering; these can also be arranged with some of the other types described when required to work under winter conditions.

Driving Gear

The drive of some tractors is fitted with a differential gear; this is usual where there is front-wheel steering, as in the Creeping-Grip or Centiped (Phoenix). In those machines in which steering is effected by declutching one or other of the tracks it is not usual to fit a differential; where, however, the steering is effected or assisted by independent clutching or braking of the tracks, as in the Clayton tractor and in the Burford-Cleveland, a differential gear is fitted to the main drive between the tracks.

The driving gear generally comprises a main clutch and a change-gear box of somewhat similar pattern to that used on motor lorries and trucks. The number of speeds fitted varies. In one instance, the Allis-Chalmers, there are four forward speeds and a reverse; in a few tractors three forward speeds and a reverse are fitted; two forward speeds and a reverse are more usual; very rarely, as in the high-power Caterpillar (Holt, 120 hp.), only a single forward speed and reverse is ordinarily fitted, the two-speed gear being an alternative arrangement.

Chain Tracks

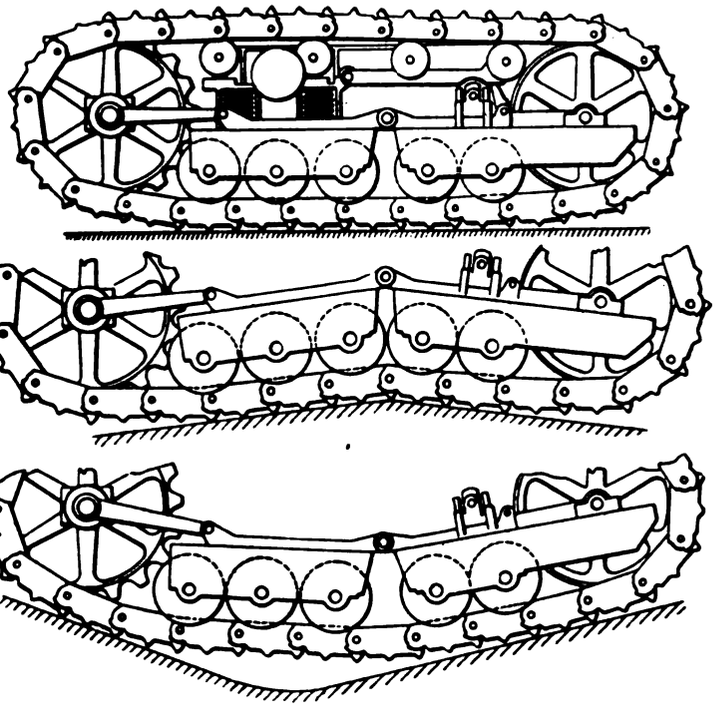
The design of the chain track itself is one of the most important factors of the success or failure of the tractor. The chain track is usually driven by a sprocket at the back end, and passes round an idler at the front carried on the track

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frame and engaging only laterally with the chain track by a central flange or flanges; the idler axle is usually fitted with an adjustment for taking up wear of the chain track. It will be noted from the cross-sections shown that the width of the track is greater than the width of bearing for the rollers, and any hard object, rock or rail, encountered by the chain may therefore tend to load it unequally, and subject it to torsional stress. Furthermore, if the chain track passes over a hard and narrow object, such as a railway rail, this will tend to produce reverse curvature in any unsupported portion of the chain. This is the case where the chain has a short free length between the leading idler wheel and the first pair of carrying rollers. Realization and over-estimation of these difficulties were probably responsible for the early designs of chains made in this country. The links were so arranged that the connecting pins were raised several inches from the ground, and the blocks, of which the chain track was composed, were so made as to butt against each other when the chain track was in the position of minimum curvature. In this way the bearing portion of the chain track formed an inverted arch, which was supported at portions of its length by the rollers, and depended on contact between the links for carrying the load on intermediate portions of the chain.

In order to reduce the stresses still further, and to relieve the chain pins of the heavy load to which they would otherwise be subjected, interlocking extensions above the pins were formed on the chain links. Unfortunately this method of carrying the load resulted in the introduction of new and greater difficulties, generally known as nut-cracker action. If the track worked only on sand or mud, or even on pure clay, there would be no difficulty; but where there is a combination of stones and clay or when, in crossing gravel or roads, any hard object can be picked up by the track and get between the bearing faces of the links, the stresses so caused become excessive and the track may even become jammed. This result can be caused also by pieces of fencing wire or scrap iron such as may occasionally be picked up on a farm. In the forms of chain track now commonly used the pin centers are brought as close to the ground level as possible, and the chain plates are so formed as to shield the opening between the track plates over the working range.

The second source of trouble to which chain tracks are subject is that of stretching due to wear. This lengthens the pitch of the chain and necessitates fitting and adjusting gear to take up the slack; it also tends to cause riding on the driving sprocket. As it is usual to pitch the chain pins so widely that they will engage with alternate teeth of the driving wheel, when cut as an ordinary sprocket, this wheel should have an odd number of teeth in order to distribute the wear uniformly over the whole of the teeth.

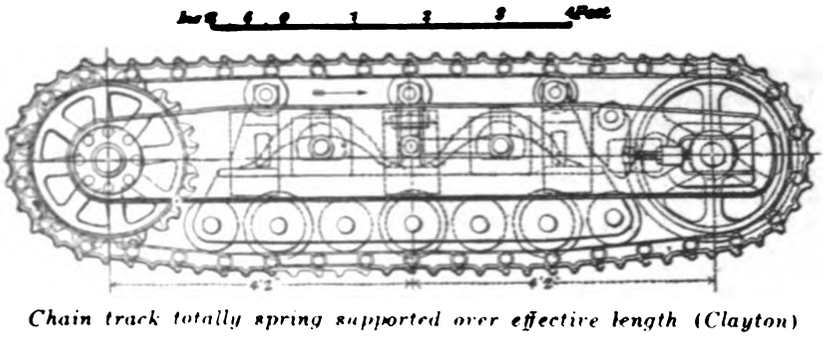


Multiple articulated truck frame (Caterpillar)

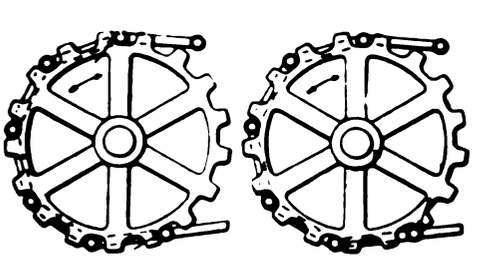
The chain-track links have three functions to perform:

1. Carrying the load.
2. Affording the necessary resistance for traction by engaging with the ground surface, and
3. Providing the gearing pin, or its equivalent in tooth form, to engage with the driving sprocket.

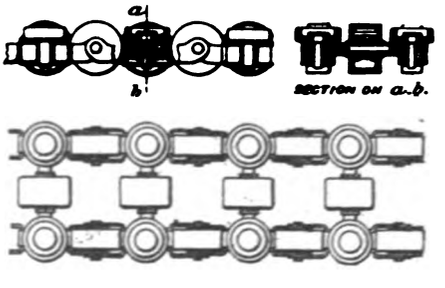
The first condition involves a machined surface, preferably hardened, for the carrying rollers to bear on. The second condition necessitates an irregular outline of the lower surface of the link, so that it can gear with the ground surface as a large pinion would gear into a rack; hence the form of shoe must approximate to a ribbed section, and is usually of pressed steel. The third condition requires that the pin joints or gear faces shall be machined accurately enough to work smoothly with the driving sprocket without risk of riding on its teeth. These three conditions, coupled with the proximity of the connecting pin to the ground, have limited the best designs to built-up forms of construction in which the actual link is a machined steel casting riveted to a pressed steel sole plate. The conditions of running require that this plate shall be of such form as to clear the end of the next plate throughout the range of inclination to which the links are subjected, and that over the same range there shall be no opening between the plates, in which nut-cracker action can take place. The troubles due to stretching can be forestalled, as was shown by Hans Renold about twenty-five years ago, by making the pitch of the driving wheel large in the first instance, so that the chain track is driven, at the beginning of its life, from a tooth nearly opposite that which is entering into engagement with it. By these means a fairly long life can be assured to the chain, provided it is not overloaded, and that efficient lubrication is maintained. The usual method is to supply a large amount of low-grade oil to the in-



Chain track totally spring supported over effective length (Clayton)



Sprocket design to allow for wear of chain (Renold)



Roller chain for Pedrail and triple roller chain

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Table II—Details of Chain Track Tractors

No.	Fig.	Description	Maker	H.P.	No. of Cylinders	Bore (In.)	Stroke (In.)	Rated R.p.m.	Main Clutch	Speeds in M.P.H. at Normal Engine Revolutions				Capacity: U. S. Gallons			
										1st	2nd	3rd	Reverse	Gasoline	Kerosene	Bulk Oil	Water
1	59	Log-Hauler (steam)	Phoenix	100	4	6.25	8.0 d.a.	—*	Throttle	0	to	5.0	0 to 5.0	....	....	....	....
2	66	Centiped, 50 h.p.	Phoenix	50	4	5.5	7.0	700	.....	1.5	3.0	5.5	1.5	....	60	....	.....
3	73	Tractor-Truck, Type A	Allis-Chalmers	68	4	5.25	7.0	1,000	Cone	1.61	3.5	6.2†	1.41	25	....	....	9
4	74	Caterpillar, 120 h.p.	Holt	120	6	7.5	8.0	550	5 disc	2.13	(3.5)	...	2.13	....	65	*6.0*	80
5	75	Caterpillar, 75 h.p.	Holt	75	4	7.5	8.0	550	5 disc	2.13	3.5	...	2.13	....	65	6.0	53
6	76	Caterpillar, 45 h.p.	Holt	45	4	6.0	7.0	625	5 disc	1.5	2.13	3.5	1.5	....	43	....	8.4
7	78	Caterpillar, 18 h.p.	Holt	18	4	4.5	6.0	750	3 disc	1.5	2.2	3.6	1.5	....	14	....	5
8	92	Clayton Tractor, 110 h.p.	(Clayton and	110	6	5.75	6.5	1,000	7 disc	1.25	3.5	5.0	2.0	2.5	14	6	14
9	100	Clayton Tractor, 35 h.p.	\Shuttleworth)	35	4	4.75	5.5	1,000	Cone	2.0	4.0	...	1.75	2.5	14	....	6
10	101	Tracklayer, 90 h.p.	C. L. Best	90	4	8.0	9.0	450	Expanding	1.5	2.375	.....	1.625	7	79	8	32
11	....	Tracklayer, 75 h.p.	C. L. Best	75	4	7.75	9.0	450	Expanding	1.5	2.375	.....	1.625	7	79	8	32
12	102	Tracklayer, 30 h.p.	C. L. Best	30	4	5.25	6.25	600	Expanding	1.75	2.5	...	2.0	....	25	1.4	.....
13	....	Tracklayer, 16 h.p.	C. L. Best	16	4	4.375	5.25	650	Expanding	*1.75 to 2.38*	....	...	*1.75 to 2.38*	....	15	....	.....
14	....	Creeping-Grip, "Giant"	Bullock	75	4	7.5	9.0	550	Expanding	1.06	2.4	3.4	1.77	14	52	....	60
15	107	Creeping-Grip, "Senior"	Bullock	50	4	6.5	8.0	600	Expanding	1.06	2.4	3.4	1.77	14	55	....	144
16	....	Creeping-Grip, "Junior"	Bullock	30	4	5.0	7.0	600	Expanding	2.25	4.0	...	2.25 to 4.0	14	14	....	25
17	108	Creeping-Grip, "Baby"	Bullock	16	2	6.0	6.0	550	Expanding	2.5	....	...	2.5	15	....	....	.....
18	112	Austin Tractor, No. 35	F. C. Austin	35	4	5.0	6.5	800	.....	1.25	2.5	3.75	1.25 to 3.75‡	20	40	....	56
19	113	Austin Tractor, No. 15	F. C. Austin	15	4	4.25	5.5	800	.....	1.25	2.5	3.75	1.25 to 3.75‡	9	18	....	14
20	114	Burford-Cleveland Tractor	H. G. Burford	20	4	3.5	5.125	1,000	2 disc	3.2	....	....	3.2	2.5	7	....	12
21	119	Strait Tractor	Killen-Strait	50	4	4.75	6.75	850	Cone	2.0	3.0	...	2.0	30	....	3	15
22	119	Strait Tractor	Killen-Strait	50	4	4.75	6.75	850	Cone	2.0	3.0	...	2.0	30	....	3	15
23	122	Strait Tractor, Mod. 3	Killen-Strait	25	4	4.25	5.75	900	Cone	2.25	....	...	2.25	12	....	3	8.4
24	124	Yuba Tractor, Mod. 18	Yuba Ball-tread	35	4	5.25	5.75	700	.....	1.96	3.05	...	1.96	5	27	3.8	.....
25	124	Yuba Tractor, Mod. 12	Yuba Ball-tread	25	4	4.5	5.5	700	.....	1.64	2.66	...	1.64	4	18	1.6	.....
26	137	Martin Cultivator, 25 h.p.	Martin	25	4	3.75	5.0	1,000	Cone	3.0	....	...	3.0	9	....	....	.....
27	147	Lefebvre Tractor, 40 h.p.	Lefebvre	40	4	5.125	6.25	900	Disc	2.15	2.92	...	2.15	26	....	....	10.5
28	....	Lefebvre Tractor, 30 h.p.	Lefebvre	30	4	4.375	5.125	1,000	Disc	2.15	2.92	...	2.15	26	....	....	8
29	152	Trench Excavator (steam), Mod. 60	Parsons	80	2	7.5	10.0 d.a.	175*	Expanding	0.002 to 0.045		1.5	1.5	....	....	....	204
30	153	Trench Excavator, Mod. 48	Parsons	62	4	7.25	9.0	500	Band	0.004 to 0.055		1.375	1.375	52	....	....	204
31	....	Trench Excavator, Mod. 36	Parsons	45	4	6.25	8.0	600	Band	0.004 to 0.055		1.5	1.5	46	....	....	163
32	154	Trench Excavator, Mod. 24	Parsons	30	4	5.0	7.5	650	Band	0.008 to 0.110		1.5	1.5	33	....	....	100
33	....	Trench Excavator, Mod. 18	Parsons	20	4	5.0	6.0	700	Band	0.008 to 0.110		1.5	1.5	26	....	....	47
34	....	Trench Excavator, Mod. 15	Parsons	30	4	5.0	7.5	650	Band	.....		1.5	1.5	33	....	....	100

Approximate and estimated figures are shown in italics. * Steam. † 4th speed 7.5. ‡ 3 speeds on reverse.

side of the chain; an oil drip so fitted to the side chains of certain early-pattern motor cars (1900-1902), which ran under almost identical conditions of mud and dust, has proved almost as efficient in preserving the chains as frequent removal, washing in paraffin, drying and soaking in a bath of warm tallow and plumbago. Cheap oil used lavishly appears, in fact, to keep the tracks from cutting or seizing even under very bad conditions. In the Tracklayer (Best) a different methed of providing against wear is adopted, the pin being made of rocker form.

Another matter that affects the design of the whole chain track is that of the permissible sag. The chain is supported laterally by the sprocket teeth at the back end and by the idler rim at the front end; over the intermediate parts it is only supported by the flanges of the supporting rollers. As the flanges of these rollers are limited for size by the closeness of the bearing surface to the ground, it will be seen that the permissible sag which may occur when crossing holes in rough ground is not very great. If supported at the ends the suspended portion of chain hanging freely will assume a curve which approximates to a catenary. For such a crude approximation as is afforded by the few suspended links of the chain track, the curve passing through the centers of the pins is very nearly a parabola; if the curvature is small, this in turn approaches a circular arc. The worst condition for the chain occurs when there is a combination of steering and backing on rough ground; this may at the same time cause slackness in the carrying part of the chain combined with sideway thrust due to steering, and in some of the forms of construction described the roller flanges may be caused to ride on the chain surfaces.

One method of dealing with the difficulty is that of giving a large camber to the supporting portion of the track. In a vehicle styled the "Centipede," built by William Foster & Co., Limited, the track was given a camber about equivalent to that of a 16-ft. wheel. In the majority of the tractors described the curvature of the supporting portion of the chain track is very small, corresponding to that of wheels from 90 ft. to 160 ft. in diameter, and in some cases even it has zero value, the part of the chain track on which the wheels run being laid flat. This necessitates care in keeping the chain track constantly adjusted for wear. It will be noted that this difficulty is not so serious in the chain tracks fitted with an intermediate chain, as both the chains can sag together, and it is possible to provide deep retaining faces to keep the intermediate roller chains in place.

Lateral Pressure

The lateral pressure on the chain track when the tractor is traveling on side-lying ground, or crossing ditches obliquely, is another factor that must be taken into account in designing the chain track as well as the truck frame and its connections. Under most conditions the sideway thrust is taken partly on the flanges of the truck rollers and partly on the flanges of the driving sprocket and idler. An arrangement which appears to provide specially for this condition is that of the Ball-Tread (Yuba). In this the whole of the lateral as well as the vertical pressure is transferred from the chain track to the track frame through the balls. Lateral load merely affects the angle of incidence of pressure on the ball without increase of friction. Diplock, in his recent developments of the Pedrail, has obtained the same result in a different way, by using a compound chain of rollers arranged alternately with axes horizontal and vertical, the track frame and bearing surfaces of the chain track being made with appropriate faces for receiving the vertical and lateral loads respectively.

For traveling on rough country and under general agricultural conditions the pressed steel shoe is found satisfactory. In this case the supporting surface for the rollers consists of a steel casting, or case-hardened drop-forging, bolted to the shoe; in other cases the track shoe and supporting surface

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Details of Chain Track Tractors

TABLE II—(*Continued*)

Chain-Track Tractors

No.	Fig.	Description	Maker	Supports to Each Track	Track Width		Track Length	Area of Tracks		Weights (Lb.) Carried On			Total Weights (Lb.)		Insistent Weight in Lb. per Square Inch	
					Normal	Wide		Normal	Wide	Tracks		Steering Wheels				
					In.	In.	In.	Sq. In.	Sq. In.	Normal	Wide		Normal	Wide	Normal	Wide
1	99	Log-Hauler (steam)	Phoenix	14 rollers	12 0	....	60	1,440	....	30,500	.....	5,500	36,000	.....	21.18	....
2	66	Centipod, 50 h p	Phoenix	14 rollers	12 0	....	60	1,440	....	13,600	.....	3,200	16,800	.....	9.45	....
3	73	Tractor-Truck, Type A	Allis-Chalmers	15 rollers	12 5	....	60	1,500	....	*14,400*	.....	*3,600*	18,000	.....	*9.60*	....
4	74	Caterpillar, 120 h p	Holt	5 wheels	24 0	30 0	80	3,840	4,800	23,750	....	2,500	26,250	.....	6.19	4.95
5	75	Caterpillar, 75 h p	Holt	5 wheels	24 0	30 0	80	3,840	4,800	21,350	.....	2,250	23,600	.....	5.56	4.45
6	76	Caterpillar, 45 h p	Holt	5 wheels	12 0	30 0	70	2,080	4,800	13,000	14,500	.....	13,000	14,500	6.25	3.02
7	78	Caterpillar, 18 h p	Holt	5 wheels	11 0	....	64	1,408	....	6,000	.....	.....	6,000	.....	4.26	....
8	97	Clayton Tractor, 110 h p	Clayton and Shuttleworth	7 wheels	22 5	....	100 5	4,522	....	26,880	.....	3,360	30,240	.....	5.94	.....
9	100	Clayton Tractor, 35 h p		4 wheels	14 0	....	71 3	2,000	....	5,040	.....	.....	5,040	.....	2.52	.....
10	101	Tractlayer, 90 h p	C. L. Best	7 wheels	24 0	30 0	90	4,320	5,400	*25,000*	*25,000*	*5,000*	*30,000*	*30,000*	*5.79*	*4.63*
11		Tractlayer, 75 h p	C. L. Best	5 wheels	24 0	30 0	66	3,168	3,960	*23,300*	*23,300*	*4,700*	*28,000*	*28,000*	*7.36*	*5.88*
12	102	Tractlayer, 30 h p	C. L. Best	4 wheels	12 0	20 0	66	1,584	2,640	8,500	8,500	.....	8,500	8,500	5.37	3.22
13		Tractlayer, 16 h p	C. L. Best	3 wheels	10 0	....	66	1,320	....	5,100	.....	.....	5,100	.....	3.86	....
14		Creeping-Grip, 75 h p	Bullock	4 wheels	20 0	....	64	2,560	....	19,500	.....	3,500	23,000	.....	7.62	....
15	107	Creeping-Grip, 50 h p	Bullock	4 wheels	20 0	....	64	2,560	....	*16,500*	.....	*3,000*	*19,500*	.....	*6.45*	.....
16		Creeping-Grip, 30 h p	Bullock	3 wheels	12 0	....	48	1,152	....	6,500	.....	*1,500*	*8,000*	.....	*5.64*	....
17	108	Creeping-Grip, 16 h p	Bullock	3 wheels	12 0	....	48	1,152	....	5,200	.....	.....	5,200	.....	4.51	.....
18	112	Austin Tractor, 35 h p	F. C. Austin	6 wheels	12 0	36 0	96	2,300	6,900	10,800	12,300	.....	10,800	12,300	4.70	1.78
19	111	Austin Tractor, 15 h p	F. C. Austin	2 wheels	12 0	....	60	1,440	....	6,750	.....	.....	6,750	.....	4.70	....
20	114	Burford-Cleveland 30 h p	H. G. Burford	1 wheels	6 0	....	50	600	....	3,000	.....	.....	3,000	.....	5.00	....
21	119	Strait Tractor, 50 h p	Knight-Strait	3 wheels	18 0	24 0	48	1,728	2,304	*8,000*	*8,000*	*1,500*	9,500	*9,500*	4.63	*5.47*
22	119	Strait Tractor, 30 h p	Knight-Strait	3 wheels	30 0	36 0	48	2,880	3,456	*8,500*	*8,500*	*1,500*	*10,000*	10,000	*2.95*	2.46
23	122	Strait Tractor, 25 h p	Knight-Strait	3 wheels	17 0	....	48	816	....	*5,000*	.....	*1,000*	6,000*	.....	*5.68*	....
24	124	Yuba Tractor, 35 h p	Yuba Ball-tread	2x21 balls	17 0	....	48	1,632	....	7,400	.....	1,500	8,900	.....	4.53	.....
25	124	Yuba Tractor, 25 h p	Yuba Ball-tread	2x16 balls	15 0	....	36	1,080	....	6,000	.....	1,600	7,600	.....	5.55	.....
26	127	Martin Cultivator, 25 h p	Martin	3 wheels	8 0	....	40	640	....	3,250	....	670†	3,920	.....	5.01	....
27	147	Lefebvre Tractor, 40 h p	Lefebvre	Not supporting	10 2	....	63	....	..	..	....	4,000	7,050	....	....	....
28		Lefebvre Tractor, 30 h p	Lefebvre	Not supporting	8 3	....	51	....	..	....	....	1,780	5,950	.....	....	....
29	152	Trench Excavator, Mod. 60	Parsons	6 wheels	26 0	....	72	3,744	....	27,000	....	27,000‡	54,000	.....	7.21	....
30	153	Trench Excavator, Mod. 48	Parsons	6 wheels	27 5	....	72	3,960	....	33,800	.....	11,200	45,000	.....	8.54	....
31		Trench Excavator, Mod. 36	Parsons	6 wheels	26.0	....	66	3,432	....	22,000	.....	8,000	30,000	.....	6.41	....
32	154	Trench Excavator, Mod. 24	Parsons	6 wheels	25 5	....	62	3,162	....	12,000	....	5,000	17,000	.....	3.80	....
33		Trench Excavator, Mod. 18	Parsons	6 wheels	24.0	....	41	1,968	....	7,000	.....	2,600	9,600	.....	3.56	....
34		Trench Excavator, Mod. 15	Parsons	9 wheels	30.0	....	78	4,680	....	20,000	.....	.....	20,000	.....	4.27	.....

Approximate and estimated figures are shown in italics. *2,000 lb. on wheel. †On ploughs. ‡Two pairs of wheels.

are formed in one as a single steel casting. Where the ground surface presents small resistance to shear or actually lubricates the shoes, as is the case with clay and chalk and some grass surfaces, it is sometimes found necessary to attach grousers or spuds of angle bars to the shoes by means of bolts. When the tractor is required to do hauling on ordinary roads it may be necessary to attach thin sleepers of hard wood to the shoes in order to provide a flat bearing and prevent damage to the road surface. Those chain tracks which present fairly flat surfaces to the road and are not excessively cambered—the lower-powered Caterpillars, Clayton and Burford-Cleveland for example—can be run over inferior roads with even less risk of damage than would occur with the ordinary driving slats of the common traction engine.

Engines

The internal-combustion engines fitted to chain-track tractors are generally of a type resembling that used for heavy truck work. There is no reason for great economy in weight, and indeed the weight of the vehicle must not be too small for the tractive effort; consequently cast iron is preferred to aluminum for the engine and also for the gearbox. A governor is usually fitted to prevent racing the engine. That care which is taken in designing the passenger car engine to obtain a flat torque curve, and which is accompanied by large diameters of valves, induction and exhaust passages, is not called for here. The torque curve consequently falls rapidly at a comparatively low speed. This, as is generally recognized by the makers of engines for commercial vehicles, is not without advantage, for when the resistance to traction becomes unduly heavy, owing to gradient or softness of the ground, and the speed of the engine is consequently reduced, the torque increases and the driver has a better chance of extricating the vehicle from its difficulty without changing gear than is the case with constant torque. A typical torque curve of one of these engines is given in the accompanying diagram. The tractor engine runs at a low piston speed, 600 ft. to 900 ft. per minute; that is, at barely one-half the speed usual for the passenger car engine. On the other hand, it is required to work at a greater percentage of its full power than is the case with the passenger car engine, and for considerations of fuel economy it should, in general, be designed to give its best efficiency, measured in brake horsepower per gallon per hour, at from 50 per cent to 70 per cent of its full rated capacity. In many instances the engines are designed to start on gasoline and to run normally on kerosene, or, in America, on "distillate"; this also implies a larger engine for the power than is the case where gasoline or benzol is the usual fuel.

Lubrication

Lubrication of the engine is usually insured by the splash system, but in some instances a combined splash and forced lubrication system is fitted. Separate oil reservoirs are of course required for the engine-lubricating oil and for the crude black oil used for the track chains.

The usual form of ignition is the high-tension magneto. Self-starters are not fitted, as they would involve too much additional complication. Owing to the large size of some of these engines, and the difficulty of starting by swinging the starting crank handle, a trip gear is arranged on the magneto which enables a strong sparking current to be obtained for a small movement of the cranking handle. This arrangement was used by the author in 1895 on gas-traction tram cars, the engines of which were started by pulling over the flywheel. The combined use of gasoline for starting and kerosene for running complicates the carbureter and piping arrangements slightly, and involves fitting an extra tank,

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Details of Chain Track Tractors

TABLE II—(*Concluded*)

No.	Fig.	Description	Maker	Steering Gear	Tractor Overall: Normal Width	Tractor Overall: Length	Turning Radius	Drawbar Pull on Low Gear	Front Wheels: No.	Front Wheels: Width	Front Wheels: Diam.	Pitch of Chain Track	Drawbar Pull Per Cent of Weight: Normal	Drawbar Pull Per Cent of Weight: Wide
					Ft. In.	Ft. In.	Ft. In.	Lb.		In.	In.	In.		
1	89	Log-Hauler (steam)	Phoenix	Runners and engines	5 4	27 6	75 0	.....	2	Runners		*9.5*	....	....
2	66	Centiped, 50 h.p.	Phoenix	Front wheels	5 4	21 0	25 0	8,000	2	10	40	*9.5*	47.6	....
3	73	Tractor-Truck, Type A	Allis-Chalmers	Front wheels	*5 6*	*21 6*	*26 0*	8,000	2	10	40	7.6	44.4	....
4	74	Caterpillar, 120 h.p.	Holt	Front wheel and clutches	8 8	31 0	*16 0*	12,000	1	18	36	*9.25*	45.7	....
5	75	Caterpillar, 75 h.p.	Holt	Front wheel and clutches	8 8	19 6	15 0	8,500	1	18	36	*9.25*	36.0	....
6	76	Caterpillar, 45 h.p.	Holt	Clutches and brakes	6 8	12 9	6 0	4,500	None	....	....	*9.25*	34.6	31.0
7	78	Caterpillar, 18 h.p.	Holt	Clutches	4 3	9 6	6 0	2,800	None	....	.....	*7.5*	46.7	....
8	92	Clayton Tractor, 110 h.p.	{Clayton and Shuttleworth}	Front wheel and brakes	7 4	17 6	10 0	22,000	1	6	50	7.75	72.8	....
9	100	Clayton Tractor, 35 h.p.		Clutches and brakes	5 4	10 10	7 0	.....	None	.....	.....	7.5	....	....
10	101	Tracklayer, 90 h.p.	C. L. Best	Front wheel and clutches	*8 9*	*24 6*	....	14,500	1	20	40	9.75	48.3	....
11	...	Tracklayer, 75 h.p.	C. L. Best	Front wheel	8 7	22 4	.....	12,000	1	24	48	9.75	42.9	....
12	102	Tracklayer, 30 h.p.	C. L. Best	Clutches and brakes	5 5	9 4	6 0	3,500	None	....	.....	7.25	41.2	....
13	...	Tracklayer, 16 h.p.	C. L. Best	Clutches and brakes	4 2	7 0	5 0	1,750	None	....	.....	4.6	34.3	....
14	...	Creeping-Grip, 75 h.p.	Bullock	Front wheels	8 0	18 8	30 0	13,000	2	10	40	9.0	56.5	....
15	107	Creeping-Grip, 50 h.p.	Bullock	Front wheels	8 0	18 0	30 0	8,200	2	10	40	*9.0*	42.1	....
16	...	Creeping-Grip, 30 h.p.	Bullock	Front wheel	5 8	13 0	22 0	3,330	1	14	32	*7.0*	41.6	....
17	108	Creeping-Grip, 16 h.p.	Bullock	Clutches*	5 3	11 6	8 0	.....	None	....	.....	*6.0*	*30.6*	....
18	112	Austin Tractor, 35 h.p.	F. C. Austin	Clutches and brakes	5 8	10 0	6 0	5,400	None	....	.....	*9.0*	50.0	43.9
19	113	Austin Tractor, 15 h.p.	F. C. Austin	Clutches and brakes	6 0	9 0	6 0	3,000	None	....	.....	*9.0*	44.4	....
20	114	Burford-Cleveland, 20 h.p.	H. G. Burford	Band brakes	4 2	8 0	6 0	*2,000*	None	....	.....	8.0	*66.7*	....
21	119	Strait Tractor, 50 h.p.	Killen-Strait	Front track	6 0	13 0	8 0	5,600	1	14	chain	6.5	59.0	*59.0*
22	119	Strait Tractor, 50 h.p.	Killen-Strait	Front track	8 0	13 0	8 0	5,600	1	14	chain	6.5	*56.0*	56.0
23	122	Strait Tractor, 25 h.p.	Killen-Strait	Front track	5 10	12 10	8 0	*2,500*	1	12	track	6.5	41.7	....
24	124	Yuba Tractor, 35 h.p.	Yuba Ball-tread	Front wheel*	6 1	15 1	7 6	4,600	1	14	36	*3.75*	51.7	....
25	124	Yuba Tractor, 25 h.p.	Yuba Ball-tread	Front wheel*	5 9	14 7	7 9	3,400	1	14	36	*3.75*	44.7	....
26	137	Martin Cultivator, 25 h.p.	Martin	Dog clutches	4 6	16 0†	8 0	*1,900*	None	....	.....	7.0	48.5	....
27	147	Lefebvre Tractor, 40 h.p.	Lefebvre	Front wheels	6 1	18 0	16 6	4,400	2	10	30	8.5	62.4	....
28	...	Lefebvre Tractor, 30 h.p.	Lefebvre	Front wheel	5 9	15 8	11 6	3,100	1	14	30	8.5	52.0	....
29	152	Trench Excavator, Mod. 60	Parsons	Front and back wheels	10 0	35 0	30 0	.....	2‡	14	40	7.0	....	....
30	153	Trench Excavator, Mod. 48	Parsons	Front wheels	10 5	46 6	50 0	.....	2	20	40	6.0	....	....
31	...	Trench Excavator, Mod. 36	Parsons	Front wheels	8 9	36 6	50 0	.....	2	20	34	6.0	....	....
32	154	Trench Excavator, Mod. 24	Parsons	Front wheels	7 8	28 3	30 0	.....	2	15	30	6.0		
33	...	Trench Excavator, Mod. 18	Parsons	Front wheels	7 0	23 0	30 0	.....	2	15	26	5.0	....	....
34	...	Trench Excavator, Mod. 15	Parsons	Clutches	10 0	15 0	30 0	....	None	....	.....	6.0	....	....

Approximated and estimated figures in italics. *Either track can be reversed. †Includes ploughs. ‡Also two back wheels.

but the advantage of ease in starting is well worth this.

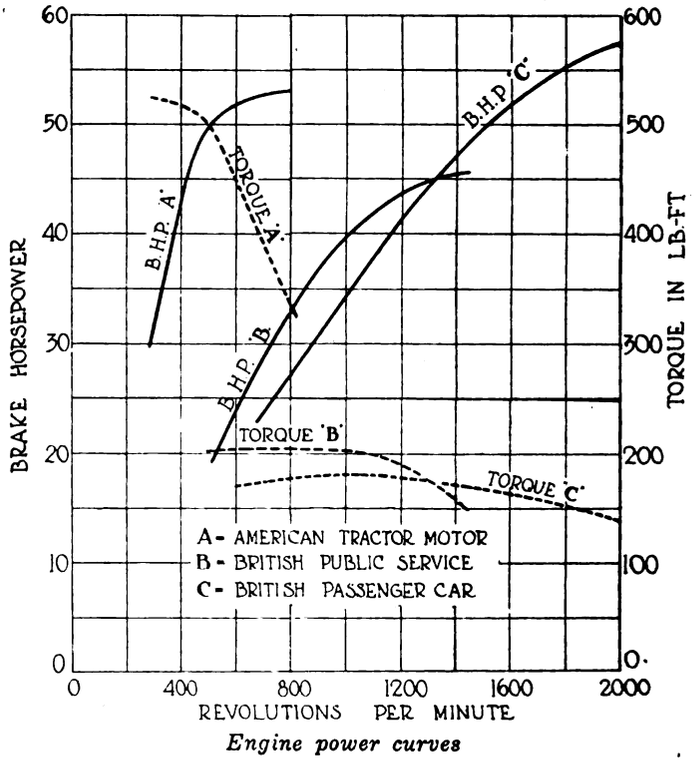
The radiators of chain-track tractors have been designed to meet the exigencies of the working conditions. The cooling surface must be large to enable the engine to run continuously under heavy load in the heat of summer; and a fan, if fitted, must be easy of access and simple in its driving gear. The water supply carried must be sufficiently large to last for a long journey of perhaps a whole day away from the base station; for this reason a large tank for water, or equivalent radiator capacity, is provided in most models. Finally, it is necessary that the whole water system should be capable of being drained at its lowest points, to avoid risk of damage by frost when the machine is laid up in winter.

As the machines have to work in places distant from large manufacturing centers, it is moreover advisable that the design of radiator should admit of its easy removal from the vehicle, of ready access of its water joints, and of the possibility of executing repairs without special tools and appliances. The conditions of the problem are similar to those of the motor omnibus; more severe regarding the total cooling to be effected, and less severe in weight restrictions. The type generally adopted is the vertical gilled tube with top and bottom reservoirs; in some of the lower-powered tractors these reservoirs are made of sufficient size to avoid fitting a separate water tank. The water circulation is usually forced by means of a centrifugal pump or by a gear pump, the former type being the more common.

At normal revolutions per minute of the engine the lowest or first speed of the majority of chain-track tractors varies from 1.25 m.p.h. to 2.25 m.p.h.; on the second speed from 2 m.p.h. to 3.5 m.p.h.; and on the third or top speed, where such is fitted, from 3 m.p.h. to 5.5 m.p.h.

The changing of gear is usually effected by sliding gears or dog-clutches in a gearbox of motor-lorry type, the main clutch being disengaged for gear changing or reversing. Cut steel gears, case-hardened, are usual for spurs and bevels; plain bearings are commonly fitted in the gearboxes, which are of heavy design and usually of cast-iron.

(*To be continued*)



Engine power curves

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Thermostatic Control Considerations

Shortening of Warming-Up Period Reduces Crankcase Dilution—Installations Vary in Detail

By J. Edward Schipper

IN connection with the subject of crankcase oil dilution the question arises, to what extent this trouble may be obviated by the use of thermostatic water-temperature control. There is no doubt that the installation of a thermostat materially reduces the period required to warm up the engine, and, therefore, its use should have a beneficial effect in maintaining the lubricating quality of the oil in the crankcase.

Practical considerations enter into the question whether or not thermostatic control should be fitted. Probably the most important of these is the possibility of restrictions in the water passages, especially in systems not primarily designed for the thermostat. Undoubtedly, in extremely warm weather the effects of such restrictions would be noticeable, unless some sort of by-pass arrangement could be included so that the circulation would not be impeded.

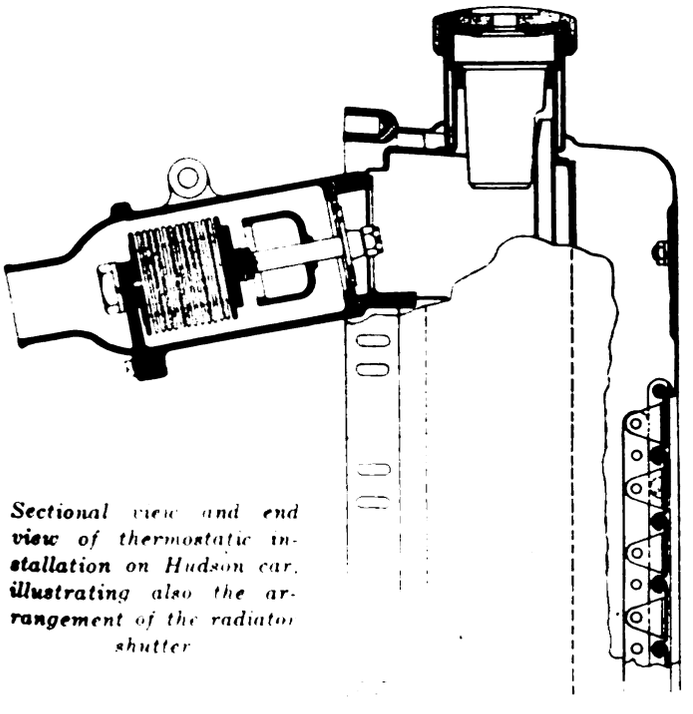
The internal-combustion engine is essentially a heat engine, being used for converting heat energy into mechanical work. In proportion as the heat of the fuel is converted into useful work its efficiency is increased; conversely, the more the heat that passes into the jacket cooling water the lower the efficiency of the engine. In order to establish fairly constant working conditions a thermostat is so placed as to control the temperature of the water leaving the cylinders.

During the winter the advantage of such control is pronounced. When a car is left standing the temperature of the cooling water drops. Upon restarting the engine, if the whole volume of cooling water must be raised to the most efficient working temperature, considerable time must elapse, which results not only in delay and inconvenience to the driver but in the consumption of an extra amount of gasoline because of the necessity of employing the choke, and consequent increased leakage past the rings.

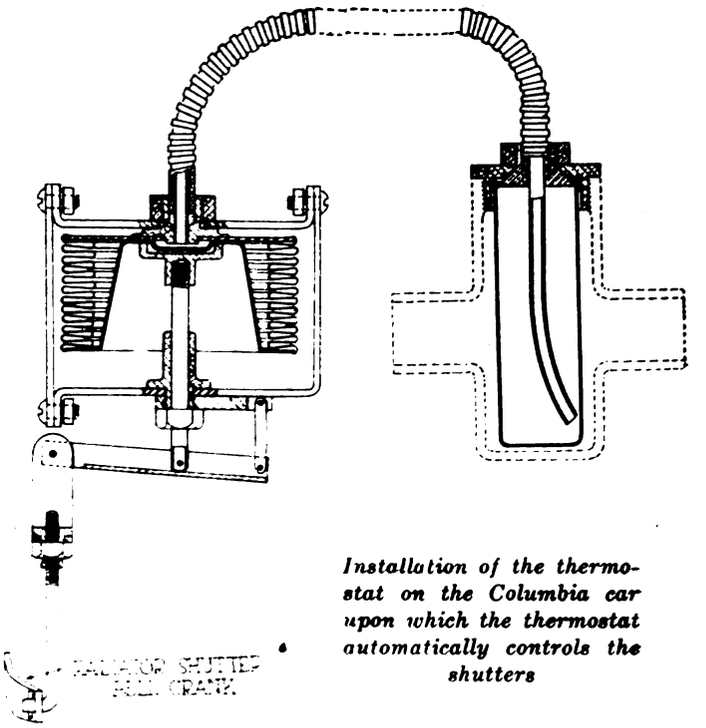
With the thermostat, only a small portion of the cooling water requires heating to the normal temperature. This results in a quicker getaway and a much smoother running engine. Aside from the resulting convenience to the driver, there is a saving in gasoline, because the thermal efficiency is much higher when the engine is working at its best running temperature.

Loss of Alcohol a Factor

Another factor to be considered in this connection is economy of anti-freezing solution. It has generally been found that alcohol solutions make the most satisfactory non-freezing fluid, and these solutions are very extensively used. With the thermostat set at a sufficiently high temperature to justify its use, there is naturally a tendency for the alcohol to be boiled off rapidly. If some provision is not made to take care of this, the maintenance of the solution at its proper strength may become quite a source of expense to the car user. This objection has been overcome by the Cadillac company by



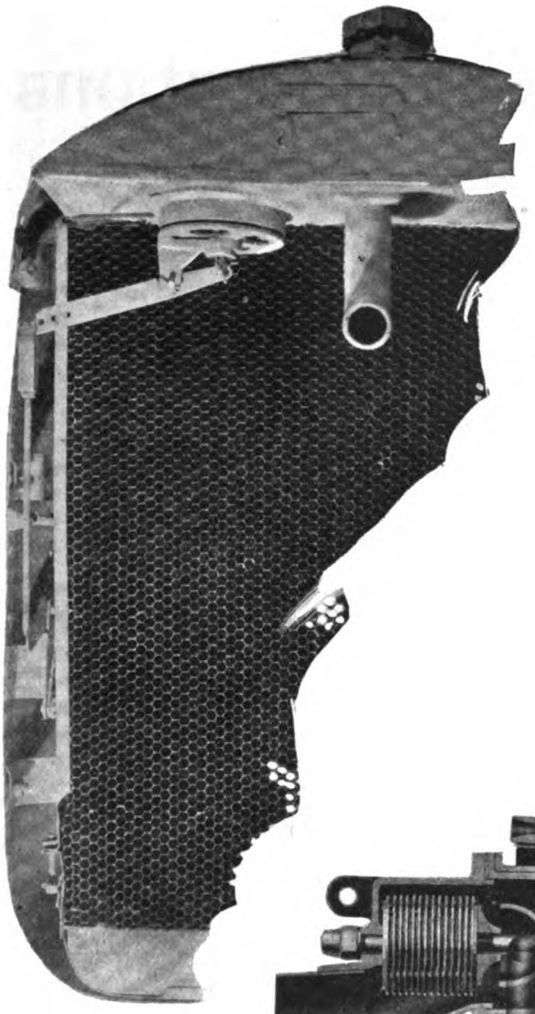
Sectional view and end view of thermostatic installation on Hudson car, illustrating also the arrangement of the radiator shutter



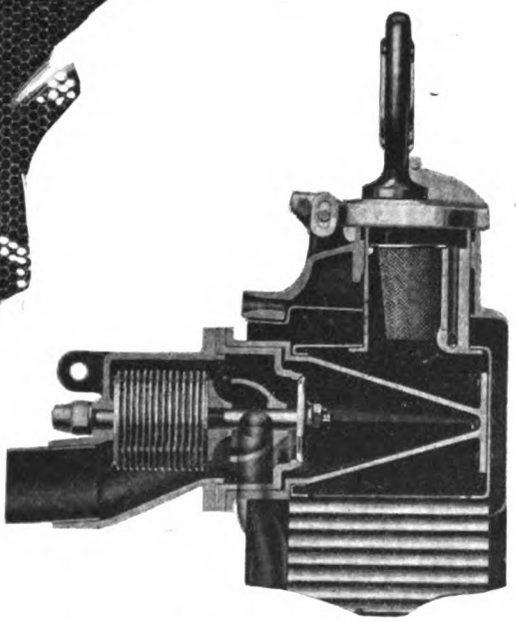
Installation of the thermostat on the Columbia car upon which the thermostat automatically controls the shutters

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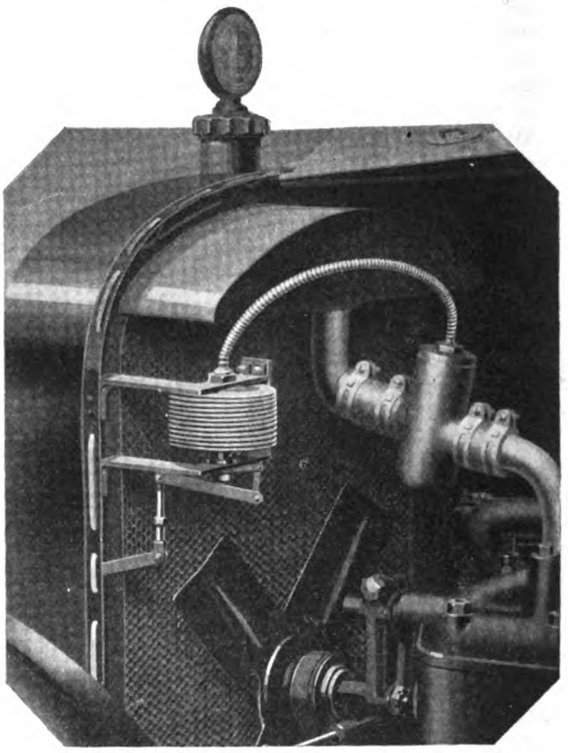
Installations of Thermostatic Circulation Control



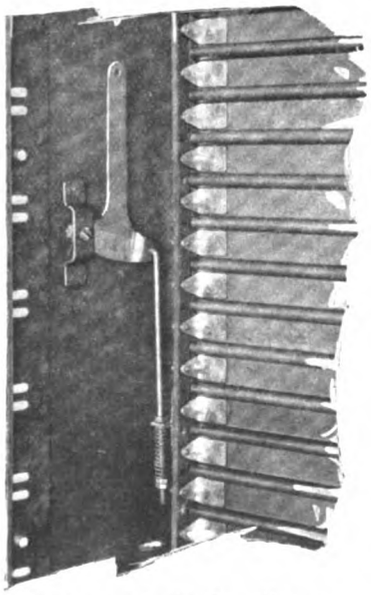
Recommended installation for thermostat in tank of Harrison radiator



Thermostat on Packard radiator



Attachment of thermostat behind radiator of Columbia car



Lever control of radiator shutters for hand linkage on Hudson

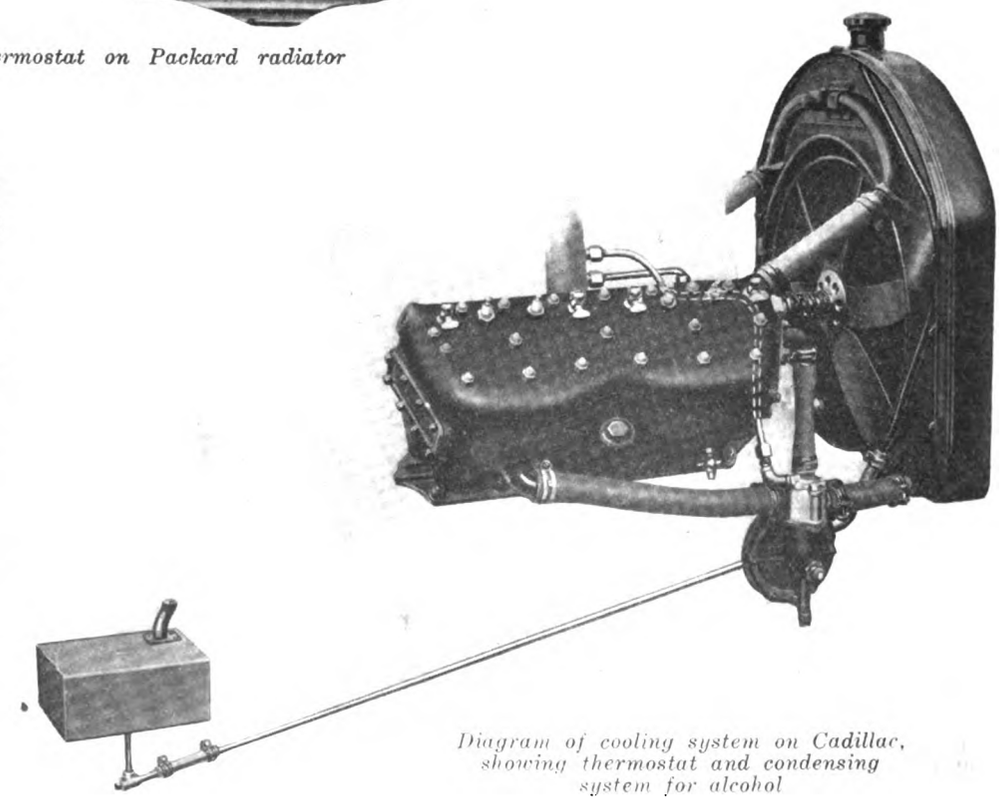


Diagram of cooling system on Cadillac, showing thermostat and condensing system for alcohol

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the employment of a condensing apparatus which traps the vapor arising from the alcohol in a small tank beneath the car, from which it can be drained off at intervals and used over again.

If water-temperature control is to be developed further we will probably eventually come to the use of variable cooling surface, that is, variable radiator area. It has often been contended in these columns that it is a reflection on the engineering ability of the industry to see expensive passenger cars on which hundreds of dollars have been spent to secure pleasing appearance carrying a piece of old cardboard or newspaper over the front of the radiator in cold weather.

The use of radiator shutters has been one of the means used to control water temperature. Two well-known cars using the shutters are the Hudson and Columbia. On the Hudson the shutters have nothing to do with the thermostat. On the Columbia the opening of the radiator shutters is controlled by the thermostat. On the Hudson car, the radiator shutter, construction of which is shown in sectional view on page 638, when the thermostatic valve is closed the water is by-passed through the tubing to the intake side of the water pump. When the water has reached the running temperature the taper-seated valve is wide open and the flap valve opening into the by-pass is closed, so that all the water is forced through the radiator. This part of the system is automatic. The remaining part of the system is manually controlled by the driver, who can vary the effective radiator area by means of a lever under the cowl.

The advantage of the independently controlled shutters is that it eliminates the danger of the engine freezing while running. Even after the engine is thoroughly warmed up the water will freeze in the radiator when running into a severe head wind if the full area is exposed. By means of the shutters, with a motometer on the radiator cap, the driver can hold the temperature of the water at the desired point, while the thermostat takes care of the preliminary heating during the warming-up stage.

One objection to thermostat installations having only one valve controlling the flow of the water at the entrance to the upper tank of the radiator is that when the proper temperature has been reached, and the valve opens, the water can either flow into the upper tank of the radiator or into the by-pass tube. It will naturally divide between the two paths in the reverse proportion of their resistances. Such control is not desirable in that the full value is not secured from the radiating surface.

A 30 per cent saving in fuel through the use of the thermostatically-controlled shutters has been claimed by the makers of the Columbia car. A saving of lubricating oil, due to the reduction in crankcase dilution, is also claimed.

Make-Up of Thermostatic Control

Thermostatic circulation-control devices generally consist of two main parts. The first of these is a bulb and flexible tube containing the sensitive liquid, the latter being composed chiefly of ether. This bulb is held in an iron housing placed in the water-return line. The second part is an expansion drum of flexible copper, which is forced open in the manner of an accordion by the action of vapor given off by the contained liquid under the effect of heat. As the motor temperature varies, this drum opens and closes, and operates the shutter through a system of levers.

The thermostat becomes active as the temperature approaches 140 deg. Fahr., and the shutter, which, when closed, permits little water to pass through the radiator, begins to open. This opening action is continued until an engine temperature of 180 deg. is reached, at which temperature the shutter is entirely open. At 180 deg. the motor is working at its maximum efficiency. The highest possible temperature is essential to satisfactory performance with present-day gasoline of low volatility. With thermostatic control the maintenance of the highest possible temperature is rendered possible without danger of overheating the engine, as any variation of temperature affects the thermostat, and the valve is automatically shifted to meet the new condition. A motometer is generally used to show the driver that the temperature of the engine is being properly regulated, and is an essential part of thermostatic equipment.

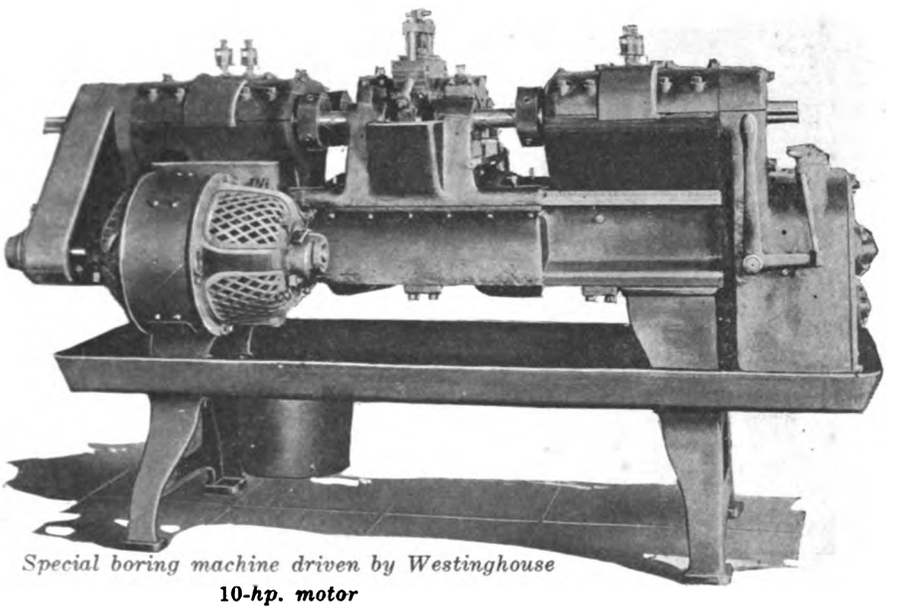
Special Boring, Reaming and Facing Machine

A SPECIAL boring, reaming and facing machine built by the Reed-Prentice Co., Worcester, Mass., to bore, ream and face a steel forging used as an engine support in an automobile is illustrated herewith.

The work is held in quick acting clamps mounted on the revolving triangular turret of the carriage. All of the operations are automatic, with the exception of placing the work in the machine and indexing the turret. Each time the work holder is revolved 120 deg., the finished piece at the top is removed and another rough forging is placed in position with little loss of time.

There are four spindles, two on each of the opposing heads.

Two pieces of work are operated on simultaneously. The cycle of operations is as follows: The carriage moves toward the right; during its travel one piece is drilled and a second piece faced on one side. The carriage then automatically moves toward the left, during which travel one piece is reamed and the second piece faced on its other side, after which the carriage returns automatically to its neutral or starting position, at which point the feed is tripped.



Special boring machine driven by Westinghouse 10-hp. motor

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Lauraine High Tension Magneto

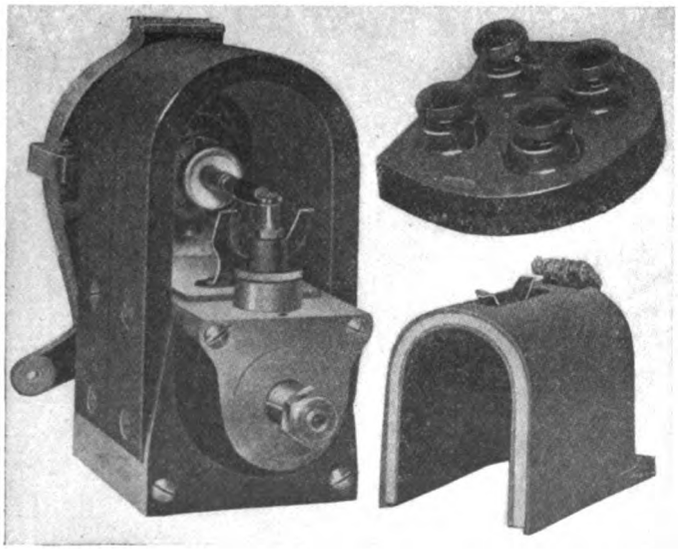
Made in All Standard Types for Terrestrial, Marine and Aerial Use

A NEW high tension magneto has been placed on the market by the Menominee Electric Products, Inc., New York. The machine is of conventional design throughout and is entirely water-proof. It is made in all standard sizes, and in addition to models for motor car, marine, truck and tractor work, a special light model made in aluminum for aircraft work has been brought out. By the use of aluminum and other light material a saving in weight of 4 lb. has been effected.

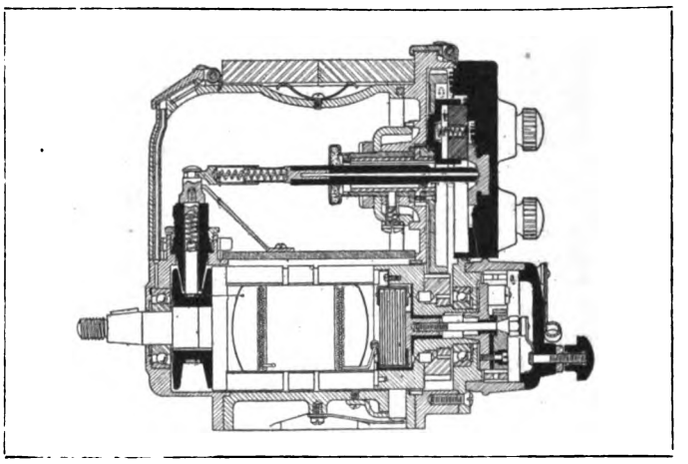
From the sectional view herewith most of the important constructional details may be seen. The armature is of the Siemens shuttle type and carries both the primary and secondary windings. One end of the primary winding is grounded on the armature core, while the other is carried out to the circuit breaker on the end of the armature shaft. The breaker arm bearing is built up of cross sectional fibre working on a pin which is integral with the main breaker block, thus preventing undue compression and expansion due to moisture or high temperature. The breaker cam is cut from steel tubing which is shaped, hardened and ground to size, and it is claimed that as a result of this construction absolute synchronism is assured. The breaker housing on these magnetos comes with two arms, so the machine may be installed on either side of the engine.

The high tension current is collected from the armature through a collecting ring and brush at the driving end. From this brush the current is transmitted to the distributer. The usual safety spark gap is provided to afford an outlet for the spark in case a high tension cable should come loose from the spark plug or the high tension circuit be interrupted in some other way. The spark at the safety gap may be observed through a small window in the water proofing cover. All parts of insulating material subjected to high tension are made of hard rubber. The distributer gear is adjustable for wear by means of an eccentric bushing, and it is claimed that this will insure quiet operation throughout the life of the machine.

In the Lauraine magneto the water proofing effect is carried out in a somewhat different manner from that found on most other magnetos. The water-proofing cover is inside



Lauraine magneto complete, its distributer block and water-proof housing



Section through magneto

of the horseshoe magnets, hence the magnets and also the end plate can be removed without disturbing the water-proofing effect. Although the water-proofing cover is inside the magnets, it also can be easily removed, in case it is desired to gain access to parts within it.

All castings, bases and end plates are made of bronze, which obviates trouble due to warping and consequent disalignment of the parts. The shaft height, shaft end and other features conform to S. A. E. standards. As will be seen from the sectional view, the armature is supported in annular ball bearings, while the distributer is carried in a plain bearing of very liberal size, which is provided with wick oiling.

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Military Aircraft Problems

IN a paper published in a recent issue of the Journal of the Franklin Institute, W. F. Durand discussed some of the problems encountered in the development of fighting aircraft. Referring to the plan of firing safely through a revolving propeller by mechanism by which the gun is prevented from firing unless the propeller blades are clear, he said that this device was not always effective owing to occasional delayed ignitions. Hence blades were sometimes hit, but in general no great damage resulted. In exceptional cases, however, the injury to the propeller was serious, and might lead to disaster. Another method of firing dead ahead on "tractive" machines was to mount the gun on the upper plane so that it fired over the propeller, but the gun was not then under such ready control.

A third plan was to make the propeller shaft hollow and fire through it. This was only practicable when the propeller was gear driven, but this was now becoming desirable for other reasons since modern engines were being run at rates of revolution incompatible with the high efficiency of a direct driven propeller capable of absorbing the power developed. To get a good propeller efficiency it was, in short, desirable to keep down the speed, while to get a high development of power per pound weight of the engine it was necessary to put up the speed of rotation. With the V type of engine the shaft of a geared propeller might be, he said, conveniently arranged between the two rows of cylinders. In this way any desired gear ratio could be adopted, and by making the shaft hollow a path for the bullets was provided free from any possible obstructions.

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Dimensions of Steel Tube Struts*

With Formulas and Graphs for Use in Selecting the Proper Size of Tube for Different Lengths of Strut and Loads

By Carlo Maurilio Lerici

THE accompanying graphs have been prepared in order to facilitate the calculation of the dimensions of such circular and streamline steel tubes as are employed in airplane construction. The diagrams give directly the compression permissible for a maximum load of 10 kg. per sq. mm. (13,750 lbs.-sq. in.); that is to say, with a factor of safety of six for steel commonly employed having an ultimate strength of 60 kg. per sq. mm. (82,500 lbs.-sq. in.). The streamline section tube is that of minimum resistance (Fig. 1), tested by Eiffel and adopted as standard by nearly all the constructors of the world. The fineness ratio of this section is about 3. The ratio of the two moments of inertia I_{zz} and I_{yy} is about 5. It will be easily seen that there is an almost constant relation between strength in compression of circular and streamline steel tubes.

For the standard type (Fig. 1) I have found that the streamline tube whose section has the external dimensions $d \times 3d$ has the same compressive strength as a circular section tube of the same length and thickness (gage), having an external diameter = 1.5 d. This factor has formed the basis for the graph Fig. 2. The following data are given: W = normal compressive load, L = length of tube. The graph shows that for each value of W there are generally several solutions according to the different values of the thickness adopted. In this connection it should be noticed that, in order to attain maximum lightness, one should adopt the minimum possible thickness s. The ratio of s to d should not be less than 1/30.

It should also be pointed out that the condition of minimum weight for streamline tubes exposed to a current of air, as the struts of an airplane, is only convenient in machines having a low flight speed. Generally it is possible to so dimension these tubes as to render minimum the power absorbed by their weight and by their head resistance. In the best of modern high-speed machines the total power P absorbed by one meter of streamline tube exposed to the air is given by the formula:

$$P = \frac{dv^3}{10^6} + \frac{34vds}{10^4}$$

d in cm.
s in cm.
v in metres per second.

$$P = \frac{7.25dv^3}{10^8} + \frac{7.85vds}{10^6}$$

d in inches.
s in inches.
v in. ft.-in.

An examination of this formula gives the following results: (1) For machines having a speed of not more than 120 km.

*From *Flight*.

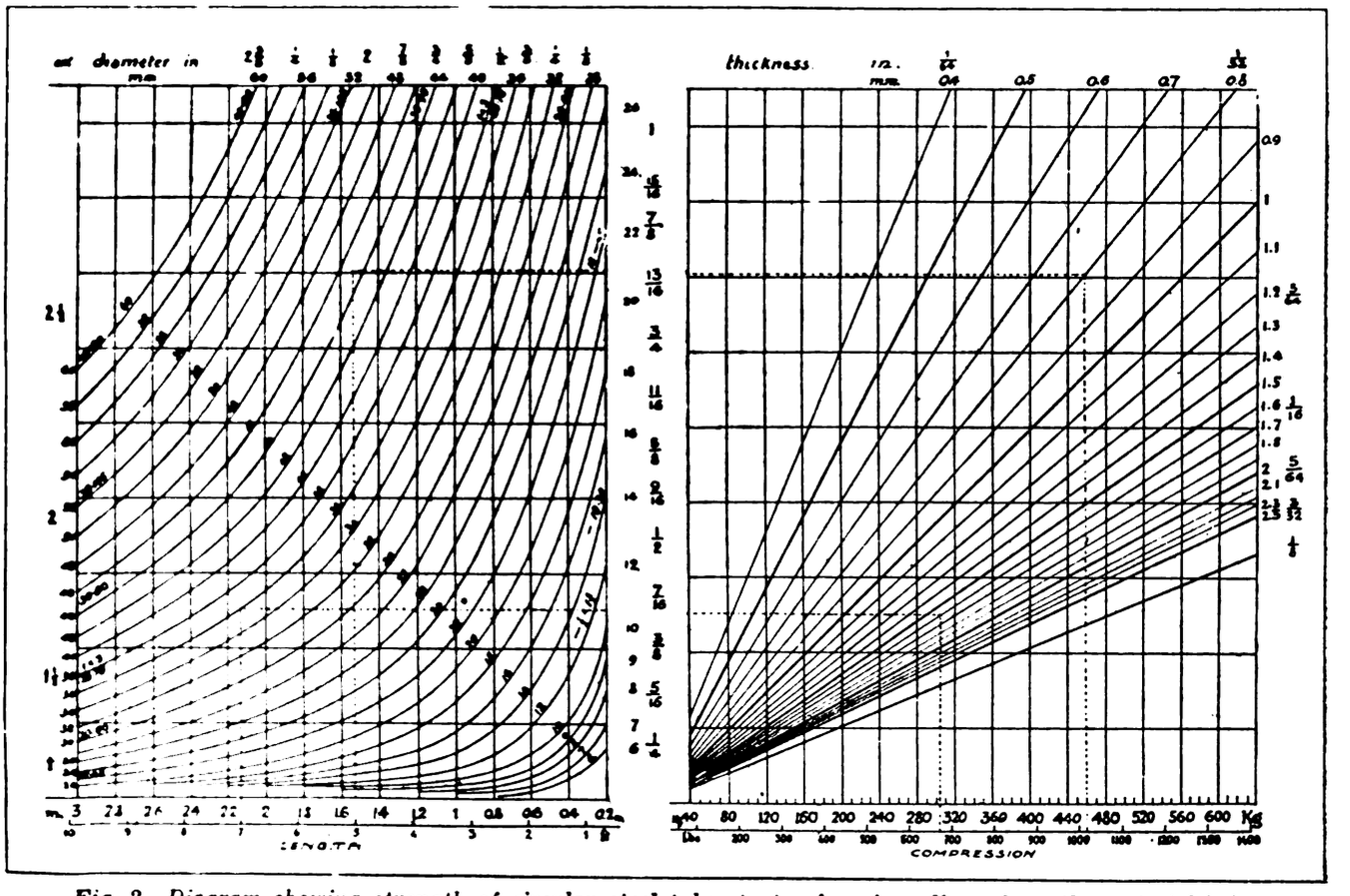


Fig. 2—Diagram showing strength of circular steel tube struts of various dimensions, the material being assumed to be steel of 74,000 lb. per square inch tensile strength. For the section shown in Fig. 1 the values found for circular struts must be divided by 1.5.

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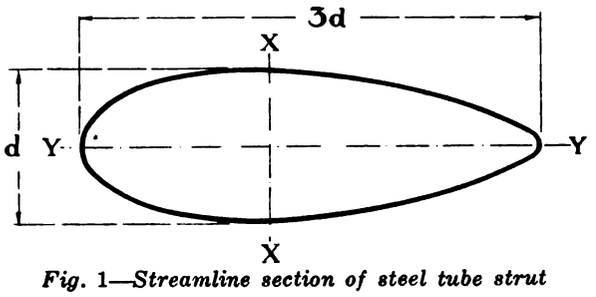


Fig. 1—Streamline section of steel tube strut

per hour (75 m.p.h.) the minimum value of P is obtained by giving the struts a thickness of between 0.8 and 1.6 mm. (1/32 in. and 1/16 in. respectively). (2) For machines of which the normal speed varies between 120 and 160 km. per hour (75 and 100 m.p.h.) the optimum thickness varies between 1.2 and 2 mm. (3/64 in. and 5/64 in.). (3) For speeds between 160 and 200 km. per hour (100 to 125 m.p.h.) the optimum thickness varies from 1.6 to 2.4 mm. (1/16 in. to 3/32 in.). (4) For speeds above 200 km. per hour (125 m.p.h.) the struts should be given the maximum possible thickness, weight having no longer any appreciable influence.

It sometimes happens that one has to depart from these dimensions giving maximum efficiency in order to avoid during flight every vibration that might diminish the compressive strength of struts. For instance, this happens when the frequency of the struts' proper vibration under normal load coincides with or is a multiple of the number of revolutions of the motor. Such a phenomenon of resonance can be countered by modifying one of the dimensions s or d.

The following examples show the method of using the graph:

(1) *Center Section Strut.*—Streamline section. Steel of 60 kg. per sq. mm. (82,500 lbs. per sq. in.). Factor of safety = 6. Length, 7 ft. Compression in strut, 670 lbs. Thickness s = 1/16 *in.* From the diagram it will be seen that the circular tube has an external diameter of 36 mm. (1 7/16 in.). Streamline tube having same length, $d = 36:1.5 = 24$ mm. (61/64 in.). As the fineness ratio of the strut is three, the dimensions should be about 1 ft. 3 in.

(2) *Chassis Strut.*—Streamline section. Steel, 60 kg. per sq. mm. (37 tons per sq. in.). Factor of safety, 6. Length 5 ft. Compression under normal load, 1020 lbs. Thickness 1/32 in. The circular tube indicated in the diagram as being of the requisite strength for this load has an external diameter of 45 mm. (1 13/16 in.). Streamline tube having same strength $d = 45:1.5 = 30$ mm. (1 13/64 in.). As the ratio of s to d is less than 1/30, it will be advisable to adopt a thickness of 3/64 in. In that case $d = 41:1.5 = 27.5$ mm. (1 3/32 in.).

Helping the Jobber Through the Dealer

By Allen Sinsheimer

THE Marvel Accessories Mfg. Co., Cleveland, Ohio, sells its products to the jobber. The jobber distributes them to the retailers. The dealers retail them to the public. At first glance the business of the Marvel company comprises chiefly the problems of manufacture and the organization of jobber distributors. But the company operates more intensively. It builds on the principle that its products are not sold until they are in the hands of the consumer, and it extends its sales activities beyond the jobber to the dealer.

The entire country is divided into territorial districts, each under the control of a responsible salesman, who sells to the jobbers in his district, and in addition, following the company's plan, also supervises the dealers in his territory. Each new dealer is watched. Aid and advice are given. And every jobber is urged to follow the same principle and to maintain sufficient stock to meet the dealer requirements.

Advertisements are placed broadcast by the company, reaching to every field, and creating a constant interest in the products. All inquiries resulting from the advertising, and sent to the maker, are in turn handed to the jobber or dealer, as the case may be.

Recently the company started its largest campaign based on:

Advertising in many publications.
Window signs for the dealer.
Lantern slides for the dealer.
Folders for the dealer.
Outdoor "gas" signs for the dealer.
Counter display signs for the dealer.
Circulars for the dealer's use.
Newspaper electros for dealer's use.
Demonstration patches.
And wall hangers, catalogs, etc.

Postal cards were forwarded with an announcement of the campaign to dealers, who were requested to check the advertising needs desired and to return the cards to the company's offices.

Each folder, window hanger, etc., was given particular attention, and was designed to carry a certain message. The campaign started at the height of the tire vulcanizing season. September is the month when motorists attempt to make used tires do for a period and carry them to the repair shops, and the company issued several pamphlets calling attention to its vulcanizing kits, which allow the motorists to vulcanize their own tires, besides a large window sign and a metal display card that can be attached to the gasoline pump, where every driver can see it.

A catalog of newspaper electros was sent broadcast, and resulted in hundreds of orders for electros from dealers who will co-operate in the campaign.

In the same way, pamphlets, folders, leaflets and window signs, designed to sell valve grinders, socket wrenches, chain fasteners and other products, were mailed to all dealers. The plan has been found extremely effectual, working prosperously for the company, jobbers and dealers, and welding all three into a close, harmonious manufacturing and distributing organization, where each division aids the other to a very important degree.

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Discussing Metric System

THE British Institution of Electrical Engineers recently discussed the probable effect on the British electrical trade of the introduction of the metric system, especially in those markets in which the English system is now in vogue, with a view to determining whether the compulsory introduction of metric measures should be pressed or resisted.

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IT is very important that in designing a charging equipment for electric motor vehicles provision should be made for boosting charges at high rates. The need of boosting may not at the outset be apparent. With roads in average condition, the possible mileage capacity of each vehicle may be ample for the daily service requirements. But inevitably there comes a time when the condition of the roads, combined possibly with high wind, is such that the energy taken per vehicle mile rises by from 50 to 100 per cent above normal. It is under such conditions that provision for boosting saves the situation and permits of the usual delivery service.

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Testing Electric Ignition Apparatus*

Notes on the Measurement of Current in Electric Ignition Spark Circuits

By J. D. Morgan

IN connection with the testing of electric ignition apparatus, namely, magnetos and induction coils, it is required to measure the current in the high tension spark circuit. Owing to the complex character of the current, the problem of measurement is a difficult one. At present the problem appears to be incapable of complete solution, and the task of producing a practical instrument resolves itself into devising means which will give useful indications when subjected to the actions of different currents having the same general characteristics.

The currents in the spark circuit of a magneto or induction coil are intermittent and oscillatory. In most cases the oscillations are superimposed on a unidirectional discharge. Also the oscillations are divisible into two successive parts, in the first of which the frequency is enormously higher than in the second. Plotting current against time, the general characteristics of a single discharge are related, as shown in Fig. 1. In some special cases the discharge is as shown in Fig. 2. Possibly the first part (a) consists of a series of oscillations, but the frequency is so great that the image of the spark in a rotating mirror is seen as a single bright line. The image of the second spark (b) is seen as a row of parallel lines which are much less bright than the first. It is to the current corresponding to the first bright line in the spark image that the difficulty of current measurement is due. This current is associated with the self-capacity of the spark generator. When the interrupter in the primary circuit is opened there is a rapid change of flux in the system. For a short interval at the commencement of this change a small quantity of current is stored due to the self-capacity of the generator. When the voltage reaches such a value that it breaks down the spark gap, the stored current discharges and produces the first part of the spark. It follows that this part of the spark has a practically constant value.

Tractors Affecting Spark Energy

In all ignition apparatus the current in the spark circuit depends on the speed of operation of the spark generator and the size of the spark gap. In magnetos provided with means for varying the position at which the contact breaker is opened in the revolution of the armature, current variations also accompany adjustment of the contact breaker. The character of the variations found in a normal magneto is as follows: Keeping the gap constant and fixing the contact breaker, the current increases with the speed. Keeping the speed constant without varying the contact breaker, the current increases with diminution of the spark gap. Keeping the gap and speed constant the current diminishes at low speeds when the contact breaker is moved from the "advanced" to the "retarded" position, and at high speed increases continuously or passes through a maximum

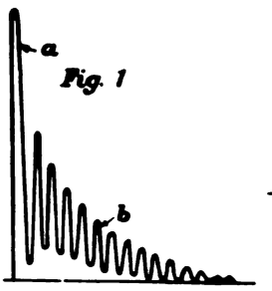


Fig. 1

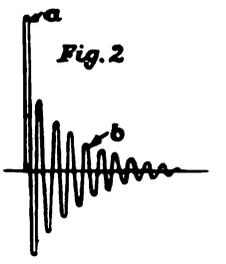


Fig. 2

value with the same adjustment of the contact breaker.

Obviously, any current-measuring instrument to be useful, must be capable of indicating the changes above mentioned, and to anyone unfamiliar with the problem it may appear remarkable that there should be any pitfall to avoid in constructing a suitable instrument. Some form of thermal ammeter or galvanometer is likely to give the best results, and several forms have been tried with ignition apparatus. In two, the heated element carrying the current to be measured consisted of extremely fine wire of comparatively low resistance. These instruments were of exquisite construction, but both showed a surprising behavior. With each a diminution of current was indicated with a diminution of spark gap instead of an expected increase. One indicated a constant current instead of a current which increased to a maximum and then decreased when at a certain speed of the magneto the contact breaker cam was moved from the advanced to the retarded position. Both gave at all

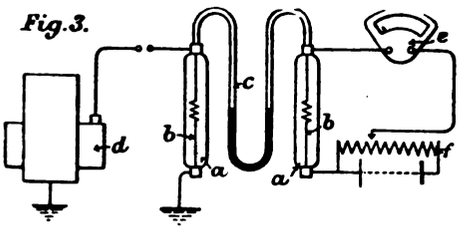


Fig. 3.

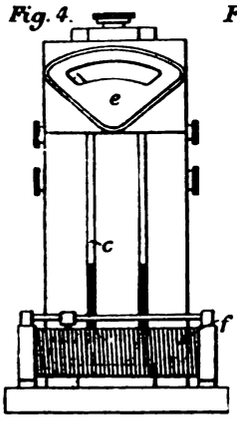


Fig. 4.

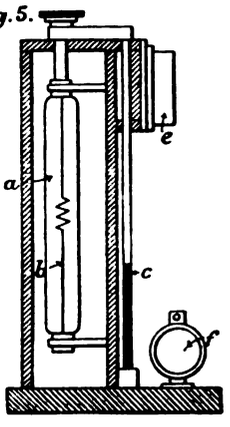


Fig. 5.

*From Engineering, London.

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speeds current values which were known to be much too high. One of these instruments was made to behave in a proper manner by E. A. Watson, by the inclusion in the instrument circuit of an inductance and a capacity which shunted the extra high frequency component of the current past the instrument and allowed only the component of lower frequency to pass through it.

Developing Measuring Instrument

Proceeding on different lines, the writer concurrently developed for his own work another type of instrument, the scheme of which is shown diagrammatically at Fig. 3 and the general appearance at Figs. 4 and 5. A pair of similar glass chambers *a* containing a metal or carbon filament *b* are connected to a capillary fluid indicator tube *c*. One of the filaments is connected to the spark circuit of the magneto *d*, as shown, while the other is connected to a battery circuit through a milliammeter *e* and variable resistance *f*. The heating of one of the chambers by the magneto current is balanced by the heating of the other by the battery current. With the particular filaments used, it is found near enough for practical purposes to take the milliammeter readings as the equivalent of the magneto current when the balance is obtained. Comparison with the instrument corrected by Mr. Watson shows that the indications of the two instruments agree very closely.

An essential condition of success in the instrument shown in Fig. 3 is that the filaments shall be of relatively high resistance. In the first model 16 cp. carbon filament lamps were used, these having a resistance of 1500 ohms each. Later cylindrical lamps recognizable in the drawings, and provided with comparatively thick metal filaments of 500 ohms resistance, were used, and found quite satisfactory. These instruments are sufficiently sensitive, and show the current variations which are expected from the theory of the ignition apparatus under test.

Ammeters for Complex Currents

In designing thermal ammeters for complex currents having widely different oscillatory components, it is necessary to pay careful attention to the heated element. If the element is made of low resistance, the instrument readings will be determined mainly, if not solely, by the high-frequency component of the current, whilst if wire of high resistance is used the readings will be determined mainly, if not solely, by the low-frequency component. Taking a typical experiment, one of the instruments first mentioned in this article was connected to a magneto, and its indication was found to be not only excessively high, but also constant for all positions of the contact breaker cam when the speed was kept constant. The only component of the current which could remain constant under this condition was the extra-high frequency component and the current value attained in it is undoubtedly much higher than in the other. Using the writer's instrument, the current value was much lower, and, repeating the test the expected variations were indicated.

It follows from the foregoing that different types of thermal instruments and varieties of the same type can give very different accounts of the same piece of ignition apparatus. Further, it follows, that in setting up a standard instrument it is necessary to settle beforehand which of the two current components shall be taken as the main or sole basis of comparison. A variety of considerations which are irrelevant to this article, and which are based on the properties of ignition apparatus, as well as on certain phenomena, lead the writer to the conclusion that it is the current of lower frequency which is the more useful for comparative measurements.

—

Brake Lining with Jute Backing

OUR attention has been called to a new method of making brake linings and clutch facings which consists, briefly stated, in weaving a fabric with an asbestos facing and a jute or cotton backing, the asbestos preferably having the usual wire reinforcement. This fabric is then given substantially the usual brake lining or clutch facing treatment. The advantage claimed for this new material is that the jute, cotton or other material used for a backing is somewhat more resilient than the asbestos and thus enables the brake or clutch in which it is used to take hold more gradually. In the case of a three or four-ply fabric, it is proposed to make one or more of the middle plies of jute or cotton and use asbestos for the outside plies. The manufacturers anticipate a great future for this material.

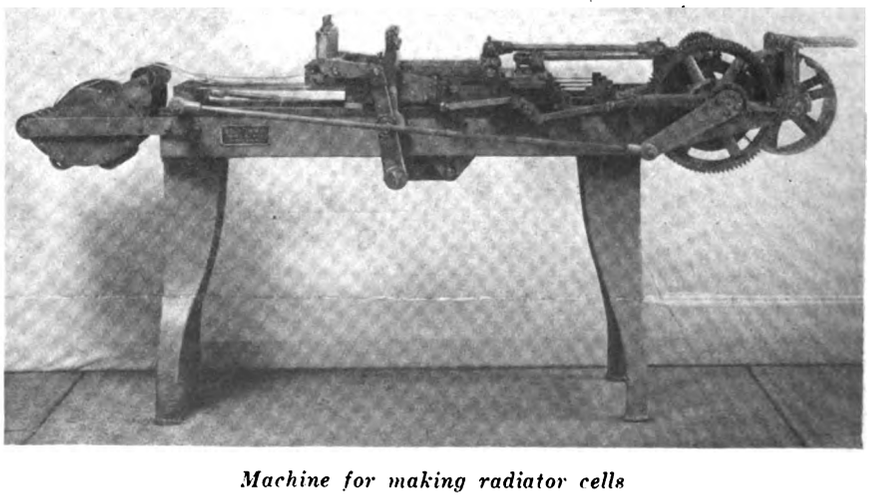
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Automatic Machine for Making Radiator Cells

THE accompanying photograph illustrates a special machine built for the F.I.A.T. Co of Turin, Italy, by the Stolp Co., Inc., Geneva, N. Y. The Fiat Co. has large orders for cars and trucks from the Italian Government and also makes the power plants for the Caproni biplanes. Its output is such that 2000 radiator cores are required per month, and this requires forty operators to produce the cells, using ordinary dies and tools, by which the cells are made in four operations.

With the machine just developed by the Stolp Co. three operators, one on each machine, will do the work, resulting in an enormous saving in wages. In addition to the saving in wages there is a saving in material. Formerly the Fiat company made its radiator cells from brass ribbons 55 mm. wide, but the machines make the same tubes from stock only 50 mm. wide, producing a perfect lock seam.

It is generally admitted that the cellular types of radiator are the most efficient, on the basis of the amount of metal used. That it is not more extensively used has generally been attributed to the large amount of labor required in its construction. It is possible that the introduction of this new machine will have a tendency to popularize the cellular radiator again.



Machine for making radiator cells

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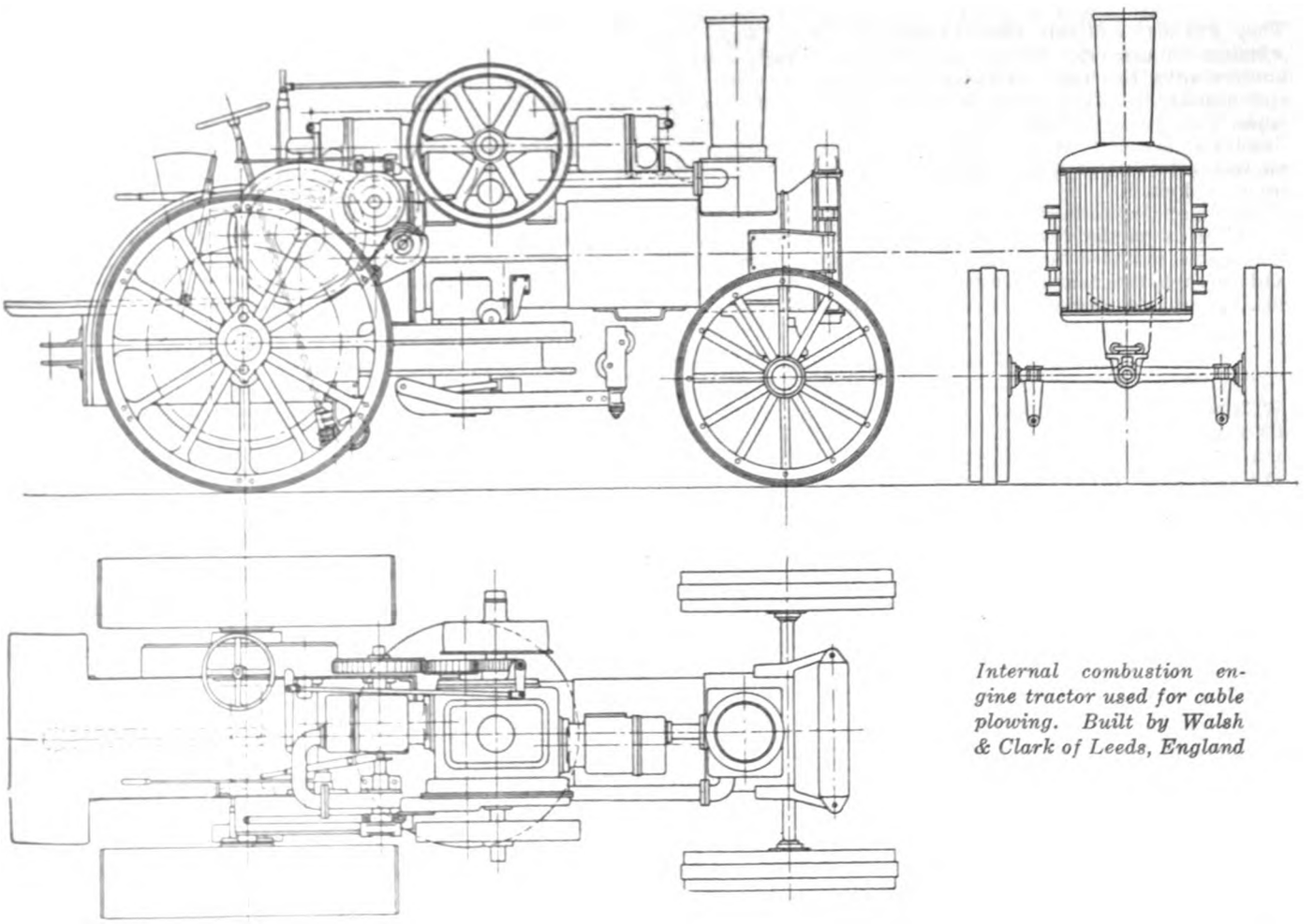
British Gasoline Cable Tractor

Advantages of Cable Plowing—Description of a British Gas Tractor Designed for Hauling Plows Through the Intermediary of a Cable

IN Great Britain the cable plow has had quite a vogue for a good many years, but almost exclusively in connection with steam power. Tillage by this system has several advantages over that done by horses, or even by the direct traction method now so much in use. It enables a much greater depth to be cut, and thus gives protection against both excess of rainfall and drought, while a more thorough mixing and disintegration of the manure with the soil is brought about. Another possible advantage is that plowing by this method can be carried on when the land would not be in condition to carry a tractor, provided the engines can be taken to the headlands. But a set of steam plowing tackle involves the expenditure of a considerable amount of capital. With the object of providing an equipment less costly than the usual steam plant, the firm of Walsh & Clark, Limited, of Guiseley, near Leeds, England, has designed a plowing set which operates on the cable system, but in which the motive power is supplied by internal combustion engines which are started on gasoline but run mainly on kerosene. Several views of the machine are shown herewith, the drawings being reproduced from *The Engineer*. Each engine weighs close upon 6 tons, and is rated at from 30 to 35 brake horsepower at an engine speed of 600 r.p.m. when traveling or plowing, and 22 brake horsepower on the driving belt.

As will be seen, the engine is of the horizontal pattern. It is secured to the barrel frame, and has two cylinders, 7 in. diameter by 8-in. stroke, with cranks set at 180 deg. On one end of the crank shaft of the engine is a simple clutch pulley, while on the other end is a flywheel. The clutch pulley has a long sleeve machine-cut steel pinion with twenty teeth, which meshes with a spur wheel with fifty teeth on a second motion shaft. This shaft serves to transmit motion either to the winding drum or to the road wheels. In the former case a sliding bevel pinion is brought into engagement with a bevel wheel keyed on a vertical shaft, on the lower end of which is a spur pinion which engages with teeth on the inside of the rope drum. The vertical shaft is carried in cast-iron bushes in brackets secured to the cross plate of the engine frame. The sliding bevel wheel is moved in and out of gear by means of a lever from the driver's seat. The movement of this lever also serves to operate a hand brake on the vertical shaft to prevent the drum running back and unwinding the rope.

On the right-hand end of the second motion shaft above mentioned are two floating steel pinions, either of which can be brought into engagement with a double spur wheel on the third motion shaft, on the other end of which a pinion is keyed. This pinion drives a large spur wheel which runs loose on the main axle, but can be secured to the road wheels by two pins. The road speeds thus provided are 2¼ and 4½



Internal combustion engine tractor used for cable plowing. Built by Walsh & Clark of Leeds, England

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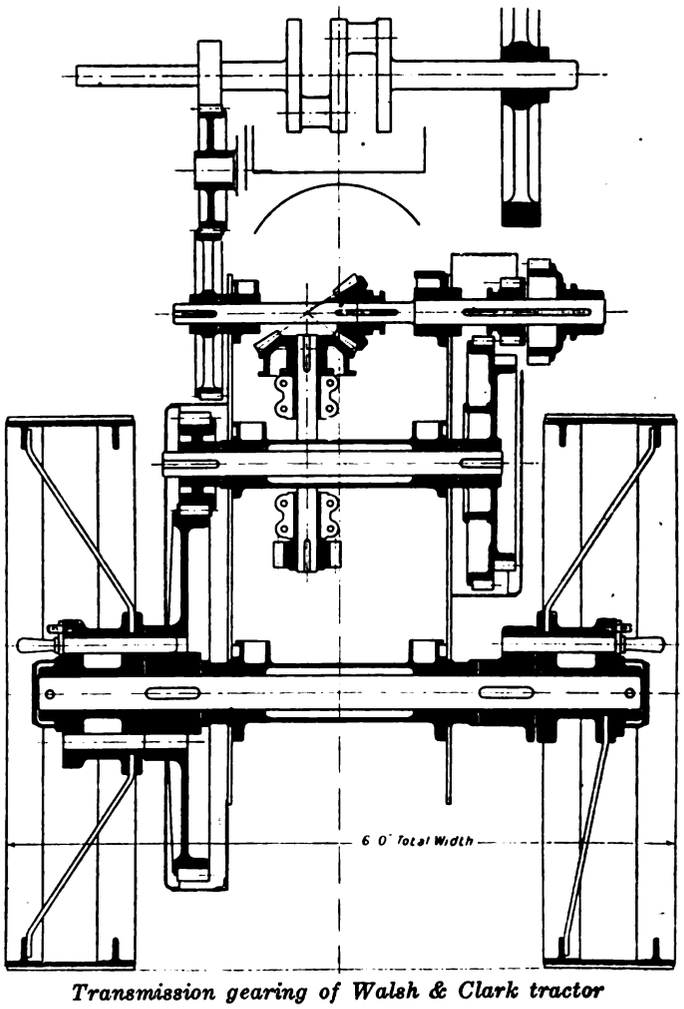
m.p.h. The driving wheels are 5 ft. diameter by 14 in. wide and are fitted with cross strakes, while the front wheels are 3 ft. 7½ in. by 8 in. wide. No differential gearing is provided. Reversing is effected by means of a wide pinion carried in a swinging link and engaging with the large double spur wheel on the third motion shaft, and the slow speed pinion on the second motion shaft. Locking gear is provided to prevent any two gears being in mesh simultaneously.

The barrel portion of the engine is used as a fuel oil tank, and besides giving the maximum stiffness to the whole machine, thus provides storage space for 50 gal. of fuel, which is enough for over four days' plowing operations. The barrel is 1 ft. 9 in. diameter and is made of ¼-in. steel boiler plates. The winding drum is carried by a stiff stud plate, ½-in. thick, double riveted to the shell and with a stiffening plate inside. The horn plates are of ⅜-in. boiler plating riveted to a cross plate at the rear end of the barrel. The third motion and main axle bearings are extended right across to each horn plate, and give further rigidity to the frame.

The valves of the engine are placed in the water-jacketed cylinder heads, and are operated by rocking levers and rods from two separate cam shafts in the engine crankcase. These cam shafts are driven by 2 to 1 spur gearing from the crankshaft, and a centrifugal governor mechanism is provided in the gearing to operate the throttle valve in each cylinder head. When starting from cold, gasoline is used, and is admitted to a small tank on each cylinder, from which it is drawn into the cylinders. Thé kerosene is also delivered by a pump into these fuel tanks, but on its way to the cylinder passes through a vaporizer formed by a nest of tubes in the exhaust passage. The engine is fitted with high-tension magneto ignition and impulse mechanism for giving a hot spark at starting.

The engine is designed to exert a continuous pull on the rope of 3500 lb. It is intended to haul a four-furrow plow on medium and light land, and a three-furrow plow on heavy land. A pair of engines can, we understand, plow from 7 to 10 acres per day of 10 hr., according to the nature of the land, and with rope speeds of from 250 ft. to 350 ft. per min. They will also cultivate from 14 to 20 acres per day. The winding drum carries 450 yd. of steel rope, which is coiled automatically by means of special coiling mechanism. The clutch pulley is 1 ft. 9 in. diameter by 6 in. face, and the flywheel 2 ft. 9 in. diameter by 4 in. face, and the engines are fitted with brakes to act on the drum on the large double gear on the third motion shaft. The steering is by hand wheel, worm and chain.

The special features of the radiator are the method of mounting it on the front end of the cylindrical frame and the means provided for inducing a current of air around and through the flanged tubes. The method of supporting the radiator is shown in the illustration, and requires no further description. The draft is caused by passing the exhaust gases round a large conical nozzle in the base of the chimney.



Transmission gearing of Walsh & Clark tractor

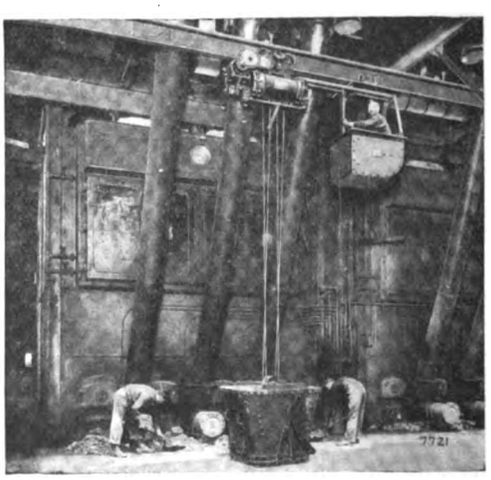
Summed up in a few words, the Walsh & Clark engine is a miniature replica of the large steam plowing engine as regards the cable mechanism, with the power supplied by a kerosene engine. The machine can also be employed as a tractor, whether for road or field work. On level roads it can haul a weight of 8 tons gross at 5 miles per hour. On the land it can haul plows taking a four-furrow plow over light land cultivators, harrows, etc.

Improved Ash Handling Apparatus

A MONORAIL electric hoist, with a bottom dumping bucket, lends itself readily to installation in existing boiler houses for ash handling purposes. This is especially true where the ashes are pulled out on the boiler room floor, which is often the case. The accompanying view illustrates an installation of the Link-Belt monorail hoist in the boiler house of a paper company.

This machine runs on the lower flange of an I-beam track. It is operated by a man traveling in a trailer cage, who controls the raising or lowering of the bucket, as well as the travel of the hoist. The laborers who clean the fires fill the bucket with ashes; the operator then hoists his bucket and runs it out directly over the car, where he dumps it, by the motion of a lever in the cage. The current required is said to be very small.

In this instance, the superintendent designed his own track support, the Link-Belt Co. of Nicetown, Philadelphia, Pa., furnishing the track and conductor. While he did the work quite cheaply, he also made a good job of it. About 30 tons of ashes are handled. They are pulled out every six hours. Two men do the work of shoveling into the buckets, and then one of them gets into the cage and runs it out into the car. At other times, to hurry the work, an additional man operates the hoist, remaining in the cage. The bucket holds 1¼ cu. yd. and is handled by a 2-ton hoist.


Removing boiler room ashes by overhead monorail hoist

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Collier Assembling 1500-Lb. Wagon

Furnishes Choice of Three Bodies and Electric Lighting and Starting for $885 f.o.b. Factory

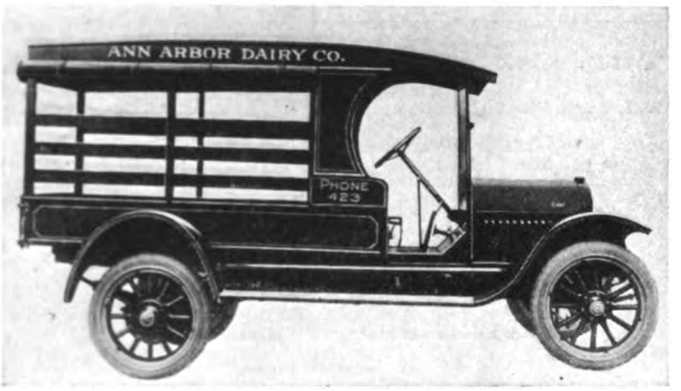
THE Collier Motor Truck Co., Bellevue, Ohio, is marketing a ¾-ton truck, selling for $885, with a choice of three body types. The truck is mounted on a 118-in. wheelbase chassis and has a 7-ft. loading space. The price includes the body, lighting and starting system. The truck is adapted to a wide range of usage where ability to carry heavy loads is not required but rather ability to make frequent and quick trips. In order to make relatively high speed practicable the truck is equipped with pneumatic tires.

The chassis is an assembled unit having a Lycoming engine, Mechanics Machine Co. clutch and gearset, Salisbury axle, Goodrich tires and Salisbury wheels. The car is shaft driven. The Lycoming engine is a four-cylinder type with two crankshaft bearings. Its bore and stroke are 3¼ by 5 in., the cylinders being cast in one block, with the valves on the right side. Cooling is by thermo-syphon circulation in connection with a cellular radiator having a pressed steel radiator case. Ignition is by a single system (Connecticut) with current from a Willard 6-volt, 80 amp.-hr. battery. A two-unit starting and lighting system (Auto-Lite) is provided as stock equipment. The carbureter is a Zenith, and fuel is fed to it by gravity.

The transmission system comprises a Raybestos faced, dry disk clutch. The selective three-speed gearset is mounted in a unit with the engine. The gears and rear axle provide a reduction of 6, 10½, and 18 to 1 forward, and 24 to 1 reverse. The drive is by means of a direct bevel gear through a three-quarter floating axle to the rear wheels. The propulsion is taken through a torque arm, which also absorbs the braking and starting torque. The springs are semi-elliptic all around. The wheels carry 32 x 4 in. tires.

The construction of the chassis is along conservative lines, a straight after section being used beneath the pay load and a slight bottle-neck effect forward of the center. This narrows at the front end of the frame to permit of shorter turning radius and also makes for a shorter supporting arm for the power-plant and radiator. The torque arm is bolted to the differential housing and to the central cross member. There are two universals in the drive, as will be noted from the plan view of the chassis herewith. The chassis frame is of pressed steel, 4 in. deep. The steering gear is a worm and gear type with an 18-in. hand wheel and with springs in the connecting link to the front axle for absorbing shocks.

The bodies offered are of the open express, side panel delivery and semi-closed type with side curtains.

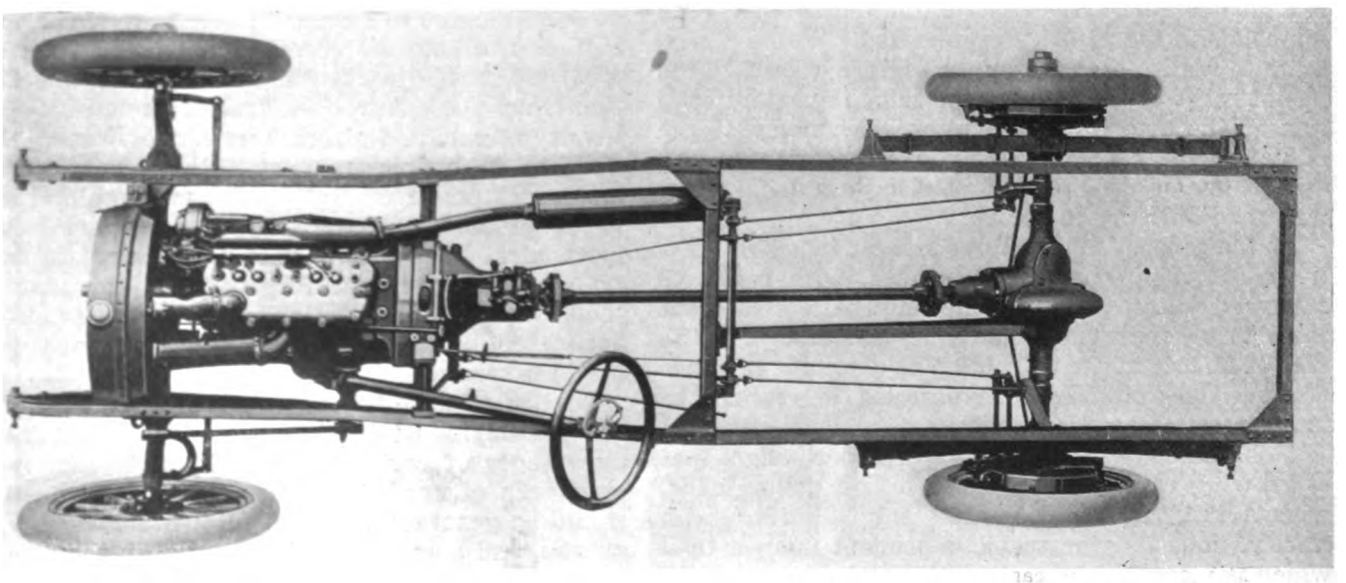


One body type offered with the Collier truck

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Flexible Coal Gas Containers

FROM information gathered by the Gas Trade Committee, it appears that so far about 4500 commercial vehicles have been adapted to the use of coal gas as fuel in England. Orders have been placed for 2500 additional flexible gas containers, all for commercial vehicles, and these are to be completed during the next few months. So far less than 4 per cent of the orders received by the manufacturers of these flexible containers have been for private vehicles, and no further such orders will be accepted. Practically all of the work on these containers is done by female labor. It is estimated that as a result of the use of coal gas for operating motor vehicles a saving of 3,000,000 gallons of gasoline a year is effected.



Plan view of Collier ¾-ton truck chassis

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The AUTOMOBILE

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Shall Our Road System Break Down?

HOW shortsighted we can be at times is well illustrated by the discrimination against road materials in the priority regulations. We have now come to realize that the public highways bear to the business life of the country the same important relation as the arteries to the internal economy of the human body. Yet, in the Government's priority orders, one of the classes first discriminated against was road-building material.

At the present moment our richest industrial districts are in a veritable cul-de-sac, with railroads crammed to capacity and the only outlets in some cases in a condition which defies description. The case of Michigan can be held up as a specific instance of how the authorities have failed to realize the importance of good highways.

This commonwealth, with a war order budget that is growing rapidly toward the billion dollar mark, with a railroad situation that only a miracle can clarify, finds its war traffic dependent upon a trail which is more like a bottomless pit than a road and which *in some parts is only 9 ft. wide!*

Between thirty and fifty military trucks, loaded with war material, plow their way daily over this Michigan road. In their wake are hundreds of commercial and passenger cars bound for Eastern points. Millions of dollars' worth of commerce taking this route is held up on a 9-ft. road and no permanent relief is expected by local road authorities before Aug. 1. At this time a year ago, August, 1917, was the date set for the completion of the permanent road.

This is only an example of what holds true in many other localities. Why should not the Government put a thousand men to work on a road of this kind? In a foreign military country it would have been done long since, as it would have been realized how serious a matter it is to have traffic of this importance in constant jeopardy. It is too long to wait until Aug. 1, particularly when past experience shows that little credence can be placed in a prediction of this nature.

One of the reasons given for the non-completion of many of the roads last fall was the embargo on road materials. This should never come up again. The Government would not think of holding up materials to repair and maintain the railroads of the country. The tonnage carried over the highways this year will far exceed the tonnage of any previous years and will probably overshadow that moved on the railroads. By all means let us watch the more essential highway arteries more closely than ever. Let us maintain them and keep them clear of mud in summer and snow in winter. Their importance cannot be over-estimated.

A New Phase in Standardization

AN effort is now being made to get the authority of the Federal Government back of certain standards which it is proposed to formulate and which cover machine parts of very general use. Standardization in this country originated in the automobile industry, and the rapid growth and prosperity of this industry during the past seven or eight years are by many believed to have been due in no small degree to this practice. It was, therefore, but natural that standardization should spread to other industries, and it was a first step in this direction when the motor boat, tractor, motorcycle, stationary engine and aircraft industries joined hands with the automobile industry in the Society of Automotive Engineers. But even the combined automotive industries constitute only a part of our mechanical industries, and if it is desired to standardize screw threads, for instance, the standard should be sponsored by an organization whose influence is coextensive with the industries using machine screws.

No doubt in the natural course of events all of the mechanical industries would eventually realize the advantages of certain standards, and possibly the standards of one of the most aggressive branches would be generally adopted. However, we are now at war, and quick action is essential in the removal of any barriers to rapid and efficient production. Screw threads have been standardized in the past,

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and for a wide range of sizes there are now three different pitches, covering a very wide range of conditions of use. However, to make screws truly interchangeable it is not sufficient to specify the pitch and form of thread. It must be realized that whatever the dimensions specified, these cannot be obtained in commercial work with absolute accuracy. We had a good illustration of this when the S. A. E. spark plug thread was first adopted. The object of this plug standard was to make it possible to use any make of spark plug in any engine. It was soon found, however, that the plug threads often came slightly over-size and could not be screwed into the cylinders. There was something lacking in the plug specifications, as originally drawn, which has since been supplied, and that is tolerances.

The same thing applies to screw threads in general. It is commercially impossible to make a screw thread of any definite pitch diameter, etc. Certain limits must be set within which these dimensions may vary, and this is the tolerance. Without tolerances it is impossible to have screws made in one plant and nuts or machine parts with tapped holes of the same nominal size in another and have any screw fit any nut or hole.

It is a rather novel proposition that the appointment of a commission to adopt screw standards should be made the basis of action by Congress. It is not the power of Congress to enforce the commercial adoption of any standard which may be formulated, but rather the prestige which would be given the standard by the sanction of Congress that is motivating those who are championing the bill. If it were not for the relation of the matter to the war it would seem that the formulation and promulgation of such standards would come within the province of the Bureau of Standards. What makes direct action by Congress more desirable in this case is that the screw thread standard is needed particularly in the work of the War Department and of the Navy. Now, the Bureau of Standards is a part of the Department of Commerce and there seems to be an aversion on the part of the branches of our Government to make recommendations or take action that might be construed as interference with other departments. Action by Congress would remove any question of authority.

Airplane Wing Coverings

BEFORE the war practically all airplane wings, ailerons, rudders, etc., were covered with linen. What makes this material especially adapted to the purpose is that, besides having great strength in proportion to weight, due to the long fibers of flax, it can be rendered taut and very smooth by treatment with acetate or nitrate dope. However, it was not long after the great value of the airplane for scouting and bombing purposes was realized and large-scale aerial programs were laid down by the different nations that the supplies of flax, from which linen is made, ran short. By far the greatest flax-growing country previous to the war was Russia, whose acreage sown to that crop was more than 80 per cent of the world's total. Next came Austria, Italy and Roumania in the order named, followed by Germany and France. Realizing the great demand for linen that would arise the various governments at an early date imposed embargoes on flax and linen, but in spite of these embargoes and of every possible encouragement to flax growers the supply has not kept up with the demand and substitutes have had to be looked for.

Experiments have been made with both cotton and silk, and it is understood that the former has given the best results in every respect. This is most fortunate, as the supplies of cotton—even of the special grades of long staple used for the purpose—can be greatly multiplied and produced at much less cost than silk. One of the chief objections to silk, and which it shares with many other fabrics, is that it does not hold the dope, so the covering cannot be made as taut and smooth as a dope-treated linen covering, and hence does not permit of reducing the skin friction to the same low figure. We are informed that the problem of a satisfactory wing covering of cotton fabric has been fully solved and that large contracts for such material have been given by allied governments.

On the other hand, there has been some talk of the Germans using metallic wing coverings. While the proposition may have been given some thought, there has been no evidence in descriptions of captured enemy planes of its having passed into practice, and as all the leading flax-producing countries of the world are now either under enemy control or commercially accessible to the enemy it is hardly likely that he will waste much time finding linen substitutes.

Force Feed Oiling

IT has long been known that force feed oiling is especially desirable in engines operating at high speed and running most of the time close to full load. Everybody will admit that a bearing to which oil is supplied under pressure in a constant stream will withstand a higher pressure per square inch than a bearing dependent on splash oiling or gravity feed. Once in a while a record has been set up by an engine using the splash system of lubrication and this has tended to create the impression that if correctly designed the splash system is as efficacious as the force feed system.

It is all a matter of bearing surface. With each system there is a critical bearing load which must not be exceeded if risk of failure is to be avoided. If the bearings are made sufficiently large so that the critical pressure for splash lubrication can not be exceeded then splash lubrication will give satisfactory service.

However, in an aircraft engine where high weight efficiency is a prime essential, it is impossible to provide this liberal bearing surface, and the force feed system of lubrication is the only one justified. In fact, the pressure under which the oil is fed should be rather higher than has been customary in the past.

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Latest News of the

St. Louis To Use Return Loads

100-Mile Radius To Be Employed—Ohio Urges Its Use

WASHINGTON, March 27.—The return loads system of motor truck transportation is taking hold in many sections of the country. St. Louis, Mo., is organizing a truck organization to handle the return loads business for St. Louis and surrounding country within a radius of 100 miles under the direction of the St. Louis Chamber of Commerce. The State Council of Defense of Illinois has appointed an active committee to work with the chambers of commerce and commercial organizations throughout the state to establish return loads bureaus. Numerous inquiries are coming into the offices of the Highway Transport Committee asking for information about the establishment of return loads bureaus. Detroit, Chicago, Cincinnati, Cleveland, Youngstown, Pittsburgh, Buffalo and a number of other cities are already establishing some motor truck transportation, although very few as yet have created return loads bureaus.

The above information was brought back to Washington by Frank E. Williamson of the Highway Transport Committee, who addressed the National Industrial Traffic League in Chicago on March 20, where he explained the objects of the committee and its work establishing return loads bureaus in cooperation with chambers of commerce and other commercial organization in the territory north of the Ohio River and east of the Mississippi to the Atlantic seaboard. The National Industrial Traffic League is composed of the principal shippers and manufacturers of the United States and Mr. Williamson's address has resulted in numerous favorable inquiries from league members.

The Highway Transport Committee is publishing a pamphlet which will be ready for distribution early next week and which will explain in detail how return loads bureaus can be established and maintained. The pamphlets will be distributed to all chambers of commerce, public service commissions, state highway commissions and municipalities. Pamphlets can also be obtained by application to the Highway Transport Committee, Munsey Building, Washington, D. C.

The Highway Transport Committee has received word of organized effort by the Ohio branch Council of National Defense to supplement steam and electric railroad transportation by motor truck transport. A meeting was held at Columbus early this month and representatives of traffic bureaus of the chambers of commerce in the principal Ohio cities conferred with the transportation committee of the Defense Council. A resolution was drawn up stating the need for additional transportation facilities and it was recommended that return loads bureaus be established in all cities. A sub-committee of the Defense Council was named to work out the development of this plan. The development of systematic motor truck transportation through country districts for the collection of milk from farms to be delivered in cities will assist materially to solve the difficulties which confront the chief and efficient production and distribution of milk in Oho.

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Continue Iron and Steel Prices

WASHINGTON, March 26.—The President to-day approved the recommendation of the Price Fixing Committee of the War Industries Board that the maximum prices heretofore fixed by the President upon the recommendation of the Board, upon ore, coke, steel and steel products, subject to revision on April 1, 1918, be continued in effect until July 1, 1918; from April 1 to July 1, however, the maximum price of basic pig iron be reduced from $33 to $32 per gross ton, and that the maximum price of scrap steel be reduced from $30 to $29 per gross ton.

No new contracts calling for delivery of any of these commodities or articles on or after July 1, 1918, are to specify a price unless coupled with a clause making the price subject to revision by any authorized United States Government agency, so that all deliveries after that date shall not exceed the maximum price then in force, although ordered or contracted for in the meantime.

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Stock Market Reflects Curtailment

NEW YORK, March 27—There has been a direct reflection in the stock market of the action of the government in reducing automobile production by 30 per cent, a condition which is but natural. During the past two weeks 26 of the listed automobile stocks have shown declines of from ½ to 4 points. Among these that have dropped most have been Chevrolet, which went down 4 points, Fisher Body Corp., 4 points, Maxwell preferred 4 points, and Studebaker 3 points. To offset this there have been some gains, such for example as Hupp preferred and International common, 5 points, International preferred, 11 points, U. S. Rubber 8 points.

No Chrome Steel Shortage

California Has Large Supplies —80,000 Tons in Storage

WASHINGTON, March 27—There will be no shortage of chrome steel for some time to come if at any time. This announcement can be made following investigations by industries interested which reveal:

Eighty thousand tons of chrome has been stored away which has been owned by a huge metallurgical concern, hoping by its storage to increase prices.

Thousands of tons of chrome ore have been found in California mines.

After six months of deliberation and waste of time Washington officials have ordered electrodes supplied to the California mines, which means that the chrome ore mined in this country will be refined and supplied for use.

Some idea of the value of the 80,000 tons of chrome that has been hidden away may be had from the fact that in past years we have only imported 28,000 tons of chrome per year. In other words, a three-year supply of chrome was stored away.

Following this long delay, the War Industries Board has notified the Shipping Board that we can use the chrome on hand and that mined in California and that ships to and from New Caledonia, from which point we have heretofore secured chrome ore, may be diverted to other uses.

Rumors have been current in Washington for several weeks of lack of cooperation between the California chrome miners and the eastern metallurgical companies controlling the necessary electrodes. There were also reports that the War Industries Board refused to recognize the great supply of chrome in California and refused to order priorities allowing shipments of electrodes to the Western Coast. Recently several individuals interested both in the automobile business and the parts industry and also in the California chrome made thorough investigations, which were placed before the War Industries Board and practically forced them to move.

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Hodgkins Resigns From Studebaker

DETROIT, March 27—R. T. Hodgkins, general sales manager of the Studebaker Corp. of America, has sent his resignation to the company, effective April 1. He has not announced his future plans yet.

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Automotive Industries

Rumors Exaggerate Airplane Delay

Temporary Hold-Up Should Be Overcome in Next 90 Days—50 Engines Completed Last Week, 100 This Week—Makers in Production Within Next 60 Days—Many Derogatory Reports Misleading—Program Includes 22,000 Planes

WASHINGTON, D. C., March 26—Washington atmosphere is heavily charged with airplane delay rumors, and while the airplane program is behind schedule and while there have been delays the real situation is very frequently misinterpreted and unconsciously misrepresented. The entire airplane industry is so little understood in this country that it is not surprising that foolish rumors get wide circulation. Nobody connected with the airplane activity denies the delay in schedule, but the next 90 days should bridge what is now known as the delay period, and by that time production will be well under way in several factories, whereas to-day production is really under way in but one factory, and that factory is 90 days behind its schedule.

There are many reasons for delay, and while many of the public will be impatient with these they should give reasonable heed to them. Changes had to be made in the Liberty engine from the first design developed last July, and while the engine contained nothing new or untried the development of an airplane engine of its size was without precedent in this country or even in Europe, and many unexpected conditions arose from the greater production of power from the engine than was originally expected. At the start the engine was expected to show a little over 300 hp., but now it has shown over 400 hp., and naturally some parts that were designed on a 300-hp. basis are proving too light for the greater power output obtained.

Changes Were Necessary

In the original design the crankshaft oiling system was not a complete pressure system, and after testing some engines it was discovered that a complete pressure system was necessary. Such a change has been made. The greater power output has called for some heavier parts, such as strengthening the crankshaft and strengthening the connecting rods and wrist pins. A small change in some of these parts calls for changes in other parts closely related to them. There were some features of design that had to be changed, and it would have been a miracle if such changes had not had to be made. These changes have been exaggerated in some circles. There have been clerical delays in conjunction with these changes, and there has been a certain amount of lack of co-operation which has not been intentional but rather due to a rapid increase in organization and handling of certain work by men not familiar with airplane work.

Certain delays in manufacture have been caused by difficulties with materials entering into certain parts of the engine. The specifications of the steels have made some of these parts slow to produce and has resulted in a heavy rejection of parts by inspectors. This has been true with connecting rods and perhaps some other parts.

Picture Too Sanguine

Perhaps public criticism to-day is due very largely to the too sanguine picture of our airplane possibilities painted last spring after it was decided that the airplane was the eye of the army and that by great fleets of planes would it be possible to destroy the effectiveness of the Hun artillery and so destroy the effectiveness of the enemy. In those days there were stories circulated of fleets of 100,000 airplanes started by newspaper men rather than by those in charge of the airplane program. Other papers talked of fleets of 50,000 and others dropped in the scale to 25,000. Nobody at that time had the slightest conception of what it meant to produce a 400-hp. engine such as the Liberty, and even to-day it is a sad commentary that such a small percentage of our talking and gossiping public has so little information on what it means for a factory to get into production on such a job. This situation cannot justly be laid at the feet of any one official, as all agreed that secrecy must surround the development of the airplane, and during the months when this veil of secrecy was enveloping the nation there were millions of citizens unconsciously dreaming of those tens of thousands of airplanes that were to point the road to Berlin.

In those days no one thought of the I. W. W. activities in the spruce forests of the West and had any conception of how production of planes could be held back by the work of such forces. Nobody anticipated the railroad situation and the delays in materials caused by it. Nobody foresaw the pro-German activities that have destroyed machine equipment for factories. Nobody dreamed of the dangerous unknown traitor within our ranks who is responsible for a score of the evils that have crept into our factories. These all have contributed to the present regrettable quota of delay in which production is 90 days behind what it was scheduled for in the picture-painting days of last July and August.

Recent and present investigations of aircraft conditions are not, contrary to general opinion, directed against either Howard E. Coffin or the Aircraft Production Board as a whole. The above facts were brought out to-day in a conference with aircraft officials of this city.

Production Board Is Advisory

The Aircraft Production Board, of which Mr. Coffin is chairman, is really only an advisory organization. The laws incorporating it specifically state that the board must not duplicate any office or organization now existing in military or naval services. Therefore, also contrary to the public impression, actual production, inspection, accounting and contracting as regards airplanes for our military establishment reside in the hands of the Signal Corps, and if any one or any department is being investigated it is the Signal Corps with its commanding officer, General Squier. This above explanation clarifies the mysterious situation of the past few weeks wherein it appeared as if Mr. Coffin, who went to Detroit with the Snowden Marshall committee to investigate Detroit airplane conditions, was helping to investigate himself.

Conditions at this time can be described as follows: Fifty Liberty airplane engines were completed last week according to authoritative statements made here to-day, and nearly 100 Liberty airplane engines should be completed by the end of this week.

(*Continued on page* 659)

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Army Well Equipped with Motor Vehicles

Ordnance Department Has Tremendous Supply of Trucks, Tractors and Trailers—Production Continues Steadily

WASHINGTON, March 25—The Ordnance Department, greatly expanded by the war urgencies, has developed a tremendous equipment of tractors, trailers and motor trucks to augment the military establishment. Forty-eight new 4-ton trailers have just been completed in design and will each carry complete equipments designed for making various repairs in the field and behind the lines, and these will soon be in process of production.

Special schools have been established at Rock Island Arsenal for equipment repairs, motor equipment repairs at Peoria, Ill., and supply work at several arsenals. Many of the commissioned and the enlisted personnel are having instruction at these schools and in addition a number of field artillery officers have been sent to acquire knowledge of motor equipment care to provide for emergencies that may arise in active duty.

There are eight heavy artillery mobile repairshops to an army, each consisting of two sections capable of independent operation, the general function being to make moderate repairs to heavy artillery and its motor equipment. Each section is composed of a repair and a supply organization.

Repair Subsection

The subsection, devoted to repair, is made up of three 3-ton trucks of the repair type called tool room trucks, air compressor trucks and forge trucks, and five 4-ton trailers of the machine shop type called generator, lathe, welding set, drill press and shaper and milling machine trailers. There are also provided a 4-ton crane trailer and a motorcycle with side car.

The supply subsection contains six 4-ton trailers of the supply parts type, which are completely housed and provided with bins of various sizes, similar to those in a stock room; six 3-ton trucks of the repair type for carrying large spare assemblies; two motorcycles with side cars, one solo motorcycle and one 1-ton delivery truck.

A complete section is further provided with one 4-ton trailer with machine shop body and two 3-ton trucks with repair body for transporting baggage; one 3-ton truck with repair body slightly altered and equipped with desks, files, etc., to be used as an office; one 3-ton truck of the ammunition type for carrying fuel in drums; one touring car and one rolling kitchen of the trail mobile type.

Each shop is commanded by a major assisted by one second lieutenant as adjutant. The commissioned personnel assigned to one section is one captain commanding; one first lieutenant in direct charge of the repair subsection, being assisted by a second lieutenant; one first lieutenant in charge of the supply subsection, records and files.

The enlisted personnel totaling 103 are of various grades from ordnance sergeant to private, acting in capacities of expert machinists, electricians, inspectors, mechanics, ignition and carbureter experts, blacksmiths, welders, assemblers, testers, chauffeurs, stockkeepers, helpers, etc.

For traveling purposes each of the twelve trucks of the repair type hauls a 4-ton trailer and the tank truck, the rolling kitchen, leaving the light delivery truck free for general purposes, the motorcycles being employed for dispatch and agent service.

Special Parking System

In the general scheme of operation the vehicles are parked so as to occupy three sides of a rectangle, leaving an end open for entrance of repair jobs to the park, the supply and spare parts trucks and trailers usually occupying one side, the power and machine tool trucks and trailers the other, leaving one end for the office and delivery trucks together with motorcycles and passenger cars. The personnel are quartered under canvas or such shelter as the commanding officer may direct constructed.

The generator trailer contains two 15 kw. D.C. generators, each being directly connected to a separate gasoline engine in order that one set may be overhauled without shutting down. A three wire system is employed giving a total output of 30 kw. for power and lighting.

The air compressor is directly connected with a 40 hp. gasoline engine identical with that installed in the trucks, and compresses 70 cu. ft. of free air per minute, delivered at 125 lb. pressure. A 100-ft. armored hose of 1 in. diameter is provided to deliver air to the appropriate hammers, chippers, etc.

The lathe trailer contains an 18-in. lathe with an overhead trolley chain hoist to handle heavy jobs.

Forge and Tool Room Trucks

The forge truck contains a large portable forge, anvil, rivet furnace, and a complete set of blacksmith's tools.

The tool room truck contains a 9-in. lathe, a bench drill, a combination cutter and drill grinder, and a complete outfit of small tools.

The welding set trailer is completely fitted with apparatus for oxy-acetylene welding, together with a low pressure acetylene generator of large capacity.

The drill press trailer contains a 21-in. drill press and a shaper, together with complete tool equipment.

The milling machine trailer contains a 9-in. lathe, a precision lathe, a milling machine, and a sensitive drill press, an optical repair chest for the repair and parts replacement of optical instruments.

The standard ordnance motor vehicles are as follows:

The *ammunition truck* consists of a steel body mounted on a four-wheel drive type of truck chassis. The body is designed to accommodate original packing boxes of any type of ammunition. This body will also conveniently carry five 55-gal. steel tanks for gasoline, oil and water supply. In general it is intended to use this body wherever an ordnance truck is required for heavy cargo purposes.

The *equipment repair truck* consists of a repair body mounted on a four-wheel drive type of truck chassis. The body is fitted with bins and chests of drawers for spare parts and raw material for repairing personal equipment, machine guns, pistols, rifles, leather equipment, etc. Machines for sewing leather and canvas, work benches, etc., are supplied, together with the necessary hand tools for making the above repairs.

The *artillery repair truck* consists of a small machine shop repair body mounted on a four-wheel drive type of truck chassis and constitutes a small repair shop. The equipment consists of a lathe, drill press, bench grinder, portable electric drill, oxy-acetylene welding outfit, air riveting hammer, milling attachment, blacksmith outfit, and an assortment of the necessary tools to repair artillery material and motor vehicles. Electric power is supplied by a small gasoline-driven generator mounted on the truck. It is intended to use this truck with possible minor variations in equipment wherever the service of such vehicle is necessary. This truck is ordinarily accompanied by an artillery supply truck carrying tools, spare parts, raw material, bar stock, etc., for use in connection with such repairs.

Artillery Supply Truck

The *artillery supply truck* in motorized batteries takes the place and carries the equipment of the battery and store wagons of what was formerly horse-drawn field artillery. The equipment consists of tools, spare parts, etc., pertaining to the particular type of cannon to which assigned. This vehicle is also used as a companion truck to the artillery repair truck wherever it may be used for carrying spare parts, material, etc.

The *artillery tractor, 2½-ton,* weighing about 5000 lb. and capable of crossing bad ground at a speed of 10 m.p.h., or developing about 12 m.p.h. under favorable road conditions, will be provided for handling the reel and cart attached to the battalion and regimental headquarters of motorized artillery regiments in place of the 6-horse team used in horsed regiments.

The *artillery tractor, 5-ton,* weighing about 9000 lb. and having speeds of 1½ m.p.h., 3 m.p.h. and 6 m.p.h., respectively, is intended for use with 4.7-in. gun and 6-in. howitzer material, each tractor hauling one-half a section or other loads not exceeding 10,000 lb.

Artillery 10-Ton Tractor

The *artillery tractor, 10-ton,* weighing about 17,000 lb. and having a low speed of about 1½ m.p.h., and capable of developing 4½ m.p.h. or a little better on high speed, is intended for use in motorized regiments of 6-in. guns or for loads weighing up to 18,000 lb., such as a large howitzer broken up into smaller units for transportation.

The *artillery tractor, 15-ton,* weighing 26,000 lb. and having speeds of 2⅛ and 3½ m.p.h., and the *artillery tractor,* 120-hp., weighing about 28,000 lb., and having speeds of 2⅛ and 3½ m.p.h., will be supplied in limited numbers. These tractors are of the track-laying type, similar to those used by the French and British Governments, and are used for handling heavy loads which are not subdivided for transportation.

The *reel and fire control truck* consists of a four-wheel drive truck chassis, having the

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rear wheels replaced by caterpillar tracks to improve the ability to negotiate bad ground, and a wire reel, mounted on the rear end of the truck. Between the reel and driver's seat are located chests for carrying fire control instruments, on which a number of men may also sit. This vehicle will have a speed of 12 mph or better.

The *reconnaissance car* consists of a 1-ton rear drive type of chassis, having mounted upon it a steel body suitable for carrying from twelve to fourteen men with necessary storage space for fire control instruments. This car is capable of developing from 30 to 40 mph under full load.

The *light repair truck*, weighing about 7000 lb., consists of a small box body mounted on a light chassis. It carries chests containing carpenters' and machinists' hand tools, automobile tools and supplies, lubricants and greases, and is used for light emergency repairing and general utility work.

Anti-Aircraft Trailer

The *1½-ton anti-aircraft trailer* is supplied to transport the 75 mm. improvised anti-aircraft gun. Two trailers are used to transport each piece, one carrying the gun and cradle, and the other, the gun platform.

The *3-ton anti-aircraft gun trailer*, weighing about 4200 lb., is designed to have permanently mounted upon it a 75 mm. anti-aircraft gun. This trailer also carries a box containing ammunition.

The *3-in. field gun trailer*, weighing about 4400 lb., is so designed that 3-in. gun material and similar vehicles may be easily loaded upon it and transported at high speed behind motor trucks. After the guns are placed, the trailers will be available for bringing up ammunition, provided road conditions are favorable enough for their use.

Other trailers of various types are furnished for special purposes, which vary from those carrying corps repairshop equipment to those of sufficient capacity to transport tractors and tanks and damaged vehicles at high speed on good roads.

Tanks and other armored land vehicles are designed, procured and maintained by the Ordnance Department.

Varieties Minimized

While the Ordnance Department has probably had to design a greater variety and handle a greater volume of motor equipment than any other department of the Government, there has been a continuous and successful effort to keep the variety of vehicles and parts to the absolute minimum consistent with the necessities of the service and, unless absolutely impracticable to do so, to use parts already in service in France or used by some other branch of the Government.

There is, for example, only one size of tire used on all the heavier trucks and trailers, and this size is also used on similar vehicles by the Quartermaster Corps, Signal Corps and Engineers. One size of tractor uses in its engine practically every part of the B-engine used by the Quartermaster Corps.

Magneto Same on All Vehicles

The same magneto is used on all ordnance vehicles and in emergency is readily replaceable with the magnetos used by other departments.

Four sizes of standard tractors have been developed and adopted to meet the needs of the artillery service, and these tractors, when required by any other branch of the Army, will be supplied by the Ordnance Department to reduce the number of types.

All the types of the ordnance truck bodies are interchangeable on all truck chassis issued to the artillery, to facilitate changes in the field. Numerous other examples could be mentioned of the effort to keep parts to a minimum and effect co-operation between the departments of the Government.

Government Opens Schools

Several Departments Cooperate to Train Selected Men in Management of Workers

WASHINGTON, March 26—Various government departments co-operating in an intensive training course of employment management have established schools. The first will open to-day at the University of Rochester and others will soon open at Harvard University, Massachusetts Institute of Technology, Boston University and the Boston Employment Managers Assn. The first course will continue for 6 weeks, and include both the theory and practice of employment management. Fifteen Rochester factories have arranged to provide the laboratory work and assist the university in presenting the theory of personnel management.

Only men selected by manufacturers of war contract plants and who possess industrial experience, good education, liberal point of view and the ability to command men will be accepted. The Department of Labor is sending two of its field agents in the federal employment service, and it is announced that the Navy Department intends sending assistant superintendents from navy yards. Twenty prospective employment managers have already been accepted and enrolled.

Purpose of Plan

The purpose of the plan is to add a fourth general division to every industrial enterprise personnel, consisting of employment or service management. This department will cover all those activities which have to do with human relations; legislation, safety, education, recreation, "hiring and firing," discipline, wage system, pensions, sick benefits, etc., bringing them all under one department.

Although this type of work is new, it had some development before the war, and during the last three years an association of employment managers was organized in Boston, Detroit, Philadelphia, Chicago and Cleveland. A representative of the Industrial Service Section of the Ordnance Department has remarked that all cases of labor difficulty which have been brought to their attention could have been avoided if the factory in question had already established a modern employment department. The Quartermaster Department cites an instance where two mills, side by side, working on the same type of material and employing the same sort of labor, got totally different results from the workers. One had a well-conducted employment and service department and the other had not. The former got better results all around and avoided strikes, although it paid a slightly lower wage. This, it is claimed, was due to the fact that justifiable complaints were attended to by the employment department as they arose.

The co-operation of manufacturers is desired in that they send carefully selected students to the course. Organizations desiring to send students should apply to Captain Boyd Fisher, 5207 New Interior Building, Washington, D. C., who represents the several departments co-operating.

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230,000 Men in Shipbuilding

WASHINGTON, March 25—Shipbuilding in American yards is now employing 230,000 men, and as yet there has been no shortage of labor except of highly skilled men, according to a statement by the Department of Labor. Within the next 6 months 150,000 more men will be needed, and these will be obtained from the ranks of the unemployed and the United States Public Service Reserve, which has more than 225,000 men enrolled.

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Italy's Exports Almost Doubled

TURIN, ITALY, March 20—Exports of automobiles and trucks from Italy during the first 10 months of 1917 amounted to more than $20,000,000, and included 916 trucks and 614 cars. This is an increase of 92 per cent over 1916. During the same period Italy imported 251 vehicles at a cost of $251,000, which is only one-fourth of the amount imported in 1915.

Detailed figures follow:

Exports for 10 Months Ended Oct. 31

Year	Number	Value	Increase over Previous Year
1917.....	8,530	$22,453,361	92 per cent
1916.....	4,936	12 110,870	19 per cent
1915.....	3,879	10,113,355	

Imports for 10 Months Ended Oct. 31

1917.....	251	$251.000	60 per cent*
1916.....	319	638,705	40 per cent*
1915.....	386	1,027,892	

*Decrease.

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Trucks for Food Shipment

WASHINGTON, D. C., March 22—An appropriation for $100,000 for experiments in utilizing motor trucks for shipments of food to large cities, authorization to the Secretary of War to turn over to the Postmaster General for use in mail transportation all airplanes and automobiles unsuitable for military purposes and a recommendation to charge 24 cents per ounce for airplane mail were contained in the Post Office appropriation bill approved Tuesday by the full Senate committee which has ordered the bill favorably reported.

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$875 for Ford Tractor with Plow

War Preparedness Board Fixes Price for Michigan After Conference

LANSING, MICH., March 27—A price of $875 for the tractor sold by Henry Ford & Son to the State of Michigan has been fixed by the war preparedness board, after a consultation with representatives of the Oliver Plow Co., South Bend, Ind., and Henry Ford & Son, Dearborn. This price includes the two-bottom plow.

Prior to the consultation, the price set on the Oliver plow was $97, arranged by Ford without the sanction of the plow company. It was explained to the war board this price was for a foreign contract, and was a flat price without any repairs, service or demonstration. With the price fixed at $125, the company agrees to send experts into the field and see that every plow works properly.

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Restrict Building Plans

WASHINGTON, March 25—All companies that plan building construction or new enterprises or enlargement of industries that are not needed in the prosecution of the war will meet with serious opposition from the Government. Such businesses will be unable to secure labor, material or capital. Power has been given the Secretary of the Treasury to approve or veto new capitalizations.

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Chicago Accessory Show a Success

CHICAGO, March 25—The third annual motor car accessory show staged last week by Rothschild & Co. was a complete success, not only in attendance, but in amount of business done. Tires, usually one of the biggest items to go at a show, were apparently of secondary importance, and the strongest buying was for storage batteries, anti-glare lenses, spotlights, etc., while body polishes, paints, oils, etc., came next, accounted for by the overhauling season. The special accessory department for Fords, including parts, did a large volume of business.

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Changes in J. & D. Tire Co.

CHARLOTTE, N. C. March 25—F. Smith, one time Eastern sales manager for the Jeffery Motor Car Co., superintendent of branch houses for the Maxwell Motor Car Co., and until recently secretary and sales manager and one of the organizers of the Briscoe Motor Car Co., is now identified with the J. & D. Tire Co., of this city, in active charge of sales. R. L. DeLissor, formerly branch manager of the Columbia Motor Car Co. and assistant sales manager of the Briscoe Motor Car Co., has been appointed Eastern sales manager. H. O. Smith remains as president and factory manager, with C. M. Downs superintendent in charge of production. The present capacity of the factory is 500 tires a day. Heretofore J. & D. tires have been sold almost exclusively through the South, but arrangements are now being completed to establish sources of distribution in the East and Middle West.

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Liberty Loan Committee for New York Dealers

NEW YORK, March 25—New York dealers have lined up their Liberty Loan drive committee. Charles M. Brown (Winton) is chairman and he has appointed the following: Charles E. Miller, vice-chairman; R. H. Johnston (White); C. S. Hare (Packard); F. G. Cavill (Marmon); A. G. Southworth (Buick); Charles E. Reiss (Hupmobile); W. A. Woods (Peerless); W. C. Poertner (National); H. J. De Bear (Maxwell); I. M. Uppercu (Cadillac); C. H. Larson (Oldsmobile); C. Lescaris (De Dion); J. F. Plummer (Liberty). J. C. Nichols, Louis Mansbach, W. A. Allen and F. W. White will represent the accessory trade. The tire dealers will work with the rubber trade committee.

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American Die Casting Reorganized

INDIANAPOLIS, March 25—C. D. Cutting, J. H. Armstrong, R. W. Smith and F. D. Tobin, of the C. A. S. Engineering Co. of Detroit, together with E. Barton Hall, formerly director of purchases of the Curtiss Aeroplane & Motor Corp., have bought an interest in the American Die Casting Co. of this city. The company has been completely reorganized and its capacity tripled. The new officers are: Lawrence Olson, president; E. Barton Hall, treasurer; C. D. Cutting, secretary, and W. L. Jenks, assistant treasurer.

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Harry Bill Winton Factory Manager

CLEVELAND, March 26—Harry L. Bill has been appointed general factory manager of the Winton company. He was formerly factory manager of the Chalmers Motor Co. and more recently manager of the experimental station plant of the aircraft board at McCook Field, Dayton.

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Hal Assets Exceed Liabilities

CLEVELAND, March 27—The schedules in bankruptcy of the Hal Motor Car Co. which have been filed in the Federal Court fix the company's liabilities at $222,180.77 and its assets at $232,291.67.

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Tractor Demonstration for Michigan

GRAND RAPIDS, March 26—The Tractor and Implement Dealers of West Michigan will conduct a public exhibition and demonstration of power farming machinery here on April 23, 24 and 25. Twenty-five acres of land have been obtained, and several shelter tents will be erected, as well as a large tent in which lectures will be given by agricultural experts and county agents.

Car and Truck Prices Increase

Reo Drops 2-Ton Truck—Deering Sets Price—Crow, Baker and Saxon Advance

LANSING, MICH., March 27—The Reo Motor Car Co. will discontinue production of its 2-ton truck. The company has received a contract from the Government for creeper-type tractors, and until the order is completed only one model truck, namely, the ¾-ton light delivery vehicle, will be manufactured. When the Government's needs have been taken care of the Reo company will probably resume production of heavy trucks.

Truck prices will be increased as follows on April 1:

Model	Old Price	New Price	Increase
Complete with body	$1,175	$1,275	$100
Truck chassis.....	1,100	1,175	75

—

$60 Increase on Crow-Elkhart Cars

ELKHART, IND., March 26—The Crow-Elkhart Motor Co. has increased the prices of its models $60, as follows:

Model	Old Price	New Price
2—Pass. roadster	$935	$995
5-pass. touring	935	995
De luxe roadster.....	995	1,055
De luxe touring.....	995	1,055

The price of the sedan was not changed.

—

Price of Deering Magnetic Fixed

CHICAGO, March 25—Prices of Deering Magnetic cars have been definitely fixed by the Magnetic Motors Corp. They are:

Model	Price
7-pass. touring.....	3,950
4-pass. roadster.....	3,950
Coupe	4,850
Sedan	4,950

—

Baker Electric Price Increase

CLEVELAND, March 26—The Baker R. & L. Co. will increase its factory prices on April 1, as follows:

Model	Old Price	New Price	Increase
Brougham ...	$3000	$3150	$150
Coach-type ..	3200	3400	200

—

Saxon Six Advanced $50

DETROIT, March 26—The Saxon Motor Car Co. will increase the factory price of its 6-cylinder touring car $50 on April 9. The new price will be $1,045. The price was increased from $935 to $995 on Feb. 10. The 4-cylinder model has been discontinued.

—

International Harvester Classes

CHICAGO, March 25—The high schools here are co-operating with the International Harvester Co. to train 1500 boys for farm work this summer. The boys receive elementary instruction in the principles and operation of gasoline en-

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gines and the adaptation of the engine to farming in the classroom. In the afternoon, the class goes to the display rooms of the International Harvester Co. and receives practical instruction in the care, operation and construction of farm machinery.

The course has been going on for several weeks and will continue until May 1. A. S. Marlow, in charge of the retail farm operative equipment department of the company, takes charge of the classes in the display room, and lectures on tractors.

—

Germany vs. Daimler Co.

AMSTERDAM, March 20—Proceedings against the Daimler Co. on a charge of war profiteering have been started in the Stuttgart Provincial Court, Germany. It is alleged that the company charged German military authorities exorbitant prices, and, despite its excessive profits, recently demanded increased prices. The company claims that its profits are due, not to excessive prices, but to rapid turnover.

—

Wilmington Aid for Truck Trains

WILMINGTON, March 25—The police department of this city has arranged to meet all government truck trains passing through here and escort them over the best route. A motorcycle policeman meets the train at the point of entrance to the city, when notification of its coming is received, and accompanies it to the point of exit. When the trains remain over night, the police take care of the trucks and the Y. M. C. A. houses the men.

—

Build "National Defense Highway" Immediately

WASHINGTON, March 25 — Immediate construction of the "National Defense Highway" from Washington to Annapolis is provided for in a bill introduced in the Maryland State Senate by Senator Metserott. The work of construction is to be commenced at Bladensburg, where the road will connect with the Washington-Baltimore Boulevard. The need of this road as a defense measure is in its connecting the Naval Academy with the Capital. The road will be 30 miles long and will be called the National Defense Highway.

—

To Improve Dixie Highway

DETROIT, March 25—It is planned to start improving the Dixie Highway north of Monroe as soon as the weather permits. The Monroe-Toledo road is the only exit for motor vehicle travel south and east of Detroit, and it has been almost impassable of late.

—

Liberty Hydro-Airplane in Test Flight

WASHINGTON, March 23—The navy hydro-airplane equipped with a Liberty engine made another official test flight here yesterday, accompanied by several other hydro-airplanes. The plane equipped with the Liberty engine quickly outdistanced the others, and the test was announced to be highly satisfactory.

Call 5000 Men for Airplane Work

Draft Registrants in Middle West to Have Thorough Mechanical Training

WASHINGTON, March 25—Five thousand draft registrants will be called this week to assist in the maintenance of America's air fleet. A call has been made for men from Illinois, Minnesota, Iowa and Indiana. A thorough training course in woodworking and gas engine operation and repair will be given these men at 14 educational institutions selected by the Government.

Voluntary induction will be tried, but where the states fail to produce the required quotas, men will be conscripted. Registrants must have at least a grammar school education to their credit. Assignments to duty will be made according to ability shown.

The schools and quotas of each state follow:

Minnesota, 1820 men; 300 to Carnegie School of Technology, Pittsburgh; 500 to University of Cincinnati; 500 to University of Minnesota; 189 to Pennsylvania State College and 330 to University of Pittsburgh.

Illinois, 700 men; 100 to University of Chicago; 200 to Lewis Institute; 100 to Northwestern University; 300 to Bradley Polytechnic Institute.

Iowa, 2200 men; 100 to New York University; 400 to Wisconsin University; 500 to the Auto and Tractor School, Kansas City, and 500 to the Sweeney Auto School, Kansas City.

Indiana, 500 men to Purdue University.

The above schools have been selected following thorough investigation of the country's educational institutions by the Federal Vocational Board.

—

Miller Rubber Selling Treasury Stock

AKRON, OHIO, March 27—The Miller Rubber Co. is offering 6000 shares of treasury stock for sale at par to present holders of common stock in the ratio of one share for every six held. The company is carrying an inventory which is $1,600,000 larger than normal, according to reports, and expects to do a business of between $15,000,000 and $17,000,000 during 1918. The additions being erected to the Miller plant are almost completed.

—

Combat Plane Production Slow

WASHINGTON, March 25—The House Military Affairs Committee in conference with the War Council this week learned that production of combat planes was behind schedule. Contractors have been unable to keep up with the demand, and it is difficult to tell when the scheduled supply will be obtainable.

—

Chicago to Have General Accessory Show

CHICAGO, March 25—The accessory show which was held in the Coliseum last fall and which then was known as the "Ford accessory show" is to be held again this September, but this time the name Ford will be dropped, and it will be a general accessory exposition.

It is expected that it will be held in the Municipal Pier and not in the Coliseum. The pier is much better for show purposes and there is more room.

—

Continue Federal Aid Road Construction

WASHINGTON, March 25—The theory that Federal aid road construction will not be sanctioned during the war has been exploded by the fact that the Government has fixed the price of cement for this work. Cement plants at Hannibal, Mo., and Iola, Kan., are required to deliver cement to the Government at $1.50 a barrel during the first 4 months of 1918.

—

Mid-West S. A. E. Meets

CHICAGO, March 23—A talk on the work of the Signal Corps by Col. L. D. Wildman, chief signal officer, Central Department, U. S. Army, and an illustrated lecture on motion pictures as a selling medium for automotive products by Wm. Lehle, president of the Commercial Motion Picture Mfg. Co., Chicago, comprised the program at the meeting of the Mid-West section of the S. A. E. last evening.

—

Air-O-Flex Re-elects Officers

DETROIT, March 25—The Air-O-Flex Automobile Corp. has re-elected the following officers: President, G. M. Walker, Jr.; vice-president and chief engineer, O. C. Kreis; secretary, Charles D. Lehmkuhl; treasurer and consulting engineer, Robert A. Weinhardt, and general manager, A. B. Hanson.

—

Racine Dealers Have First Show

RACINE, WIS., March 25—The Racine Automobile Dealers' Assn., organized several months ago, held its first annual show in the Municipal Market Building on March 21, 22 and 23, with excellent results. Formerly the shows were conducted under private auspices, and had little support. There were exhibits by 14 dealers and 6 accessory and supply firms.

—

Louis Seguin Dead

PARIS, FRANCE, March 1—Louis Seguin, chairman of the board of the Gnome & Le Rhone Engine Co. and a pioneer in the development of aviation engines, died here on Jan. 7. He was a grandson of Marc Seguin, the French engineer who invented the water tube boiler.

Louis Seguin in 1895 organized the Gnome Engine Co., which developed the Gnome and later the Le Rhone rotary aircraft engine.

—

$188,000,000 for Navy Flying Service

WASHINGTON, March 22—Congress has appropriated $188,000,000 for the flying service of the United States Navy. This is three times the amount of the total appropriations already made for this service, making a total of $248,000,000 for naval flying operations.

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France Decides to Market Alcohol

22,000,000 Gallons to Be Sold After the War for Use of Automobiles Only

By W. F. Bradley

PARIS, March 1—Immediately after the war it is the intention of the French Government to put on the market, for the use of automobiles only, a quantity of not less than 22,000,000 gal. of alcohol. This cannot be used alone in the present type of internal combustion engine, and as there is no desire to change the engine to absorb the new fuel, suitable mixtures will have to be made with this alcohol. It is estimated that after the war there will be available a total quantity of 15,000,000 gal. of benzol. The dyeing industries and perfumery makers will require 3,500,000 of this, leaving 11,500,000 available for automobile use. A mixture of 50 per cent alcohol and 50 per cent benzol is suitable for engines as they exist at present with no other changes than slight modifications to the carbureter. The General Omnibus Co. of Paris made use of this mixture for two years with very satisfactory results, only abandoning it owing to the fluctuations in the price of alcohol.

Alcohol Not Soluble in Gasoline

On a 50 per cent mixture the supply of benzol will not be sufficient to absorb all the alcohol available, and it is impossible to mix the alcohol with gasoline owing to the fact that alcohol is not soluble in gasoline. If the two were used together the gasoline would be used up first, leaving a fluid too rich in alcohol to be suitable for the carbureter.

The Paris Compagnie Générale des Voitures, which controls most of the taxicabs of Paris, has discovered, however, that a very suitable mixture can be obtained by 50 per cent alcohol, 25 per cent benzol and 25 per cent gasoline. The benzol will dissolve both the alcohol and the gasoline, making a homogeneous mixture. On this basis the whole of the 22,000,000 gal. of alcohol which could not be absorbed completely owing to the limited supply of benzol can be made use of in present type motors.

Before the war France imported 66,000,000 gal. of gasoline, most of this coming from America. It is estimated that the quantity required during the first year of peace will be 132,000,000 gal., and as the great increase in the use of automobiles in America makes a further supply from the United States somewhat doubtful, the authorities are seeking as far as possible to assure a home supply. There is practically an unlimited supply of alcohol available from France and the French colonies, but as is well known, this fuel cannot be used alone without important modifications in the present type of engine, and it cannot be mixed with gasoline. This reduces the French to a mixture of alcohol and benzol, which is already well known and was used to quite a considerable extent before the war. Under the Government plan, which consists of a State monopoly of alcohol, steady prices will be assured and important users of automobiles will be induced to adopt this fuel. As a compensation and as a steadying influence against variations in the supply of alcohol produced from beets, there is synthetic alcohol now being produced by the calcium carbide factories in the Alps and other mountainous districts of France. By reason of the war these factories have been obliged to enlarge to an enormous degree, and although not able at the present time to produce synthetic alcohol in any great quantities, they would be in position to produce it under very economical conditions on the return of peace.

Before the war France produced comparatively little benzol, and although this fuel was used exclusively by Paris taxicabs most of it was imported from Germany and from England. Since 1914 the gas companies have been obliged to extract the benzol from the coal treated by them. This extraction reduces the calorific quality of the gas, but not, however, to a very serious degree. It is not thought that the Government will allow the benzol to be left in the gas immediately peace conditions return. Supposing only 20 grammes of benzol per cubic meter are withdrawn, there will still be a total supply in France of 15,000,000 gal.

In 1913 France produced 66,000,000 gal. of alcohol at 100 deg.; in 1914 this dropped suddenly to 44,000,000 gal., and in order to meet the shortage purchases had to be made abroad. No figures have been issued for 1916 and 1917, but it is officially stated that for the preparation of powder alone the army consumes 176,000 gal. of alcohol per day.

—

Tank Production Increases

DETROIT, March 26—The United States is going into tank production on a scale hitherto undreamed of, and great numbers of American tanks in several different types for various kinds of fighting are being rushed to completion in many factories in the East and Middle West.

Two hundred men are needed for two New York tank companies. They may be from 18 to 41 years of age, draft age included, and need have no mechanical knowledge. The personnel of a light tank company consists of a captain, 4 lieutenants, 19 sergeants, 27 corporals, 2 cooks and 50 privates. A heavy tank company consists of a captain, 20 lieutenants, 45 sergeants, 43 corporals, 5 cooks and 144 privates.

—

Ford Loses State Tax Lawsuits

DETROIT, March 25—The Ford Motor Co. lost its fight to avoid payment of the California franchise taxes when the United States Supreme Court upheld the local Federal Court. This court had dismissed proceedings of the Ford company to restrain the state from collecting the franchise tax.

200 French Makers at Lyons Fair

Automobile Participation the Main Feature—Gives Evidence of Post-War Plans

By W. F. Bradley

LYONS, FRANCE, March 4—The City of Lyons opened its third annual trade fair this week with 3800 exhibitors, compared with 2614 in 1917. The Lyons fair was inaugurated in direct rivalry to the one at Leipzig, and has been so successful that it is doubtful if the German exhibition will ever regain its importance. It is claimed that last year the value of the business transacted at Lyons exceeded $40,000,000, this being done under adverse conditions of weather and with transport congested to a very serious degree.

Outstanding Feature

The outstanding feature of this year's fair is the automobile participation. Two years ago there were no automobile makers in the Lyons show. Last year the French Syndicate of Automobile Manufacturers officially boycotted the fair by sending an intimation to all its members that they must not take part in the event. The great majority accepted this advice as an order, although Lyons automobile manufacturers refused to be dictated to. The result was that only local firms, such as Berliet, Rochet-Schneider, Luc Court, Zenith, etc., and agents for American cars held stands at the fair.

Different Policy This Year

This year the French Syndicate has adopted an entirely different policy, for not only are 200 manufacturers exhibiting, but the syndicate has its own hall, and it has sent down its general secretary, Henry Cezanne, who was general manager of all the later Paris automobile salons, to be chief commissioner of the motor section of the Lyons fair. This indicates a desire on the part of the whole French automobile industry to prepare as early as possible for after-the-war conditions. It is also an abandonment of the narrow policy of jealousy which sought to kill all other exhibits than the one in the Grand Palais, Paris, and which obviously cannot be held again until after the war.

To Erect Permanent Building

As an indication of the permanent success of the Lyons fair, it has been decided to build a permanent building to cost not less than $5,000,0000, capable of holding 5000 exhibitors, and having an area of 1,287,000 sq. ft. Plans of this hall have been prepared and constructive work will begin at an early date.

Last year there were exactly 100 exhibits in the automobile section of the Lyons Fair, and the official American stand was at the head of the section. The American exhibits this year were scattered.

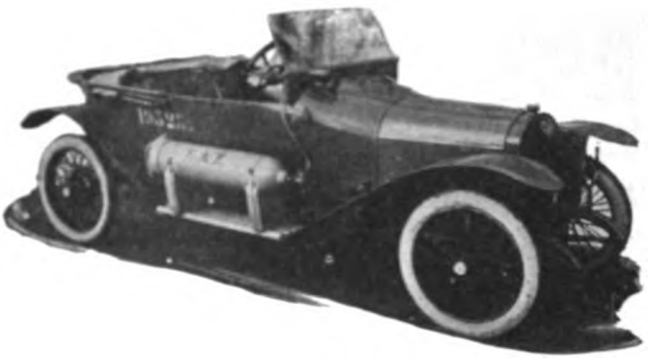
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The Outstanding Feature of the Lyons Fair—The Automobile Exhibit

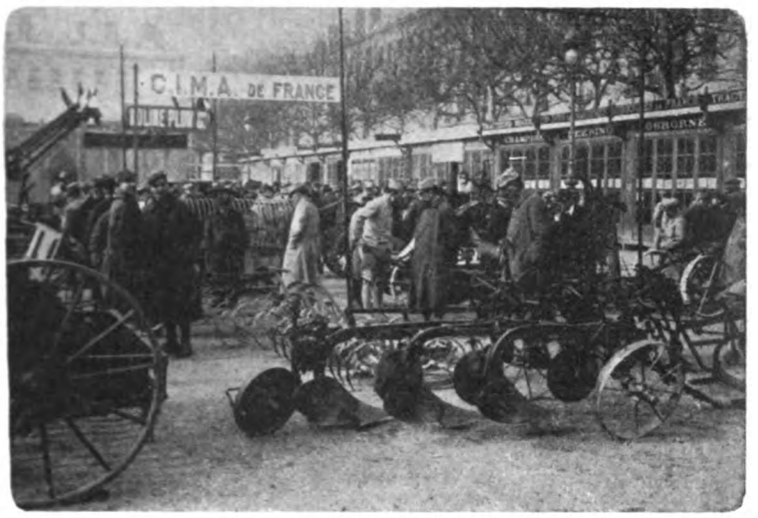
Syndicate of French Manufacturers Has Its Own Hall, Containing 200 Displays



The automobile exhibits were housed in an attractive one-story building, with stained glass windows and clusters of flags at regular intervals



Here is one of the cars fitted with a small tank to run on gas. The registration number is painted on the sides and the cowl



American plows were a source of great interest to the soldiers who visited the fair



The Rochet-Schneider exhibit included a truck chassis, two cars and a body. Note the steel wheels on the truck



Each exhibit was partly roped off, contrary to American custom. Trucks, cars and chassis were exhibited side by side

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Gray & Davis, Inc. Pays All Its Debts

BOSTON, March 25—Gray & Davis, Inc., which went into the hands of a creditors' committee Nov. 24, 1916, paid off its last claim Saturday and to-day is free and clear and carrying on a good business.

The total debts to banks and merchandise creditors when the committee was named amounted to $2,550,000. It was paid in 12 equal payments. The period of payment covered only 16 months.

While the company is devoting a large part of its facilities to munitions work the starter and lamp business is still maintained, and last year amounted to $2,500,000.

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May Embargo Exports to Canada

WASHINGTON, March 27—An embargo or at least licensing of automobiles shipped from the United States into Canada, is being considered by the Canadian War Board. This creates a serious situation owing to the fact that Canada is importing more than $16,000,000 worth of American automobiles a year. At present the National Automobile Chamber of Commerce is endeavoring to counteract the embargo propaganda by education of the public of the value of motor cars by publicity scattered through the civic organizations of Canada. This education campaign has been planned and in operation for several months for officials of the industry here have foreseen the possible transfer of anti-automobile agitation from the United States to Canada.

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California Tractor Demonstration Covers All Farm Work

SAN FRANCISCO, CAL., March 21.—What is described as educational tractor demonstrations will be held under the California Tractor and Implement Association on the University farm at Davis, Cal., April 17, 18 and 19. The demonstrations and expositions will be entirely educational in character, and will be immediately under the supervision of the Society of American Agricultural Engineers.

The list of the different tractors that are to demonstrate has not yet been made public. The rules covering the demonstration provide for plowing for 1½ hr. each afternoon, harrowing for 30 min. and other activities for 1 hr. The mornings will be given over to private demonstrations and in these all plowing must be at a depth of 8 in.

The rules provide that not more than one tractor of a size and model will be permitted to operate during the public demonstration. Those companies or individuals demonstrating must be members of the California Tractor and Implement Association. Some of the rules governing the demonstrations are as given below.

Studebaker Distributers Take Over Two Branches

SAN FRANCISCO, March 25.—Effective March 15, the C. N. Weaver Co., Studebaker distributer, takes over all the territory of the San Francisco Studebaker branch. This includes northern California as far south as Porterville and the western half of the state of Nevada. The C. N. Weaver Co. has been Studebaker distributer since 1913. C. N. Weaver, president of the company, was formerly an employee of the Studebaker Corp., having been connected with this firm for nearly 25 years. For several years before Studebaker began the manufacture of automobiles he was the manager of the vehicle branch at San Francisco and continued as automobile manager until he took over the dealership in 1913.

At the same time the F. L. Shaw Co., Studebaker distributer at Dallas, has taken over the Dallas branch of the Studebaker Corp. with the exception of the new Mexico territory, which will be transferred to the Kansas City branch.

—

First Standardized War Truck Convoy En Route

WASHINGTON, March 28—The first standardized war truck convoy, which left Lima, Ohio, late last week, is nearing Chambersburg, Pa., and will arrive in Baltimore Friday night. The trip to date has been without a mishap of any kind.

Rules of California Tractor Demonstration, April 17, 18 and 19

1. In the afternoon of each day public demonstrations will be held, divided into three periods as follows:

Plowing	1:30 to 3:00
Harrowing	3:00 to 3:30
Stunts	3:30 to 4:30

Private demonstrations will be held in the mornings on the portion of the field allotted for that purpose, also during the "stunt hour." Each public and private allotment shall be entirely under the control of its owner, except that all plowing must be done to a depth of at least eight inches, measuring the furrow wall. Re-working of ground already plowed in public demonstrations will be permitted on Thursday and Friday mornings and Wednesday, Thursday and Friday afternoons between 3:00 and 3:30.

2. Not more than one tractor of a size and model will be permitted to operate on the field during public demonstration. Extra equipment or slight variation in design are not to be interpreted as distinguishing different size or model. During the public demonstration no tractor will be permitted in operation in any other part of the field.

3. Size of land allotted to each tractor exhibitor for private demonstration and for public demonstration will be determined by the average width of plows which they undertake to pull.

4. All exhibitors will be allotted land in the same field or adjoining fields during each day's demonstration. (It appears on this date, March 16th, that each exhibitor will be allotted one field for private demonstration and one field for public demonstration. The private field will serve for special demonstrations during the mornings, sufficient area being reserved to plow in the public demonstration Friday afternoon. The field allotted for public demonstration will be half plowed on Wednesday afternoon and the other half on Thursday afternoon. This cannot be definitely determined until all entries are in).

5. All plows on any given gang must be set at the same depth and kept there during the demonstration period. This depth must be at least eight inches. Plows found operating otherwise will be ordered from the field for the balance of the day's work.

6. In all public demonstrations the motor of tractor must not be run at more than 10 per cent above its catalog speed.

7. Positions on field first day will be arranged by lot. Each exhibitor will be required to finish his land daily in a workmanlike manner and assist in plowing the end lands as directed by the general manager.

8. Each field will be surveyed and staked ready for each day's demonstration.

9. Each tractor shall bear a placard showing the brake horsepower of the engine, the revolutions per minute, the plowing speed in miles per hour, and the kind of fuel used and its Baume test. Tractors using more than 5 per cent of gasoline shall be classed as burning gasoline and be so placarded.

10. All tractors on the demonstration field belonging to one exhibitor must be kept on or along the land allotted him for that day's demonstration, until the hour designated by the management for returning to headquarters.

11. No machine will be allowed to operate with special equipment other than designed for practical use with same. No spectacular methods will be permitted on the part of salesmen or others to attract crowds. The demonstration must speak for itself.

12. Each tractor exhibitor will have the privilege of burning any kind of fuel he desires but no one will be permitted to burn fuel of a higher gravity test than that used by his competitor burning the same kind of fuel. All exhibitors will be required to obtain fuel from source designated by general manager.

13. Manufacturers will be privileged to make turning tests or tests of drawbar pull of their tractors during any day of demonstration, but if submitting to these tests, which will be conducted by the University of California, they thereby agree that the results may be made public. These tests must be made in forenoons, or following public demonstrations afternoons.

14. The interpretation and enforcing of these rules shall be left to the field manager of the demonstration under the direction of the committee.

15. Each company exhibiting at this demonstration shall appoint one manager who will be expected to report to the general manager not later than 8:30 o'clock each morning for instructions and information regarding the day's work. This manager of exhibits will be held accountable for the work of his company, and no instructions will be issued to any one else, nor will requests, instructions or complaints be recognized from any one but this exhibit manager. He shall wear a badge furnished him specifying his being official exhibit manager.

16. Each exhibitor will be expected to keep plows, tractors, etc., around his tent arranged in first-class order, and the land allotted to him for exhibiting purposes free from circulars, rubbish, etc., such as will be distributed around headquarters daily. They will also be expected to use care at all times in operating machinery in respect to its safety for all visitors. The management will appreciate co-operation of these exhibit managers in all matters.

17. Each entrant will sign the rules and hereby agrees to live up to the rules and co-operate with the committee in every way to make the tractor demonstration a success.

18. No companies or individuals are eligible to demonstrate unless they are members of The California Tractor and Implement Association.

19. It shall be against the rules and regulations for any tractor manufacturer to put on an exhibit on the street corners of the city where the tractor demonstration is held, or to do any other thing in the way of exhibiting machines that would detract from the tractor demonstration and the regular established exhibits in the tents.

20. Exhibitors of machinery to be driven by belt power will be permitted only in the exhibit tent, not in connection with the field demonstration or exhibitors' headquarters tents in the field.

21. During Saturday the members of the Association will come to the campus of the university as guests. A plot of ground will be given to the association, which plot of ground will be at the disposal of the Demonstration Committee. The members of the association are individually bound to comply with the one rule that the university has made —i. e., there shall be no sales efforts of any sort on the property of the University of California on Saturday. All exhibiting members are obligated to see that their entire sales force observes this rule. It will be permissible to take the names and addresses of prospective customers, but it will be against the spirit of this regulation to go further. All exhibiting members are expected to appear in the parade on Saturday afternoon, with every available tractor.

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Rumors Exaggerate Airplane Delay

(Continued from page 651)

At present the Packard company is producing practically all of the Liberty airplane engines. The Lincoln Motors Co. will be ready within 60 days. Their original schedule called for beginning of production April 1.

It is expected that the three General Motors plants will be in production within the next 30 to 40 days. In other words, all of the companies are rapidly approaching the state which they should have attained from 60 to 90 days sooner, and we should see quantity production of Liberty engines by mid-summer.

The Aircraft Board has for its functions the co-ordination of Army and Navy flying requirements, and operates also as a clearing house for the industrial airplane problems. The real causes for the delay come from the over-optimistic view of manufacturing conditions that was taken a year ago when the airplane program was laid out and before fuel shortages, transportation troubles and difficulties with priorities this last winter were experienced. Every company manufacturing war supplies demanded priorities, with the result that most industries vital to the war suffered. The aircraft officials frankly admit that they did not conceive of the difficulties of the past winter in their program, and that this was the cause of the exaggerated predictions.

Many Reports Misleading

With regard to the recent criticisms published throughout the country of the Liberty engine and the airplane program, it can be said that many of these reports are untrue. For example, in a recent report published in New York City it was said that the Liberty airplane which fell at Mineola suffered the accident because of a broken crankshaft. As a matter of fact, the crankshaft was bent as a result of the fall, and was not the cause of it. It is on view in Washington, and is the proof in itself of the falsity of the report. The real reason for the accident is known in military circles. It is one that does not reflect in any way on the Liberty airplane engine, but which cannot be told here because of the objection of military authorities.

The report that a Bristol plane equipped with a Liberty engine refused to leave the ground at the Curtiss plant at Buffalo did not tell the complete story. It failed to include the fact that minor mechanical troubles such as is often found in a new automobile or motor truck was the cause of the difficulty. When this was remedied, the airplane flew perfectly and is giving excellent service now.

The reports have also dwelt with inefficiency, so-called, at the Curtiss factories. The report stated that the company had failed to produce a single battleplane so far, and that it was producing bombing planes very slowly. It added that the company was 74 per cent behind schedule.

Authoritative statements, made in answer to these charges, say that the Curtiss company is not behind schedule. When it was taken over by the Willys-Overland Co., and negotiated with the Government, it was told to make training planes only, as they were needed most urgently. It entered into training-plane engine tooling and production. More than 1100 training planes have been turned out this month by the Curtiss and Willys-Overland organizations.

Planes Well in Hand

The company has also produced a number of bombing planes, but these have not been finished because the engineers of the Signal Corps, according to company officials, have not yet designed the bombing attachments. The company states that it is ready to produce fighting planes as soon as it gets Government contracts for them.

Snowden Marshall's committee is visiting Buffalo this week, and is making a thorough investigation of the Curtiss plant.

Major-General Leonard Wood before the Senate Military Affairs Committee said that we should use foreign engines in our planes because they have been tried. He criticized the Liberty airplane engine, but investigation here to-day failed to reveal any specific knowledge that he has about the Liberty engine other than that which he obtained abroad. No great importance has been attached to his statements.

The conference to-day developed many other facts. It was shown that 22,000 airplanes are included in our program, of which 7000 will be training planes. Eleven thousand will be made here of three types, including the Bristol machine, which is a two-seater, fast and light, and carries machine guns and photographic equipment but no bombing apparatus. The Day Bomber, which is a general-purpose machine, similar to the de Haviland type used by England, and which carries machine guns, bombing apparatus, photographic equipment, and is used for fighting and scouting both, together with the Night Bomber, capable of carrying heavy loads of explosives and somewhat similar to the huge Caproni with more than one engine and used principally for making night raids, are also included. The remaining 5000 planes in the program are those ordered from France and Italy last August to be furnished directly to our soldiers at the front. Italy, owing to the great German offensive, has been unable to live up to its program and the schedule for this 5000 has fallen somewhat behind.

The greatest problem we will have, according to Howard E. Coffin, will be the question of shipping tonnage. One airplane with its spares requires two crates 7 ft. x 8 ft. x 7 ft. x 40 ft. long each, and it is questionable that the shipping tonnage will be available when quantity production begins. The French Government when we entered the war suggested that we build no airplanes on this side but provide the materials and workers to France and England instead. Reports here indicate that this has been done to a surprising extent and that many thousands of our men are working at allied factories. There are also other reports to the effect that in the near future American-built airplanes will be flying on the battle front that will have been made by American workers out of American material in American factories in France and England. It is also likely in event that shipping tonnage is not available that all of the fabrication work will be done in this country and the assembling abroad.

The Aircraft Board states that there is no trouble at this time either with materials as regards quantities or with labor, although it is very likely that in the near future, when quantity production is reached, there will be a shortage of highly skilled workers.

Fuel Oil Distribution Rules Revised

WASHINGTON, March 26—Rules governing the distribution of fuel oil in all districts east of the Rocky Mountains have been revised. By the proclamation of Jan. 31, manufacturers and distributers whose gross sales aggregated more than 100,000 barrels a year were required to obtain licenses from the Fuel Administration. The present revisions govern these licenses.

It was found that under the old rules distributers controlling only a small supply were unable to meet the requirements of all their customers, while those of large distributers were able to meet the needs of all consumers on the priority list. The new scheme provides that the Fuel Administrator may require a distributer to meet the demands of another distributer's customers before he can supply the needs of his own customers not on the preferred list.

The priority list follows:

1. Railroads, bunker fuel and oil refineries using or making fuel oil.
2. Export deliveries or shipments for the United States army and navy.
3. Export shipments for the navies and other war purposes of the Allies.
4. Hospitals where oil is now being used as fuel.
5. Public utilities and domestic consumers now using fuel oil, including gas oil.
6. Shipyards engaged in Government work.
7. Navy yards.
8. Arsenals.
9. Plants engaged in manufacturing, production and storage of food products
10. Army and navy cantonments where oil is now being used as fuel.
11. Industrial consumers engaged in the manufacture of munitions and other articles under Government orders.
12. All other classes.

Takes Over Cell-Beam Sales

NEW YORK, March 27—The Cell-Beam Corp., 501 Fifth Avenue, has been formed to take over the merchandising of the Cell-Beam spotlight formerly manufactured and sold by the Cell-Beam Mfg. Co., Brooklyn, N. Y. The incorporators are: President, Rex W. Wadman; vice-president, Nicholas G. Rost; secretary, J. J. Record.

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Urge Motor Trucks for Rural Mail Service

John Blakeslee, Fourth Assistant Postmaster General, Outlines Plans by Which Service and Transportation Facilities Can Be Greatly Improved

WASHINGTON, March 25—The great opportunity for increased use of motor trucks in the rural mail service of all sections of the country was outlined today by John R. Blakeslee, fourth assistant postmaster general, in charge of rural mail delivery. Mr. Blakeslee says there is a 10 per cent reduction in the productivity of the manpower in the vicinity of Washington due to transportation difficulties.

Next winter we will be 10 per cent short of men, and this must be compensated for in some way. An increase in the service offered by rural mail delivery is considered one of the great possibilities.

There are 44,000 rural mail routes in the country and these average but eight pieces per route per day, which is less than 10 lbs. On the return trip the average is less than one piece per route per day. The entire average is less than 1 lb. per day per farm. Mr. Blakeslee sees no reason why, by means of the rural delivery system, the capacity of the farmer should not be increased. Through these channels the produce of the farm can be transported quickly to the place where it is required, and the merchandise from the city can be transported to the farmer, without the farmer's having to go to the market for it. These 44.000 delivery routes offer flexible channels for such work.

No Thought of Efficiency

At present too many of these rural mail routes are laid out without any thought of efficiency. They literally start from nowhere and end nowhere. A rearrangement is necessary so that at one end of the route there will be the town or city market requiring produce which can be brought in by parcel post delivery, and at the other end the productive country areas which can furnish the food supplies for the cities.

To this end, Mr. Blakeslee has been working on experimental rural mail routes which are not circuits but rather out and return routes over the same distance, this plan being adapted to increase trade for a parcels post service both ways.

An example of such a route, and the resulting business over it, is from Lancaster, Pa., to Gettysburg, to Baltimore, Md., a total distance of 105 miles. On the first day, only 56 lbs. of food produce from the farms was collected for the city markets, but after the route had been running 17 days the daily load had increased to 2200 lbs. Soon two motor trucks were necessary to serve it. Before this experiment was tried there was no thought of any necessity for a motor route over this area, as Lancaster possesses ample agricultural facilities to supply its needs. The same is true of Gettysburg and Baltimore. In spite of apparently unfavorable conditions the route has proven very successful, and in addition to parcels post matter, first class mails are carried.

An example of the thoughtlessness in laying out these rural mail routes is evidenced by the fact that from fifty-two of the largest cities in the country there are only 256 important rural routes leading out of these cities, and these rarely lead into the country areas but generally circle through the suburbs. Of these 256, 172 lead out of St. Louis. No rural routes leading into productive farm areas radiate from New York or Philadelphia, although it is from such centers that routes should radiate to make the food supply from the country to these cities more flexible.

Surveys Made

Surveys of rural routes out of such cities as Chicago, Denver, St. Paul, Detroit and Grand Rapids have been made, with the thought of establishing 100-mile routes from these cities into the country and back over the same roads. An example of how such a route works out is Savannah, Ga., where there is a route to Statesboro, a distance of 50 miles. Savannah is the center of a desert so far as food production is concerned, and it is not before you are 25 miles out of the city that you reach the productive area. It is possible with this 50-mile route to tap this productive area and bring farm produce to the city.

Examinations of parcels post shipment have disclosed the fact that much farm produce is taking an indirect road to the market, whereas with the rural motor parcels post system it would go direct.

Examples of Inefficiency

Here is an example: On a parcels post route out of Philadelphia is located the small town of Oxford, which is a great mushroom center, from which 1700 lb. per day are shipped by motor truck to Philadelphia, where they are re-shipped by the postoffice mail system to New York City, Lansdale, N. J., Washington, Baltimore, and other places. If these were transported direct from Oxford to Lansdale by motor it would be a 35-mile trip, whereas the way they are handled at present the distance is 177 miles.

Another example of how the motor rural delivery system could care for this farm-city transportation is the postoffice of New Holland, Pa., which ships 25.000 crates of eggs a week. Many reach New York by an indirect way through the railroad postoffice. This means many handlings. It is possible to send eggs direct from New Holland to New York and deliver them direct to the customer. There is no reason why such delivery direct to the customer should not be made by parcels post or fourth-class mails because it is done with the first-class mails. Sending these eggs through the regular postoffice channels requires twelve handlings where one should suffice.

Shipping 30 crates of eggs from Vineland, N. J., to New York now requires fourteen handlings. The cost of the eggs is doubled by the cost of the operations in transit. The time consumed between the farmer and consumer is more than doubled, and yet the distance is less than 100 miles. If motor trucks in the parcels post organization traveled between Vineland and New York, the operations of handling the eggs would decrease to two. The time for shipment from Vineland to New York would be slight. One motor truck could haul fifty crates of eggs direct from Vineland to New York in a day. At present the weight limit of any parcels post package is 70 lb. This permits shipment of a bushel of potatoes, which weighs 62 lb. or a crate of eggs, which weighs 52 lbs.

At present there are 8 different rural routes operating on this system. Some of them have one and others two trucks. They operate so as to cover the route each way once a day. If the route is short one truck makes a return trip. If it is too long for this, two trucks are used, one starting from each end of the route each day. The routes are as follows:

Route 1—Philadelphia to Atlantic City, 107 miles. A truck leaves each end each day. They meet at Vineland, midway.

Route 2—Baltimore to Solomons, Md., 92 miles. A truck leaves each end daily, but the one leaving from Solomons waits until the one from Baltimore has arrived.

Route 3—Washington, D. C., to Leonardstown, Md., 55.7 miles. Two trucks make the round trip each day, starting from opposite ends.

Route 4—Washington to Baltimore, 76 miles. The two trucks start from opposite ends and meet at Mt. Airy, where they turn, and exchange loads as necessary.

Route 5—Lancaster to Baltimore, 105 miles. Two trucks, one from each end, meet at Gettysburg, where they exchange loads and return over their respective routes.

Route 6—Baltimore to Philadelphia, 116 miles via Oxford. A truck leaves each end. They meet at Oxford, where they return over their routes. Oxford has a population of 2,390.

Route 7—Savannah, Ga., to Statesboro, Ga., 55.5 miles. One truck makes the trip out one day and back the next.

Route 8—Columbus, O., to Zanesville, O., 55 miles. One truck makes the round trip daily.

The capacities of the trucks used on these eight routes approximate 1½ tons. Most of them have pneumatic tires, 36 x 6 in. There is one man on a truck who looks after the mail, as well as the parcels post. Regular parcels post rates are charged and the driver can collect packages from one point and deliver them to another point on that route without the parcels having to go into a postoffice. He carries the necessary stamps and has the power to cancel them. In fact he transacts a regular postmaster business while on the truck.

The first of these routes with the exception of two Maryland routes which were already in operation, was started in December, 1917.

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American Cars Popular in Southern France

Excellent Methods of Sale and Low Prices Made the Demand for United States Products Increase Rapidly Before the War

MARSEILLES, FRANCE, March 1—Prior to the war, the demand in the French Mediterranean region for American automobiles increased steadily and rapidly, due to excellent methods of sale and low prices, according to consular reports. It is believed that the demand will continue after the war.

There were approximately 8000 motor vehicles here, of which only a few hundred were trucks. The countries which sold cars in this region included the United States, Italy, Switzerland and England. A few German cars and certain French makes were also popular.

French roads are excellent, and cars are not subject to the same strain as are those in many parts of America. Therefore the cars that French manufacturers produced and sold here were not as strong as American cars, but were more economical, selling for an average of 8000 francs ($1,544) to 9000 francs ($1,737). In addition they conformed with the French tendency to have a small bore and long stroke.

The two types of cars that have had considerable success here are 5-7 and 12-16 hp. The details of these and of a popular truck follow:

Model ..... 5-7 hp	12-16 hp.	Truck 32.5
Capacity ..... 2-pass.	4-pass.	5-ton
Bore and stroke 2½x4¾	3x5	4¼x5
Speeds 3	4	..
Treaty gage... 49.275	49.212	..
Cylinders 2	4	4
Control.....right side	right side	right side
Body ..... Torpedo	Torpedo	..
Upholstery Buff lea.	Buff lea.	..
Wheelbase..... 123 in	130 in.	..
Price $917	$1,408	$3,281

To obtain satisfactory results, American companies desirous of entering this field should appoint a general agent at Paris with the power of appointing subagents throughout the provinces. The central depot should carry a full line of cars and trucks, as well as parts. The last item is especially important, as purchasers hesitate to buy a foreign car for which parts are not available.

A general agent in Paris is in a better position than the manufacturer to select efficient representatives in provincial centers. Furthermore, he is always in close touch with his subagents and can confer with them in regard to local requirements. He should also be able to organize a publicity campaign, which can be directed more easily from Paris, and he should take steps to participate in all shows, exhibitions and contests. In respect to obtaining orders from the French government an agent in Paris is of great value.

Cars Obtained on Consignment

Such agents usually obtain cars on consignment, paying a deposit on order, and the balance when the car is sold. They are sometimes required to guarantee a certain number of sales a year. Manufacturers give the agents a commission of 20 to 30 per cent of catalog prices, to cover expenses of advertising and commissions of subagents.

A guarantee of the car for at least a year is often required.

At present it is impossible to ship vehicles other than heavy trucks to France. Nevertheless it is advisable for American manufacturers to negotiate with agents, so as to be ready to enter the field when importation is permitted.

Trucks of 2 to 4 tons will be in the greatest demand after the war. Light delivery wagons will also grow in popularity. Chain drive seems to have the preference in this district, with the gear box located on the right side, and 3 or 4 speeds. Automatically regulated air admission to carbureters is usually required, due to severe climatic conditions. Lighting should be electric and the trucks should be equipped with plain or grooved band tires and towing hooks for trailers.

Each automobile of foreign make, before it can be placed in general use, must be accepted by the "Service des Mines" at which time it receives a registration number. Before a car can be accepted, a demand must be made on stamped paper, accompanied by specifications of the car, in French.

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Cook Elected President of Lane Truck

KALAMAZOO, MICH., March 25—M. H. Lane has resigned as president and general manager of the Lane Motor Truck Co., and is succeeded by W. A. Cook, formerly with the Indiana Truck Co., Marion, Ind., who will also be chief engineer. W. W. Lang of Kalamazoo is vice-president, and L. W. Hamilton is secretary, treasurer and general manager.

The capital stock of the company has been increased from $25,000 to $250,000. The output for 1918 is proceeding on a basis of 600 trucks of 1½, 2½ and 3½-ton capacity. During 1917 the company built and sold 107 trucks.

—

3000 Cars Coming from Pan-American

DECATUR, ILL., March 25—The Pan-American Motors Corp. has announced that it will turn out 3000 cars during 1918.

Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co	51	53	—1
*J I Case T M Co pfd	84	88	+1
Chalmers Motor Co., com	6	8	+2
Chalmers Motor Co. pfd	30	40	..
*Char Der Motor Co	82	84	—1
Chevrolet Motor Co	114	116	—5
*Fisher Body Corp. com	32	35	—1
*Fisher Body Corp. pfd	76	80	—7
Fisk Rubber Co. com	50	53	..
Fisk Rubber Co. 1st pfd	98	103	..
Fisk Rubber Co. 2nd pfd	70	75	..
Firestone Tire & Rubber Co., com	95	96	—2
Firestone Tire & Rubber Co. pfd	97	98	—1
*General Motors Co. com	117	118½	—6½
*General Motors Co. pfd	81	82	..
*B F Goodrich Co. com	43	44	—1
*B F Goodrich Co. pfd	93	99	—1
Goodyear Tire & Rubber Co. com	135	138	—3
Goodyear Tire & Rubber Co. pfd	97	98	—2
Grant Motor Car Corp.	3	4	..
Hupp Motor Car Corp. com	3	3½	..
Hupp Motor Car Corp. pfd	82	90	+7
International Motor Co. com	20	25	+3
International Motor Co. 1st pfd	51	56	+1
International Motor Co. 2nd pfd	22	27	+2
*Kelly Springfield Tire Co. com	42	43	—2½
*Kelly Springfield Tire Co. 1st pfd	75	85	..
*Lee Rubber & Tire Corp.	13	14	+ ½
*Maxwell Motor Co., Inc., com	27	28½	—1
*Maxwell Motor Co., Inc., 1st pfd	57	58½	—1½
*Maxwell Motor Co., Inc., 2nd pfd	21	22½	—2
Miller Rubber Co. com	125	130	—3
Miller Rubber Co. pfd	96	98	..
Packard Motor Car Co. com	95	100	..
Packard Motor Car Co. pfd	89	92	—1
Paige Detroit Motor Car Co.	17½	20	..
Peerless Truck & Motor Corp.	15½	16½	—1½
Portage Rubber Co. com	109	110	—2
Reo Motor Car Co.	17½	19	..
*Saxon Motor Car Corp.	7	9	— ½
Standard Motor Construction Co.	10¾	11¼	— ¼
*Stewart-Warner Speed. Corp.	56	57	+1
*Studebaker Corp. com	44½	46½	— ½
*Studebaker Corp. pfd	..	94	..
Swinehart Tire & Rubber Co.	22	35	..
United Motors Corp.	26⅜	26½	—1⅛
*U. S. Rubber Co. com	54½	55½	+ ½
*U. S. Rubber Co. pfd	101	103	+1
*White Motor Co.	42	43	— ½
*Willys-Overland Co. com	17	18	— ¼
*Willys-Overland Co. pfd	80	81½	— ½

*At close March 23, 1918. Listed N. Y. Stock Exchange.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS	Bid	Asked	Net change
Auto Body Co.	7	8	..
Bower Roller Bearing Co.	..	18¼	..
Chevrolet Motor Co.	115	120	—2
Commerce Motor Car Co.	..	10½	..
Continental Motor Co. com	5⅜	5⅝	— ¼
Continental Motor Co. pfd	..	..	..
Edmunds & Jones com.	..	..	..
Edmunds & Jones pfd.	..	..	..
Ford Motor Co. of Canada	205	..	..
Hall Lamp Co.	13½	14	— ½
Michigan Stamping Co. com.	12⅞	13¾	+ ⅛
Motor Products	..	..	..
Packard Motor Car Co. com.	..	97½	..
Packard Motor Car Co. pfd.	89	90¾	—7
Paige-Detroit Motor Car Co.	..	18¼	..
Prudden Wheel Co.	..	12½	..
Reo Motor Car Co.	16⅛	16⅝	—1¼
INACTIVE STOCKS			
Atlas Drop Forge	..	27¼	..
Kelsey Wheel Co.	86	93	..

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Industrial Review of the Week

A Summary of Major Developments in Other Fields

Iron and Steel Prices To Continue 3 Months

The President announced on Tuesday that the agreed prices on iron and steel products would be continued for three months beyond March 31, except that basic pig iron and heavy melting steel scrap would be reduced $1 in April. This means, as foreshadowed in this review last week, a maximum price of $32 at furnace for basic iron, $35.20 for Bessemer iron, or a reduction of $1.10 a ton, and $29 instead of $30 for heavy melting scrap.

It was argued by the Government representatives that the high costs of January and February were due to an unparalleled combination of misfortunes, and should not be thought of as a basis for price advances. The board answered the strenuous plea of certain plate mills for an advance above 3.25c. for their product by the $1 reduction in basic iron and scrap, their main raw materials.

Scant consideration was given to the request of the steel manufacturers that in the interest of the whole trade, including consumers, the prices fixed be given a life of six months or more. The War Industries Board frankly favors lower prices, and it is understood that only the wretched showings of January and February saved the schedule from general reduction at this time.

The old-material trade, which has been in a turbulent state since Government control began, is further upset by the reduction so easily put through at last week's conference, in which scrap dealers were unrepresented. The proposal so long and strongly urged that buyers of scrap be allowed to pay dealers 3½ per cent commission seems to have been jostled aside by the main issues.

The Washington meeting only added to the quietness that has been noted in the market throughout the month. The uncertainty as to the amount of steel war demands will leave for general consumption has changed into uncertainty as to the amount of ordinary business that will remain to make demands upon the steel mills.

Fabricating firms are surprised almost weekly by calls for estimates on some Government building of unusual size. There is apparently no end to the number of enormous warehouses going up.

The effort of the Shipping Board to get ships from the manganese ore trade with Brazil is a matter of concern to the entire steel industry. The development of supplies proceeds slowly.—*Iron Age.*

A New Service

¶ Herewith AUTOMOTIVE INDUSTRIES *supplies for the benefit of its readers a general summary of important developments in other fields of business. This is rendered possible by the editorial co-operation of leading industrial publications which are recognized authorities.*

By compressing the general industrial situation into this form we hope to give our readers a clear and comprehensive idea of up-to-the-minute developments which they could otherwise secure only with considerable expenditure of time and effort.

Fuel Zoning Plan and Prices Finally Announced

The long-awaited zoning plan has at last been announced by the Fuel Administration, as have also new price rulings in a few producing districts. The country has been divided into a number of producing zones within which consumption will largely be confined. In this way thousands of miles of long cross-hauls will be eliminated, thus making for an increase in car utility. A reduction in anthracite shipments to the West and Northwest has also been announced by the Fuel Administration.

Transportation facilities are still bad, the sidings in and around many collieries being congested with loaded coal cars. Considering the urgent need existing for coal, the situation cannot but be viewed with alarm. Bituminous has suffered a tremendous falling off in production, many mines being compelled to shut down because of insufficient empty cars to load. During March there was little improvement. If this condition is not remedied soon it will be exceedingly difficult for the operators to preserve intact their working organizations.

The heavy requirements for steam coal preclude any let-up in the demand. Shippers have not been in position to guarantee plenty of coal, and buyers have been ready to purchase every ton available. Here and there coal is still being confiscated by the fuel authorities for the use of public utilities which do not seem able to get an adequate supply from their regular sources. Retail dealers report many orders.—*Coal Age.*

Ford Tractor Production Plan Unchanged in Growth

(*Continued from page* 624)

A small section of the machineshop is given over to the magneto department. Here some of the sub-assemblies of the magneto are made preparatory to the general assembly processes. Another part of the machineshop is taken up by the tool room, which extends along the inside wall.

Parts leaving the machineshop pass to the assembly shop, where the transmission units are put together in one part and the engine units in another, the two coming together at the final assembly nearest the shipping platform. This assembly work will eventually be done on a sort of carrier or belt system, the same as in use in large motor car factories. At the present time the carriers used are simply wheel trays which run on rollers inside of the two channel beams which are arranged parallel to each other in the form of a track. Thus the production travels a sort of semi-circular path, starting at the foundry and stockroom, passing around through the machineshop and out the assembly shop to the loading platform, or dock.

There are a number of miscellaneous departments which have been placed in close proximity to the other plants, and these are also indicated on the map herewith. For instance, the heat treating room is next to the productive stockroom. The heat treating furnaces and carbonizing furnaces are arranged along opposite walls, allowing the work to be fed into them from the center. The same method is used in connection with the babbitting and blacksmith shop, which are on the side wall, allowing the material to be fed from the open space in the center of the room. A special room is used for magneto heat treating.

The pattern shop is at present located adjacent to the assembly shop, but will probably be changed shortly. Both metal and wood patterns are taken care of in the one department.

A new section is being added to the power house. A large gas producer has been installed, and the wheels are being put up around the producer, which is already in position. This will complete the power house to an extent necessary to take care of the growing production. The accompanying illustrations tell the story of the building work which is going on and give an idea of the remarkable manner in which plant increases and production increases are being made at the same time. Urgent orders are being filled, a shipment of twenty-five a day being required, starting April 1, to fill the order for 1000 which the Michigan State authorities recently gave the Ford company, and twenty-five a day are to be turned over to Canada to fill an order by the Canadian government. Another large commonwealth is reported to be negotiating at the present time to place a large order for these tractors with the company.

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Men of the Industry

Changes in Personnel and Position

Kepperly Succeeds Morgan as Curtiss Vice-President

DETROIT, March 22—James E. Kepperly has been appointed general manager of the Curtiss Aeroplane & Motor Corp., Buffalo, succeeding William A. Morgan. Kepperly has also been elected vice-president, a member of the executive committee and a voting trustee. He has been associated with Willys interests for some time, and is vice-president and counsel of Willys-Overland, Inc.

—

A. B. Walton, formerly sales manager of the Master Carburetor Co., Los Angeles, has received the commission of captain in the ordnance department.

—

W. J. Carr, for 2 years purchasing agent of the Falls Machine Co., Sheboygan Falls, Wis., has become associated with the purchasing department of the Aluminum Castings Co., Cleveland.

—

W. O. Rutherford, sales manager of the B. F. Goodrich Co., Akron, has been elected vice-president of the company.

—

Edward Hutchins, formerly supervising engineer of the Federal Rubber Co., has been elected vice-president of the Gillette Rubber Co., Eau Claire, Wis.

—

W. T. Edwards, formerly with the battery division of the Intermountain Electric Co. of Utah, has been elected president and general manager of the Edwards-Warden Motor Parts Co., Salt Lake City.

—

Gould Allen has resigned his position as sales manager of Fuller & Sons, Kalamazoo, Mich., and has been appointed manager of the Detroit office of the Wetzel-Hall Co.

—

L. A. Closter has been appointed district manager of the Federal Motor Truck Co., Detroit, for Michigan, Indiana, Ohio, Kentucky, West Virginia and western Pennsylvania. He was formerly associated with the Centaur Motors, Inc.

—

Gustavus Sickles has been appointed sales manager of the Sullivan Motor Truck Corp., Rochester, N. Y.

—

Ernest T. Conlon has become district factory representative of the Reo Motor Car Co., Lansing, in the Southwest after 3½ years as executive secretary of the Automobile Business Assn. of Grand Rapids.

Harry F. Prescott has been appointed sales manager of the Disco Electric Mfg. Co., Detroit. He was formerly connected with the sales department of the Saxon Motor Car Co.

—

Donald W. Douglas, formerly aeronautical engineer in the aviation section of the Signal Corps, has been appointed chief engineer of the Glen L. Martin Co., Cleveland.

—

Raymond V. Morris has been appointed general manager of the Savage Tire Co. and the Savage Tire Corp., San Diego, Cal., and will have complete charge of all the activities of the Savage companies. He was formerly connected with the Curtiss Aeroplane & Motor Corp.

—

O. S. Comer has been promoted to the position of assistant to the foreign sales manager of the J. I. Case T. M. Co., Racine.

—

W. E. Perrine, production manager of the Standard Parts Co., Cleveland, has been promoted to the position of assistant general manager and chairman of the executive board. He will carry on the work of Christian Girl.

—

W. A. Cluff, who for some time has been auditor of the Mason Tire & Rubber Co., has been elected to the board of directors. He has also been appointed first assistant treasurer.

—

C. J. E. Leach has been promoted to the position of manager of the New York State branch of the Massey-Harris Harvester Co., Batavia, N. Y. He was formerly manager of the Kansas City branch.

—

Clifford A. Williams has been appointed director of sales of the Kissel Motor Car Co., Hartford, Wis. He has directed several merchandising campaigns.

—

O. L. Blanchard has been appointed district manager of the Fruehauf Trailer Co., Detroit, and will have charge of sales in the eastern, southern and middle-western states.

—

Wayne Murray has been appointed general manager of the L. J. Robinson Co., Detroit, Michigan distributer for Maxwell and Chalmers cars. He was formerly Nash distributer in Chicago.

—

General Tire & Rubber Changes

AKRON, OHIO, March 18—The General Tire & Rubber Co. has made several changes in its sales organization. H. E. Taylor has been shifted from the position of representative in Indiana and Illinois to that of Chicago district manager. C. H. Bemis will succeed him in Indiana, and Howard F. Smith has been appointed special representative.

New Companies Formed

Latest additions to ranks of Automotive Industries

Make Trucks and Tractors Under Bollstrom Patents

DETROIT, March 23—The Bollstrom Motors Co. has been organized with authorized capital of $3,000,000 to manufacture trucks and field tractors under the Bollstrom patents. The company has bought 55 acres and leased another 100 acres in Marion, Ind., and will erect a plant immediately. Guy Hamilton has been appointed general manager.

—

To Make "Farm Boy" Tractor

COLUMBUS, OHIO, March 23—Plans have been completed for the organization of a $1,000,000 tractor company to manufacture the "Farm Boy." This tractor is at present being made by the McIntyre Mfg. Co., which organization will be absorbed by the new company. The present capacity will be doubled immediately, and the output, which has been entirely contracted for by France, will be increased.

—

To Make Boring Tractor

ROCKFORD, ILL., March 23—The Boring Tractor Corp. has been organized here to make a new type of farm tractor invented by Charles E. Boring. This will be a 2-wheel model and carry the plow between the drive wheels. The incorporators are J. F. Carpenter, C. B. Williamson, C. E. Boring and F. C. Ricard.

—

Trucks Coming from Salt Lake City

SALT LAKE CITY, March 23—The Wilson Motor Co. has been incorporated to manufacture Wilco trucks, and has bought the building and machinery of the Dickinson Automatic Governor Co. Production has already been started, and the first delivery will be made about April 15. It is planned to turn out 25 one-ton trucks a month. George S. Wilson has been elected president, H. C. Sillett treasurer and W. Daniels secretary.

—

Makes Gasoline from Gas

SALT LAKE CITY, March 23—The Hope Engineering Co. has started work on extracting gasoline from gas. The company has gas wells with an output of 15,000,000 cu. ft. a day, and the capacity of the plant is at present 6,000,000 cu. ft. a day. One and a half gallons of gasoline is made from every 1000 cu. ft. of gas. The initial cost of the Hope Engineering plant was $500,000. Additional wells have been purchased, and these will be used later.

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Durant Sells Interest in California Chevrolet

OAKLAND, CAL., March 25—W. C. Durant has disposed of his interest in the Chevrolet Motor Car Co. of California. The deal involves, it is claimed, about $1,000,000, and places the control of the plant in the hands of Norman De Vaux, president of the company, and R. C. Durant, son of W. C. Durant, who has been general manager of the company for the last year. The capital of the Chevrolet Motor Car Co. of California has been increased to $1,500,000, all paid in, and production will be increased.

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Spranger Wire Wheel in New Plant

DETROIT, March 25—The Spranger Wire Wheel Co. is now in production in its new factory. The building is on a 5-acre tract of land and is 250 x 160. The company's production is 125 sets of wheels a day, of which 75 per cent is for the Government. Two new types of wire wheels are being tested, and it is expected that production of one of them will start in June.

—

New Plant for Hackett Motor

JACKSON, MICH., March 25—The Hackett Motor Car Co. has started work on the first unit of its Burlingame plant. It is planned to have this ready within 60 days, and to double the present capacity within 6 months. The new plant will be used for assembling, body-building, painting and upholstering.

—

Central Rubber Moves to Defiance

AKRON, OHIO, March 22—The Central Rubber Co. has purchased the building formerly owned by the Diamond Glass Co., Defiance, Ohio, and is preparing to move its plant to this city. The company will employ about 150 men.

—

Factory for Landers Bros. Co.

TOLEDO, March 25—A factory is being erected by the Landers Bros. Co., where fabrics will be coated and rubberized for automobile tops and side curtains. Fifty men will be employed. R. E. Landers is president of the company.

—

Overland Drive-aways Break Records

TOLEDO, March 25—Recent drive-aways at the Willys-Overland plant have broken all previous records. Last month 2938 cars were driven across country.

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Niles Car Plant Sold

NILES, OHIO, March 20—The Niles Car & Mfg. Co. has sold its truck factory to the Niles Motor Truck Co. of Pittsburgh.

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Reo Drive-aways Increase

LANSING, MICH., March 26—Drive-aways from the Reo Motor Car Co. are steadily increasing. Three weeks ago 8 per cent of the production was driven away; 2 weeks ago the percentage increased to 18, and last week it was 28 per cent. A few days ago 26 speed wagons (¾-ton trucks) left for Atlanta, Ga., and a train of 10 speed wagons and passenger cars went to Charleston, S. C.

Current News of Factories

Notes of New Plants—Old Ones Enlarged

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Leonard Tractor Co. in Canada

JACKSON, MICH., March 23—The Leonard Tractor Co. of Canada, Ltd., has been organized as a subsidiary of the Leonard Tractor Co. of this city. The Canadian company will build 2500 tractors during 1918, according to H. M. Leonard, president of both organizations. The exact location of the plant has not been decided on yet.

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Increases of Capital

AKRON, OHIO, March 23—The Mohawk Rubber Co. has increased its capital from $1,050,000 to $2,050,000.

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DETROIT, March 23—The Fruehauf Trailer Co. has increased its capital from $100 000 to $150.000. The production of trailers has been doubled during the last 2 months, the present output being 35 a week.

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MILWAUKEE, March 25—The Industrial Controller Co., manufacturer of electric controlling devices, has increased its capital stock from $100,000 to $150 000. A shop addition was recently completed and placed in service.

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Dividends Declared

The Locomobile Co. of America has declared a regular quarterly dividend of 1¾ per cent on preferred stock, payable April 1 to stock of record March 20.

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The Hupp Motor Car Corp. has declared a regular quarterly dividend of 1¾ per cent on the preferred stock, payable April 1 to stock of record March 20.

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The Mason Tire & Rubber Co. has declared a regular quarterly dividend of 1¾ per cent on preferred stock, payable April 1 to stock of record March 20.

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The Hendee Mfg. Co. has declared a dividend of 1¾ per cent on preferred stock, payable April 1 to stock of record March 20.

—

The General Motors Corp. has declared a regular quarterly dividend of 3 per cent on common and 1¼ per cent on preferred stock, payable May 1 to stockholders of record April 15.

—

The Chevrolet Motor Co. has declared the regular quarterly dividend of 3 per cent on common stock, payable May 1 to stock of record April 15.

Nelson Truck Co. Buys Saginaw Motor Plant

SAGINAW, MICH., March 25—The newly organized Nelson Bros. Truck Co., which has a capitalization of $300,000, more than half of which has been paid in, and which is to manufacture the Jumbo 2½-ton truck, has purchased the plant of the Saginaw Motor Car Co. According to schedule, production of one truck a day will be under way within a few weeks, and will be increased as rapidly as necessary additional mechanical equipment can be installed and skilled labor obtained. The company plans to erect a permanent factory as soon as building prices drop to a lower plane.

The officers of the company are: President, Harry B. Nelson; vice-president, Clarence A. Nelson; secretary and treasurer, Clinton J. Nelson.

—

New Company Buys Rush Motors

PHILADELPHIA, March 25—The Rush Motors Corp. has been formed and has taken over the stock of the Rush Motor Truck Co., which it purchased at the receiver's sale. The new company has obtained the building formerly occupied by the Bourne Magnetic Truck Co. and will continue the production of Rush trucks as well as service for those now in operation.

—

Yale Eight Discontinued

SAGINAW, March 25—The Saginaw Motor Car Co. has discontinued the manufacture of the Yale Eight and has sold its entire plant to the Nelson Bros. Truck Co., Saginaw. The Puritan Machine Co. of Detroit has purchased the service stock of the company.

—

Reo 4-Cylinder in Production

LANSING, MICH., March 20—The Reo Motor Car Co. has started production on its new 4-cylinder model. Within 3 weeks the company expects to be making 75 daily. Driveaways during the past week have been reduced 50 per cent, due to heavy rains.

—

Gasoline Stolen from France

PARIS, March 1—To be able to steal 30,000 gal. of gasoline in a country where every drop is rigorously controlled, and where the utmost restrictions prevail, indicates a wonderful amount of ingenuity on the part of the thief. The person who has been able to elude the scrutiny of the inspectors and at the same time rob the State and her employers is a woman employed by the Deutsch Co. in Paris. This woman, whose duty it was to control the vouchers issued by the police for the delivery of gasoline to authorized persons, found some means of retaining these vouchers, instead of handing them back to the police headquarters, and later of delivering them to gasoline retailers. In this way the voucher was made use of twice. The retailers got delivery of gasoline on these stolen vouchers and sold this

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fuel to private individuals not provided with a permit to purchase. It was a profitable investment, for instead of selling at $9, these retailers sold at $15. After a discrepancy in the accounts to the extent of several thousands of gallons, an inquiry was made and the woman primarily responsible was arrested, together with several of the retailers who had made use of the stolen vouchers.

Promote Brake Inspection Idea

TRENTON, N. J., March 25—The Thermoid Rubber Co. is promoting a brake inspection campaign throughout the United States with the object of inducing car owners to inspect their brakes, and if they are not up to par have them relined. Endorsement of the idea has been obtained from various authorities and the idea is being promoted in the company's advertising.

Ford's Milwaukee Men Find Work

MILWAUKEE, March 25—More than one-half of the entire working force of the Milwaukee plant of the Ford Motor Co. already has obtained employment elsewhere, and by April 1 only the accounting and service force will be left intact. The plant will be closed until Aug. 1 or later, as a result of the 40 per cent reduction in Ford output. Many of the men have obtained employment in the plant of the A. O. Smith Co., Milwaukee, maker of pressed steel frames, parts, etc., and others have been placed with Ford plants in other cities.

New Ohio Drive-Away Route

TOLEDO, March 25—A new route through Ohio for drive-aways has been announced by the Lincoln Highway Assn. It is via Toledo, Fostoria, Bucyrus, Mansfield, Olivburg, Ashland, Canton, East Liverpool and Beaver, Pa., to Pittsburgh. The route out of Detroit via Lima, Springfield, Columbus, Ohio, and Pittsburgh, following part of the national Old Trails road, has been rendered impassable by the collapse of the Ypsilanti bridge.

Government Contract for Workmen's Homes

KALAMAZOO, MICH., March 27—The United States government has awarded a $2,000,000 contract to the O. W. Rosenthal Co. for the erection of housing facilities in the River Rouge district where Henry Ford's shipbuilding plant is located. Homes for about 6000 workmen will be erected, and it is planned to have them ready about June 1.

"Car in Transit" Sign Not Accepted

DETROIT, March 26—Sixty Oldsmobiles being driven overland via the Lincoln Highway were held up at York, Pa., for not having license tags. The "Car in Transit" signs the cars bore were not accepted. The New York distributer to whom these cars were consigned met an additional expense of $720 for the complete set of license plates, fines, salaries and expenses of the men while idle.

War Board Restricts Imports

List of 82 Products Includes Cars, Asbestos, Graphite, Acids, Nickel and Zinc

WASHINGTON, March 22—The War Trade Board, through its Bureau of Imports, has published the first list of restricted imports, containing some 82 products, most of which are but remotely connected with the automobile industry. Among those more closely allied with the automobile industry are asbestos, cars, carriages and other vehicles, plumbago or graphite, all acids, nickel and zinc.

Hereafter licenses to import these products will not be granted except (1) when they have actually been shipped prior to April 15, 1918; (2) when coming by rail from Mexico or Canada, or (3) when coming as a return cargo from a convenient port and where their exportation is not specifically prohibited by American Allies.

The list has been issued under the Trading with the Enemy Act, by the terms of which the President on Feb. 14 issued a proclamation which required licenses for all exports and imports. The purpose of the measure is to conserve shipping space, and it is estimated that approximately 1,500,000 tons of cargo space will be saved in the 7½ months' period ending October, 1918.

At present there is a good supply of asbestos on hand, this being used chiefly for insulating purposes in steam installations. Probably between 80 and 90 per cent of the asbestos imported comes from Canada, and but a very small percentage of this is used directly in the automobile field. There is sufficient graphite on hand to last 6 months. About 10 per cent is used for lubricants and from 65 to 75 per cent for crucibles. Only the larger automobile manufacturers use these crucibles, and it is stated that they will not feel the restriction. Most of the graphite comes from Ceylon and Madagascar. The graphite people are sanguine that when licenses for imports are necessary they will be forthcoming.

The list which has been issued is essentially a list of non-essentials in that it includes only those products of which the United States already has an adequate supply to last a long time or which are now being produced here in sufficient quantity to take care of our needs.

Industrial Development in Canada

DETROIT, March 25—Figures compiled by the Ontario Motor Car Co., Ltd., Toronto, Ont., and published by the Packard Motor Car Co., show the industrial development of Canada in every line. Savings on deposit with Canadian chartered banks totalled $985,790,000 in 1917, an increase of 20 per cent over 1916. Bank clearings increased 15 per cent. Canada's production has also increased, the value of the crops being $1,089,000,000 in 1917 as compared with $886,494,000 in 1916 and $638,580,000 in 1914. Numerous munitions and ordnance plants were built and equipped last year, including the British Forgings and Aeroplanes, Ltd. The number of automobiles in Canada has increased proportionately, being 116,557 in 1916 and 191,518 in 1917.

Business Improves in Southeast

DETROIT, March 26—Manufacturers report good business in the southeast. Sales likewise are growing in the Middle West, New England and New York.

Cadillac is shipping limousines only to Ohio, Indiana, Michigan, and parts of Illinois. The cars are driven to Chicago and loaded there for shipments to western points. There is a great demand for cars in Canada, the Saxon company finds; orders for 5 carloads having been received from Toronto alone. Due to the heavy snows, Canada could not obtain cars, and is now feeling the shortage.

Ninety per cent of the cars made by the Paige-Detroit company are being driven away. Some have gone as far as Fargo, N. D., and Denver.

"2½-Cent Motor Fuel" Costs More than Gasoline

NEW YORK, March 22—The claim of Dr. Louis Clement, a Scandinavian experimenter, that he could produce a motor fuel costing from 2½ to 8 cents a gallon, was disproved recently at a test conducted before a group of chemists. According to reports, Dr. Clement used about 5 lbs. of naphtha flakes, half a gallon of benzine, several ounces of saccharine, some bicarbonate of soda, potassium chlorate, a small bag of alum, 3 gal. of wood alcohol, several ounces of oil of cedar, one ounce of sulphuric acid, 2 bags of talcum powder and about 15 quarts of kerosene. Produced with these ingredients, the chemists estimate that the motor fuel would cost more than 40 cents a gallon.

New Used Car Report Out

CHICAGO, March 27—The Used Car Report put out by the Chicago Automobile Trade Assn. has been issued in its sixteenth edition in a new form. The contents are printed as a filler for a stiff board binder. When each of the quarterly reports is received, the user is requested to take out the old filler, send it back to Chicago, and insert his new filler. This provides a better cover, makes the book lighter in weight and facilitates the work in various other ways. Recently there have been added to the book the American Six, Brewster, Comet, Doble, Holmes, Jones, Maibohm and Pan-American.

Mid-Continent Crude Oil Now $2.25

TULSA, OKLA., March 25—The price of Oklahoma and Kansas crude oil has been increased 25 cents a barrel by the Sinclair Oil & Gas Co., making the present price $2.25, the highest ever posted for mid-continent crude oil. It is expected that other companies will also increase their price.

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Employment of Women Making Rapid Headway

INDIANAPOLIS, March 26—The employment of women in factories has made considerable headway in Indianapolis within the last few months with firms that formerly employed few, if any, women in the manufacturing or inspection department of the factory.

Wheeler-Schebler has for some time been employing women in the Inspection Department and now has more than 50 women employees. Many of these are sisters and daughters of factory employees. In the departments the women are entirely separated from the men. Rest rooms have been fitted up, and a matron has supervision over all of the women employed.

Satisfactory chairs with suitable backs and foot rests are provided. In the Inspection Department the room has been painted white, which has had a psychological effect on the workers.

An effort is being made to have the girls take more substantial lunches than they have been in the habit of doing and coffee is furnished at 1 cent per cup.

Up to this time Wheeler-Schebler has not engaged women in any department where much physical effort is required. The percentage of women changing their positions is much less than that of men according to the experience of this firm.

—

Advertising a War Time Expense

LONDON, March 25—The British War Government recognizes advertising as a necessary expense even for firms almost entirely engaged in the manufacture of munitions. The British Ministry of Munitions recently stated in the *Manchester Guardian* that no arbitrary rule had been made in reference to the advertising expenses of these establishments which, as the Government expressed it, "are controlled." The statement follows:

"In dealing with such establishments for the purpose of munitions levy, it has been the practice of the Ministry to make full allowance for advertising on a pre-war basis; and while it is possible that cases may arise in connection with contracts with the Ministry in which advertising charges would have to be more or less disregarded owing to the particular contract basis, such charges are in general treated as part of the legitimate establishment charges of the firm. All such cases are dealt with separately on their merits."

—

$1,500,000 Surtax for Massachusetts Motorists

BOSTON, March 22—After a hearing before the Committee of Taxation, which lasted less than half an hour, a subcommittee was appointed to draft a bill for a surtax of $1,500,000 to be collected from Massachusetts motorists. State Senator Gifford, in introducing the measure, said flatly that this was the easiest way to get the money needed, as all passenger car owners are listed. The measure calls for a tax, in addition to present fees, of $5 for owners now paying a $15 fee; $10 for those paying more; $2.50 a ton for trucks; $2 for operators and drivers, and $5 for dealers' cars.

—

Monthly Labor Surveys for War Industries

WASHINGTON, March 23—The United States Public Service Reserve is making a month to month survey of the actual labor conditions in war industries to learn the full strength of American labor applied to war purposes. More than 500 plants now send monthly labor-status reports to the Reserve and it is expected that in the course of 60 days 2000 plants will make them. These reports act as a labor barometer, enabling the Department of Labor not only to prevent serious shortages, but also to meet promptly the new demands for labor which follow rapid expansion of production.

—

Truck Convoy For Overseas

LIMA, OHIO, March 25—The first convoy of U. S. A. standardized war trucks comprising thirty-three of the standardized trucks left Lima this afternoon en route for an eastern seaboard. This is the first convoy of the standardized trucks to travel overland bound for overseas duty and marks the beginning of huge production of the trucks. Complete sets of parts are now in hand in assembly plants for more than 500 of the class B standardized trucks.

Albert Guyot, Racer, Now Consulting Engineer

PARIS, Feb. 26—Albert Guyot, winner of third prize on a French Delage in the 1914 Indianapolis race, has been discharged from the army as the result of injuries received while on active service as an airplane pilot, and has entered into partnership with N. Causan, as a firm of consulting engineers. Engineer Causan has a reputation as designer of high-efficiency racing motors, having produced successful boat and car motors for Delage, Panhard-Levassor and Despujols. Recently Causan returned from America, where he had spent a couple of years, part of that time being with the Chalmers company. Causan and Guyot are particularly interested in racing and aviation motor developments. Their business address in Paris is 81 Rue Laugier.

—

Regulations for Exports to Sweden and Greece

WASHINGTON, March 25—The War Trade Board has issued new regulations for licensing shipments to Sweden and Greece. In the case of Sweden, a handelskommission, or import certificate, must be obtained from the Swedish Government before application for export can be made to the Bureau of Exports. In the case of both countries the application for export is sent to the War Trade Board's representative abroad, and as soon as a decision is reached as to the advisability of the shipment the applicant will be advised.

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Survey of War Industries Locations

WASHINGTON, March 25—The War Industries Board is making an extensive survey for the location of war industries. This may result in the transfer of many government contracts from the congested Eastern industrial centers to the West and the South, where factories are working under less pressure, have less difficulty with labor and enjoy better transportation facilities. Many contracts will expire April 1, and it is likely that Eastern manufacturers will not secure renewals where the contract can be placed in the West or in the South.

Calendar

ASSOCIATIONS

April 15-19—Little Rock, Ark., United States Good Roads Assn. Sixth Annual Session.

June 5-12—Hot Springs, Va., National Assn. Automobile & Accessory Jobbers.

June 17-19—Dayton, O., Society Automotive Engineers, Annual Midsummer Session.

SHOWS

Mar. 25-30—Rochester, N. Y., Tenth Annual. Rochester Auto. Trades Assn., Exposition Park. C. A. Simmons, Mgr.

Mar. 25-30—Bridgeport, Conn., Fourth Regiment Conn. Home Guard State Armory and Casino. B. B. Steiber, Mgr.

Mar. 27-29—Fort Fairfield, Me., Reed's Garage. R. F. Reed, Mgr.

Mar. 30-April 6—Hartford, Conn., Eleventh Annual, Hartford Automobile Dealers' Assn., Inc. State Armory. B. F. Smith, Mgr.

Mar. 30-Apr. 6 — Atlantic City, N. J., Second Annual. Garden Pier. S. W. Megill, Mgr.

Mar. 30-Apr. 6—Chicago, Ill., Second Annual Chicago Used Show. Chicago Auto. Trade Assn. Coliseum.

Apr. 1-6—York, Pa., York Auto Dealers' Assn. T. F. Feiffer, Mgr.

April 3-6—Battle Creek, Mich. Second Annual. W. A. Donaldson, Mgr.

April 3-6 — Ogdensburg, N. Y. Second Annual, State Armory.

April 6-13 — Green Bay, Wis., Brown County Automobile Trade Assn.

April 6-13 — Red Bank, N. J., Monmouth County Auto. Dealers' Assn., Armory, E. C. Von Kattengell, Mgr.

April 8-13—Reading, Pa., Reading Auto Trade Assn.

Apr. 9-13—Stockton, Cal., Third Annual San Joaquin Auto Trade Assn. Samuel S. Cohn, Mgr.

Apr. 16-20 — Deadwood, S. D. City Auditorium.

Apr. 17-19—Davis, Cal., Tractor Demonstration. University of California.

Apr. 17-20—Calumet, Mich., Upper Peninsular Show, Copper County Automobile Dealers & Garage Owners' Assn., Coliseum.

May 3-7 — Lima, Ohio, Ohio State Automobile Assn.

Sept. 23-28 — Chicago, National Accessory Show for Fords. Coliseum.

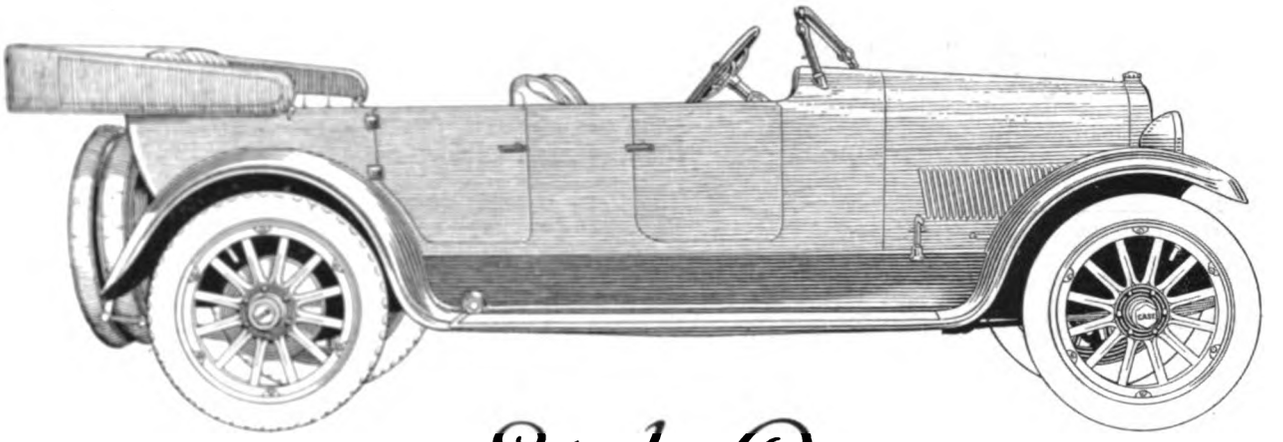
ENGINEERING

June 26-28 — Buffalo, N. Y. American Society of Heating and Ventilating Engineers.

Sept. 2 — Cripple Creek, Colo. American Institute of Mining Engineers.

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The New Case Six



Style Cars

DEALERS find that much is being said in appreciation of the grace and charm of the New Case Six. Even though this is not a time when men buy for style alone.

This points the way for wise dealers.

For a short time in the motor world it looked as though the whole consideration would be utility. And that in the zeal for economy, appearance would be secondary.

Case avoided this tendency. A utility car such as the Case can be beautiful as well. Economy and art may be related.

And so in the New Case Six, although it combines in its mechanical makeup all the proven features, is at the same time a car of striking and dignified appearance.

It has been rightly named "The All-Feature Car," because every part, every principle is known and appreciated as a feature found in the finest cars.

There are a number of places where an opportunity is open for dealers to handle the New Case Six, on a very profitable basis. Write to ascertain if this opportunity exists in your territory.

J. I. CASE T. M. COMPANY, Inc.

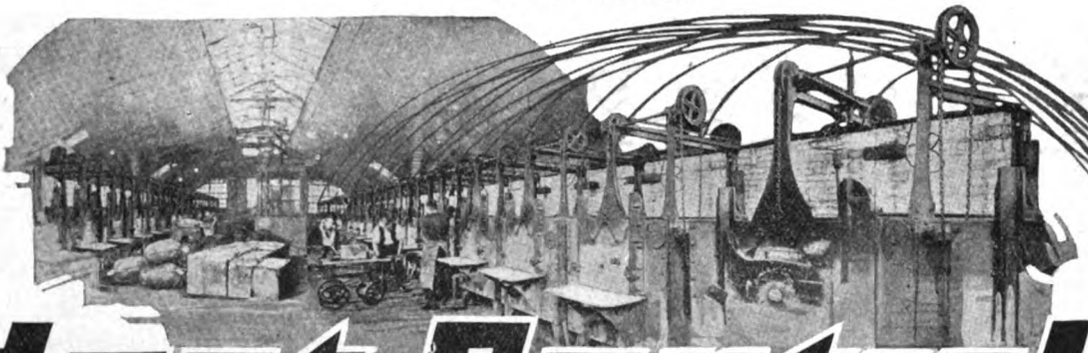
Founded 1842

246 Liberty Street, : : : Racine, Wisconsin

Family Model for 7 or 5 people, color dark blue, $1875 Sport Model for 4 people, color periscope green, $1875
All-Seasons Model, Springfield Type, for 7 or 5 people, color dark blue, $2375

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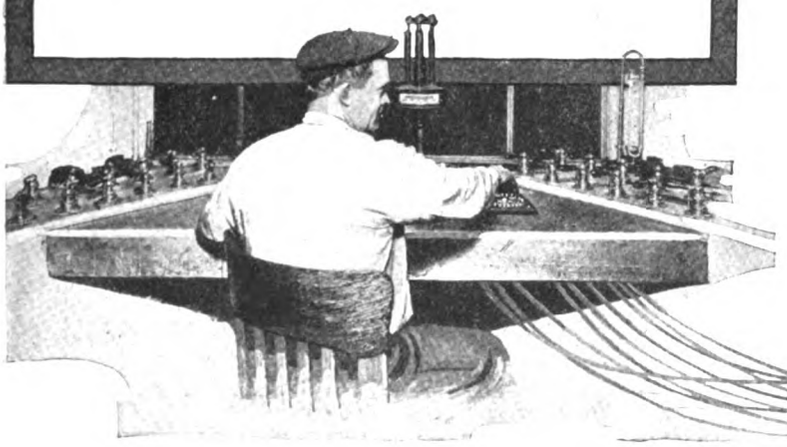
Heat Control

"HEAT TREATMENT"—annealing, case hardening and tempering—determines more than anything else the quality of the finished product.

"Heat Control"—the secret of heat treatment—is reduced to an exact science in our plant.

Your valve, bolts, and special parts are heat treated in furnaces whose temperatures are indicated by electrical pyrometers so sensitive that even a variation of less than five degrees is easily seen. An elaborate valve control system centralized at the pyrometer room enables these variations of temperature to be promptly corrected.

No element of chance enters into our heat treatment. The temperature is tested—controlled—KNOWN.



"A Department of Your Plant"

for

Motor Valves
Spring Shackle Bolts
King Bolts
Chassis Bolts
Coupling Bolts
Connecting Rod Bolts
Push Rods or Valve Tappets
Drag Links
Brake Rod Assemblies
Starting Cranks
Lamp Brackets
Tank Straps
Propeller Tubes
U. S. S. Head Cap Screws
Piston Pins

The Steel Products Co.

Michigan Plant: Detroit, Mich. **Main Plant: Cleveland, O.** **Metals Welding Plant: Cleveland, O.**

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These cars are equipped with the Waltham Automobile Clock

Anderson 6-40	Jordon
Apperson	Kissel
Brewster	Locomobile
Cadillac	Marmon
Chalmers	Mercer
Cole	Murray
Crane	Owen-Magnetic
Cunningham	Packard
Detroit-Electric	Pierce-Arrow
Doble	Rauch & Lang
Fergus	Rolls-Royce
Franklin	Simplex
Haynes	Stearns
Hal	Studebaker
Hudson Super-Six	Willys-Overland
	Winton

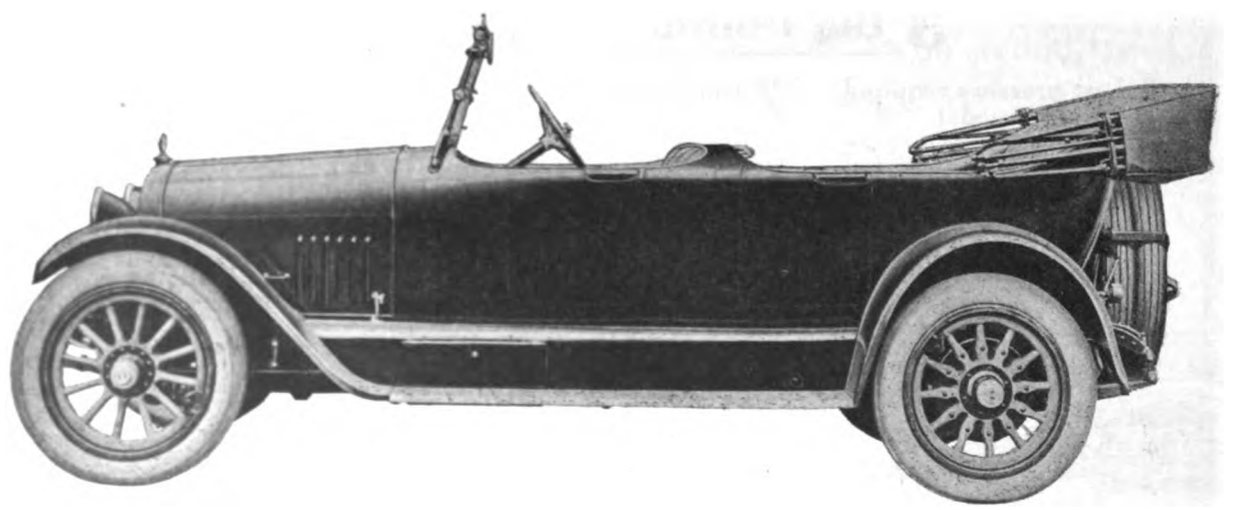
The Waltham Automobile Clock

Over 250,000 Now in Use as Standard Equipment

Handsome in appearance and thoroughly reliable as an accurate timekeeper. Built to withstand the rough shocks of motoring and the changes of temperature.

Has two mainsprings and a red signal on the dial to tell you when it needs winding. The chosen time equipment for thirty-one leading cars.

WALTHAM WATCH COMPANY, WALTHAM, MASS.

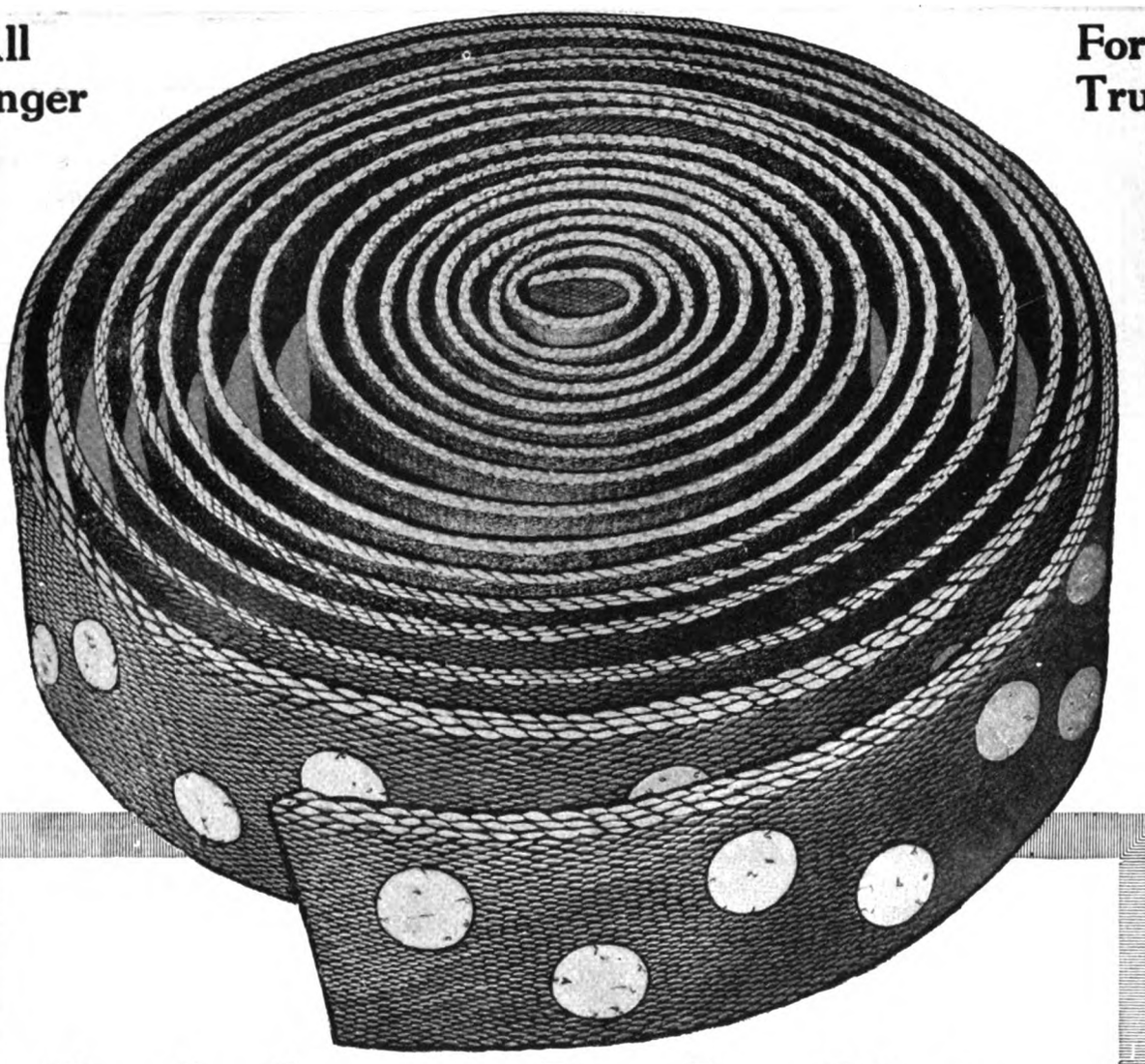


Mercer Touring Car Equipped with the Waltham Automobile Clock

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For All Passenger Cars

For All Trucks



Cork Insert Brake Lining

gives a SURE brake ALL the time

3 Big Points of Superiority

1 Less pressure required on pedal

Cork Insert Brake Lining has by far the highest co-efficient of friction of any lining. It *takes hold* firmly at the slightest touch of the toe to the brake pedal. Less pressure means less heat, longer wear, more positive service.

2 Unaffected by oil or grease

Oil on ordinary lining, destroys its ability to *hold*. Makes it undependable and dangerous. Cork Insert Brake Lining is not affected by oil or grease. It is always *dependable*—always can be relied on to *take hold* instantly—positively.

3 No grab, slip or SQUEAK

Cork Insert Lining never glazes over or gets slippery—insures freedom from grabbing and slipping. Both corks and lining wear very slowly. It gives a longer service than any other lining and holds its high frictional qualities and original efficiency to the last mile.

DEALERS! Here's another big money maker for you. The success of Cork Insert Transmission Linings and Fan Belts for Fords is being repeated *in an even bigger way* in Cork Insert Brake Lining. It is handled by the same jobbers who handle the other Cork Insert products. Get this lining in stock for it is *going big*.

ADVANCE AUTOMOBILE ACCESSORIES CORP.

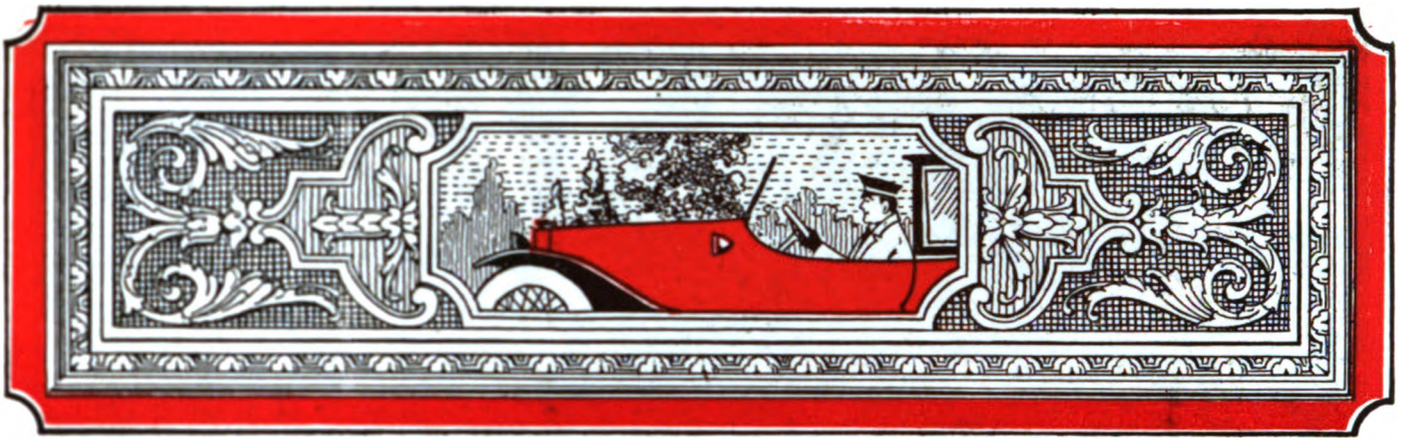
Dept. C-16, 56 E. Randolph St., Chicago, Ill.



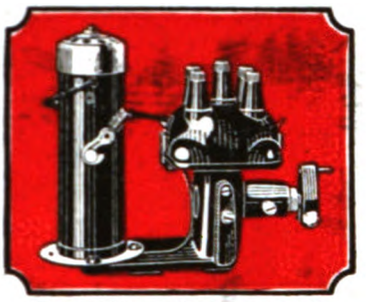
Makers also of
Cork Insert Transmission Linings
for Fords and Fan Belts for Fords



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ATWATER KENT
SCIENTIFIC IGNITION



Type CC Magneto Replacement Outfit
Specially adapted to Maxwell, Overland and other 4-cylinder electrically equipped cars

"I'M through experimenting," says the efficiency motorist. "I've found the remedy for most of my motor ills. I've replaced my magneto with an Atwater Kent Ignition System.

"That hill leading to the park, which I used to crawl up on second speed, I can now take with ease on high. I find my car starts easier, and my gasoline bills run considerably less."

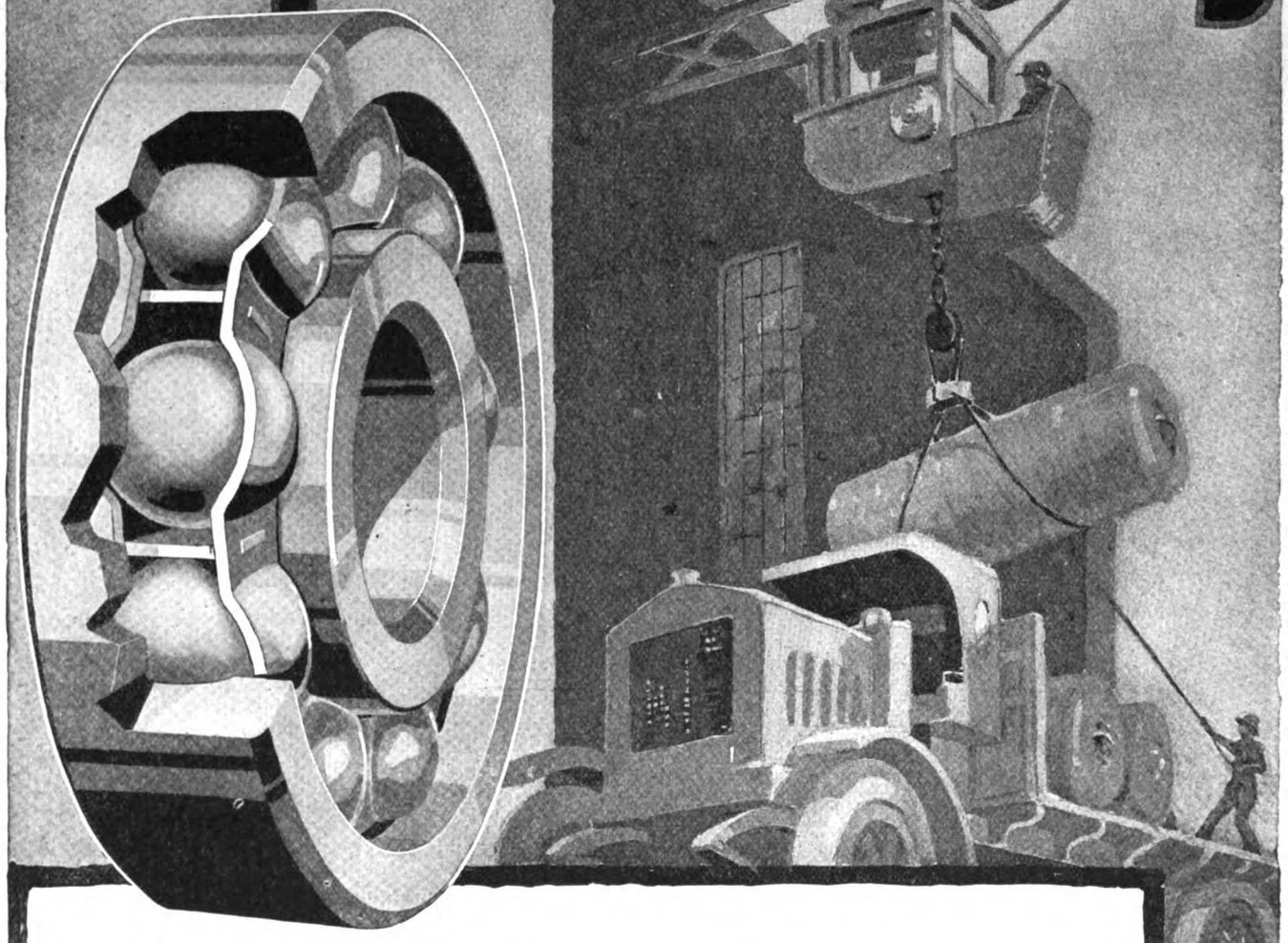
The owner of an Atwater Kent equipped car is an Atwater Kent enthusiast. If you are not selling Atwater Kent Ignition you are missing a splendid profit opportunity.

WRITE FOR OUR DEALER PROPOSITION TO 4938 STENTON AVENUE

ATWATER KENT MFG. WORKS
Philadelphia

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Super-Strong



Why must your motor develop power which never reaches the driving wheels?

At every bearing point transmission, differential and hubs—friction takes its toll. Power oozes out in the form of heat and wear—until the energy emerging at those husky driving rims is considerably reduced.

Only ball bearings reduce this internal friction to the lowest point. New Departures have the strength and stamina for the heaviest loads their capacities are known and fully guaranteed.

The most unusual reference book on ball bearings ever published is offered to designers and builders of automobiles, aeroplanes and tractors.

THE NEW DEPARTURE MFG. COMPANY,
Bristol, Conn. Detroit, Mich.

313 *Conrad*

New Departure Ball Bearings

Patent Licensee.

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What's Going On, Now, Inside Your Car?

Inside the engine?—the gearcase?—the differential?—the transmission?—the bearings?

THESE are the vital places that make—or fail to make—your motor car a source of personal pleasure—your motor truck a source of personal profit.

These are the vital places—places which should be protected by scientific lubrication.

You can have *positive* protection for your car's valuable mechanism by insisting on scientific lubricants:

Motul, for your motor.

Gearese, for transmission gears.

Cupese, for bearings and every place lubricated through a grease cup.

Send for, "The Insides of Your Car"—a 36-page book which covers completely the subject of automobile lubrication, and which gives real money-saving facts that you may have overlooked; also for booklet "Once a Year Remember." Yours for the asking.

SPECIALTIES

GEARESE

—A correct lubricant for motor car transmissions and differentials.

It follows the gears continuously, leaving no spot where metal can touch metal. Gearese insures against wear, reduces friction and insures a silent, smooth-running car. Gearese maintains its lubricating consistency under all temperatures.

Gearese should be packed into your gear case and differential about once a year.

CUPESE

—A special quality cup grease, produced by the exclusive Acaloric Process. It is made in all densities, from very light to extra heavy. Ideal for wheel bearings, brake connections, gear and clutch levers, universals, spring leaves and bolts, steering arms and knuckles and axle caps.

Cupese spreads rapidly, adheres to the bearing surfaces, absolutely prevents metal-to-metal contact. It does not liquefy or evaporate under intense heat—does not cake at low temperature—does not clog bearings or leave residue in cups. It is *all* lubricant.

MOTUL

—A superior quality oil for the protection of automobile motors. Motul is made by a special process which insures super heat-resisting qualities. Although the heat of explosion in the cylinders is terrific, Motul maintains its lubricating consistency—keeps friction under control—protects your motor, bearings and cylinders. Under test Motul shows a minimum of carbon residue.

SLO-FLO

The super-lubricant; will not drip, climb nor spatter, withstands excessive heat and pressure.

AERUL

A practical high quality oil for aeroplane motors.

ASBESTESE

An asbestos and wool-mixed grease lubricant for car journals.

MARINUL

A well-known special oil, produced to meet the excessive stresses of marine service.

CORUL

A liquid binder that meets the 11 requirements of perfect core casting.

TEXTUL

An economical, high quality oil compound for wool and worsted manufactures.

TALESE

An economical, practical drop-forge die-swabbing grease compound.

EXESE

The 600 deg. F. Lubricant—for oven gears, bloom cars—calender rolls, automatic stokers—or lubrication under excessive heat conditions anywhere.

VESUVESE

A waterproof lubricant for exposed gears—for wire cable dressing.

LARCUL

A practical, economical metal-cutting lubricant.

Also, S-F general Grease and Oil Products.

Exceptional proposition open to auto accessory Jobbers and Dealers. Write for details. S-F Auto Div.

SWAN AND FINCH COMPANY
NEW YORK

Quality Oil and Grease Products Since 1853

MAIN OFFICE:
165 Broadway, New York

BRANCHES:
Providence: 306 S. Water St.
Chicago: 20 West Jackson Blvd.
Philadelphia: 508 Otis Bldg.
San Francisco: Norman Cowan Co. Pacific Coast Representatives, 433 Rialto Bldg.
Cleveland: 1202 Swetland Bldg.

WORKS:
Bayway, N. J. Syracuse, N. Y.

SCIENTIFIC LUBRICANTS for SCIENTIFIC L[illegible]CATION

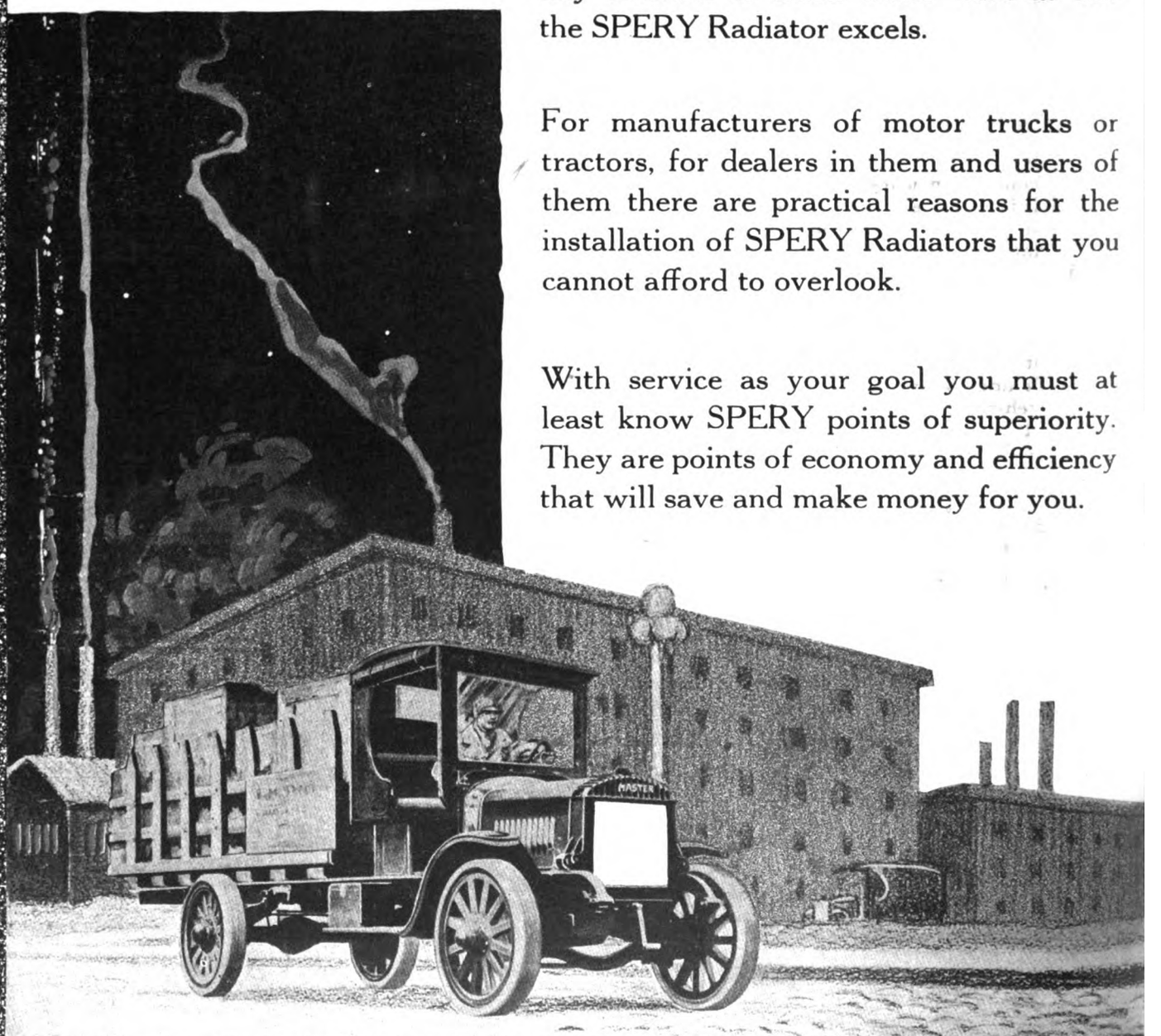
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The SPERY

The most exacting requirement placed on any radiator is truck work—and at this the SPERY Radiator excels.

For manufacturers of motor trucks or tractors, for dealers in them and users of them there are practical reasons for the installation of SPERY Radiators that you cannot afford to overlook.

With service as your goal you must at least know SPERY points of superiority. They are points of economy and efficiency that will save and make money for you.

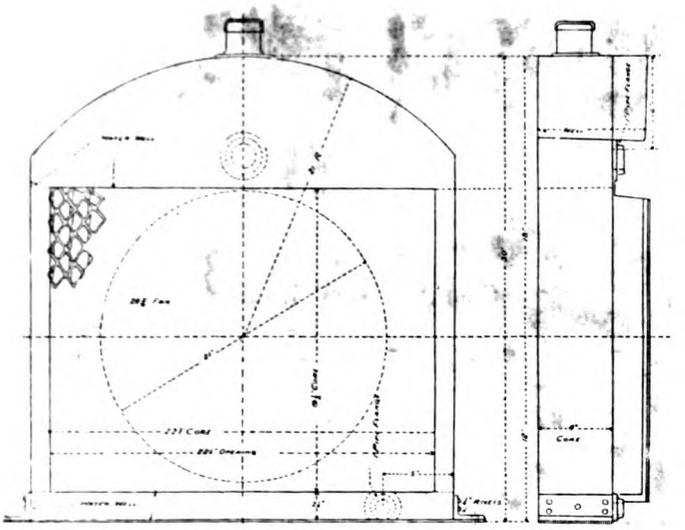


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RADIATOR

The SPERY Radiator is a new and superior type for motor trucks and tractors—and here are the reasons why:

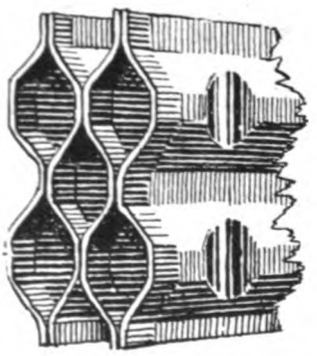
1—It combines every advantage of the tubular and honeycomb types without the disadvantages of either.
2—It has 30% to 40% greater cooling efficiency.
3—It is extremely light in weight.
4—It is the most rigid radiator made.
5—It is so durable it withstands the hardest service.
6—It offers the surest resistance against freezing.
7—It will not clog or leak.
8—It adds years to the life of the vehicle.
9—It is the handsomest, simplest and best core construction made.

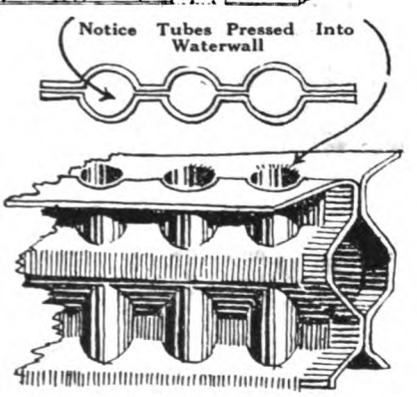


Our offer to motor vehicle manufacturers is unusual and advantageous. We will even send on request a sample radiator for tests by your engineers.

And there is **a liberal dealer offer** for selling the SPERY for replacements.

Write for particulars







HOOVEN RADIATOR COMPANY

417 S. Dearborn Street **CHICAGO**

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Carbon-Vanadium Auto Steel

A SIMPLE carbon steel with Vanadium alone added, of known quality, tried and proven by years of research, experiment and application in the most exacting fields

CARBON-VANADIUM STEEL

takes its place among its peers as the right steel at the right time for industrial users of high grade alloy steels.

With all the physical properties of the more complex alloy steels, Carbon-Vanadium steel possesses Forging, Machining and Welding properties all its own.

Let us send you specifications and tests of Carbon-Vanadium Auto Steel.

AMERICAN VANADIUM COMPANY

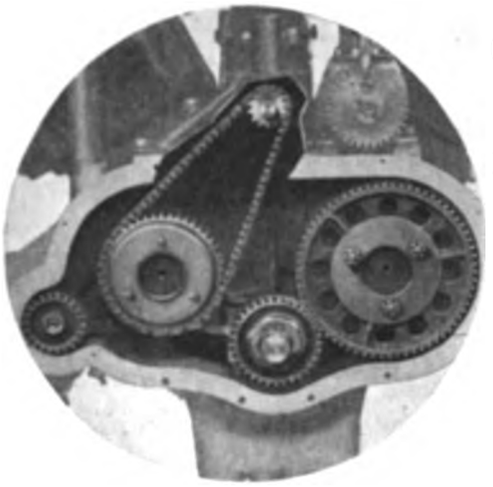
NEW YORK PITTSBURGH LONDON

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SILENCE IS ESSENTIAL



POWER IS NECESSARY

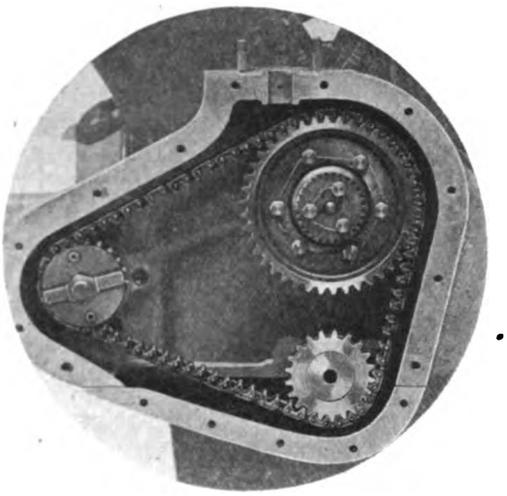


NATIONAL "12"
1916-17-18

CLOSE REGULATION REQUIRED

Flexible Durable Standard Drives Desired

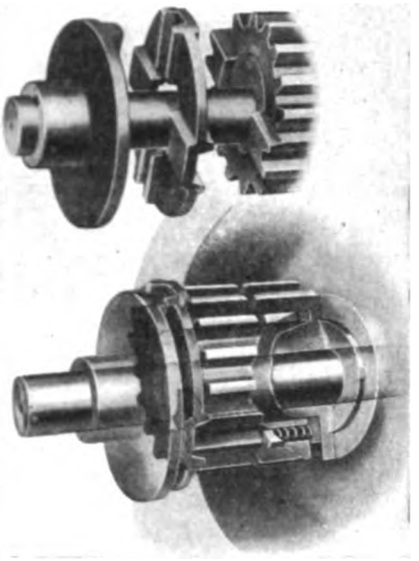
More than half the standard engine and car builders secure these features by using the MORSE Rocker Joint Chain Drive designed to eliminate friction and give flexibility and long life.



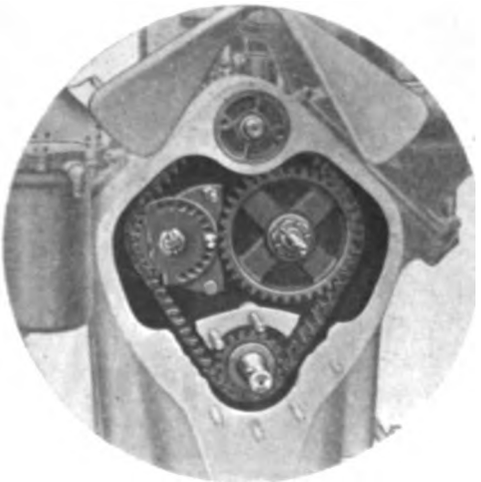
PACKARD "12"
1916-17-18

MORSE SILENT CHAIN FRONT END DRIVES

SELLS THE CAR
ASK ANY OWNER



THE MORSE ADJUSTABLE SPROCKET is the only one means for taking up slack in the chain as wear takes place when all the shafts are held in position. This Patented MORSE Device not only permits of the proper tension, but also acts as a dampener to any vibration. Another of our novel improvements to the Automotive Industry.



STEARNS-KNIGHT "8"
1916-17-18

A list of the Cars, Engines and Automotive Industries that are using and have adopted the Morse Chain Drive as their standard would be to cite every car of note and the big sellers.

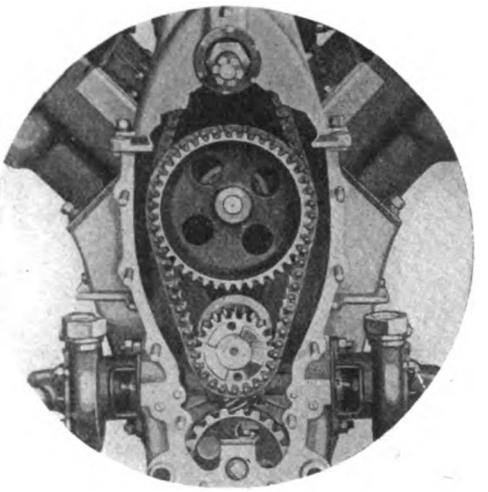
Facts will surprise you. Write for information

MORSE CHAIN CO.

General Office and Works
ITHACA, N. Y.

Detroit Sales Office and Display Rooms
1003 Woodward Ave.

Address DETROIT Office



CADILLAC "8"
1915-16-17-18

SALES OFFICES

Boston, Mass., 141 Milk Street.
Chicago, Ill., Merchants Loan and Trust Bldg.
Cleveland, Ohio, 421 Engineers Bldg.
Detroit, Mich., 1003 Woodward Ave.
Greenville, S. C., 807 Ashboro Street.
New York City, 30 Church St., Hudson Terminal Bldg.
Pittsburgh, Pa., Westinghouse Building.
San Francisco, Cal., Monadnock Building.

REPRESENTATIVES

Atlanta, Ga., Earl F. Scott, M.E., 702 Chandler Building.
Canada, Jones & Glassco, Reg'd.
Montreal, St. Nicholas Building, Toronto, Traders' Bank Bldg.
Kansas City, Mo., Morse Engineering Co., R. A. Long Bldg.
Minneapolis, Minn., Strong-Scott Mfg. Co., 413 Third St.,
St. Louis, Mo., Morse Engineering Co., Chemical Building.
Licensees for Europe, The Westinghouse Brake Co., Ltd.,
82 York Road, King's Cross, London, N.

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Prompt Deliveries

From crude materials to finished merchandise ELISCO products are made in our own steel plants, assuring us an ample and independent supply, and the ability to make prompt and regular deliveries on all orders for

ELISCO

STEEL PRODUCTS

We specialize on light gauge cold drawn steel tubing from ¼ inch to 3 inch O.D.—made by the "Elisco" process—the only process using automatic machines combining *all six* operations in *one* and ensuring the utmost in mechanical accuracy and finish.

Let us figure on your requirements also in high carbon butted and brazed Steel Tubing; Strip Steel; Bars, Angles, Channels, and Special Shapes.

THE ELYRIA IRON & STEEL CO.

East 131st Street **Cleveland, Ohio**

Chicago Office: 1243 Peoples Gas Building
Detroit Office: 1934 Dime Bank Building
Atlanta, Ga., Office: Candler Building
New Haven, Conn.: 504 Colonial Building

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THE SIOUX WAY

Trade Mark Reg U.S. Pat. Office

"Bigger Profits Through Better Tools"

Speed—perfect fitting valves in one-twentieth the time required by old grinding methods. This cuts down the labor cost and gives you more profit on every job. **Accuracy**—angles absolutely accurate and perfectly centered. This insures the kind of a job which makes satisfied customers. **Service**—We keep Sioux Tools always sharp and in good working order—no charge. This complete set of Valve Seat Reamers and Valve Refacing Tool, price $22.50. Liberal Discount to Dealers.

For Sale by All Live Jobbers

Pat. Feb. 17, 1914. Other Patents Pending.



Please mention Automotive Industries when writing to Advertisers

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BROWN-LIPE TRANSMISSIONS

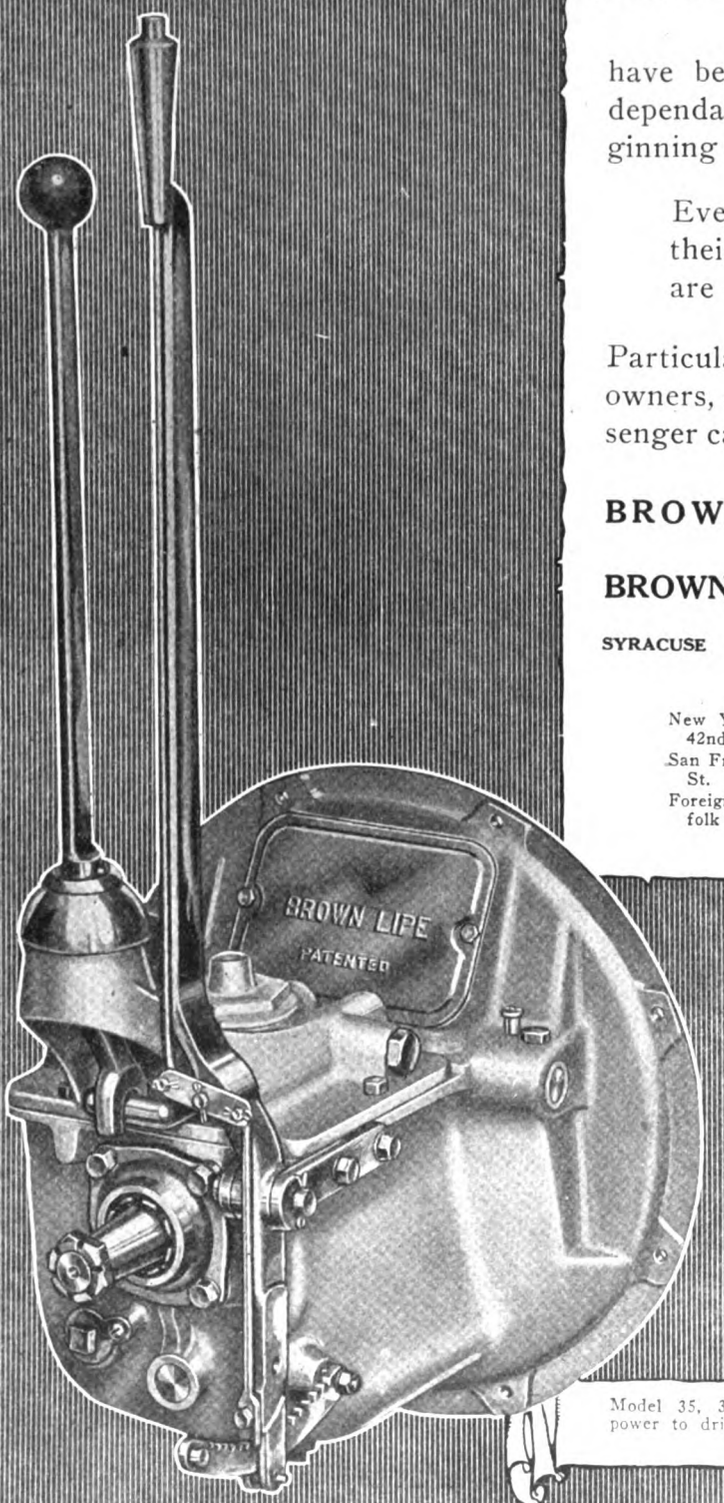
have been recognized for their dependable quality since the beginning of the industry.

Every car dealer knows their worth when they are on the car he sells.

Particulars will be furnished owners, dealers or makers of passenger cars and trucks.

BROWN-LIPE GEAR CO.
TRANSMISSIONS
BROWN-LIPE-CHAPIN CO.
DIFFERENTIALS
SYRACUSE N. Y.

REPRESENTATIVES:
New York: Thos. J. Wetzel, 29 West 42nd St.
San Francisco: A. H. Coates, 41 Speare St.
Foreign: Benjamin Whittaker, 2 Norfolk St., Strand, London, W. C.



Model 35, 3-Speed U. P. P. Transmits maximum power to drive wheels with minimum friction, noise and wear.

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MARMON 34

Advanced Engineering

First to Sail Uncharted Seas

In the development of the modern motor car, each new voyage of discovery has had its venturesome pilot. It has ever been the courage of a few that has led the many to success

BUT no exploration in the history of the industry ever called for more gallant enterprise than that on which the Marmon engineers set out four years ago. Behind them lay all the experience and development in motor cars up to the outbreak of the European War. Before them lay the unknown seas of engineering.

For more than two years they searched this trackless main, sounding new depths and discovering many new ideas and mechanical principles. To mention a few: They found how to lessen weight of the car a full half ton and yet improve its roadability and riding ease:

—how to produce a short turning radius and yet retain the desired long wheel base:

—how to design seats wide and deep and yet build a body exceptionally low:

—how to attain almost perfect balance and eliminate numerous secondary parts:

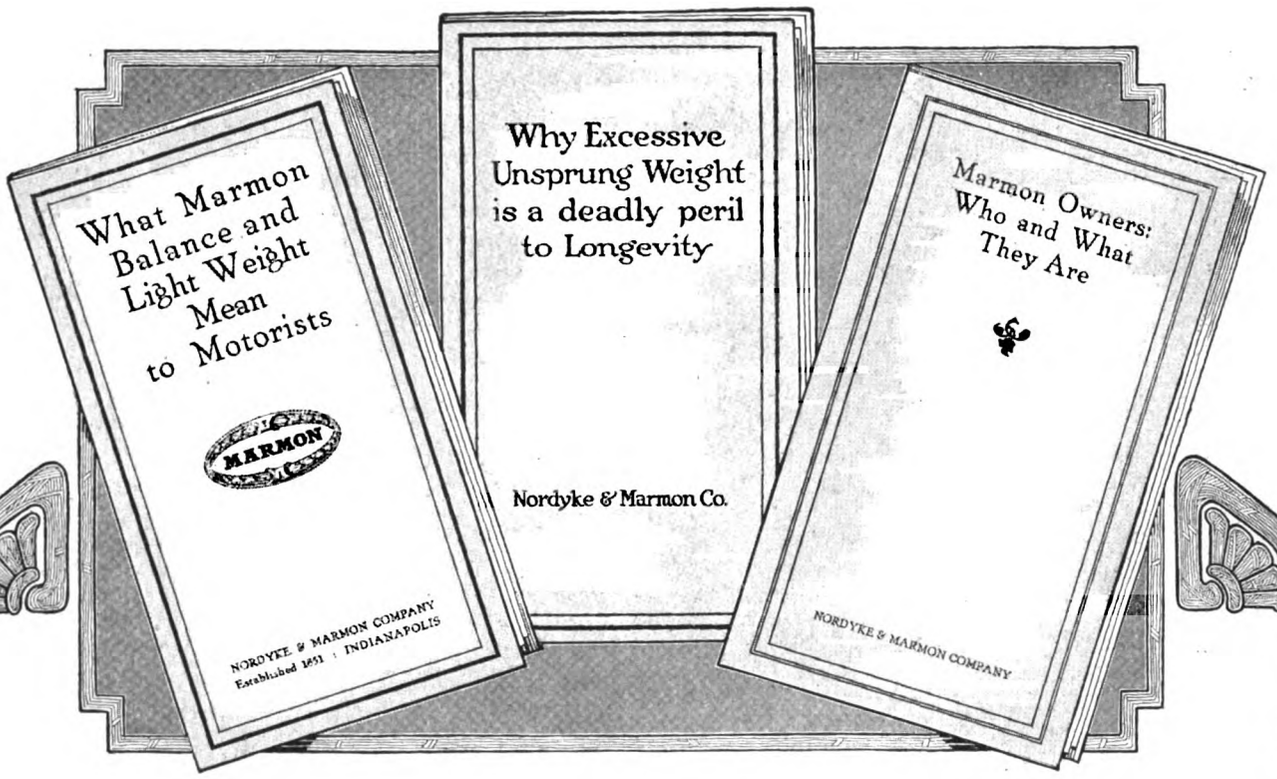
They charted the way to great efficiency and power over a course of small fuel and tire consumption.

In ways like these through the Marmon 34 the world has received the accepted guide to scientific construction. And the public has, in recognition, awarded this car the place of preferment.

NORDYKE & MARMON COMPANY

Established 1851 : Indianapolis

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MARMON 34

Advanced Engineering

Sales Follow this Established Leadership

THE Marmon sales proposition is exceptionally attractive to dealers in many ways. One sale equals two or three sales of low priced cars. And due to Marmon's leadership in the high grade field, it adds unquestioned prestige to the dealer who represents it.

Please do not entertain the mistaken idea that Marmon sales are confined to the large cities. They are not.

Many are sold in the metropolitan centers, it is true—but small town dealers have also made phenomenal records because of this car's wonderful adaptability to country driving.

The Marmon handles so easily, holds the road so well, and operates with such economy on any road or trail that it finds a ready market in any territory.

These points are better understood by those who know the principles of Marmon construction—the light weight, the balance and other vital advancements, which are explained in these interesting booklets illustrated here.

These booklets constitute just one of the many forms of effective sales assistance that are being constantly furnished to Marmon dealers.

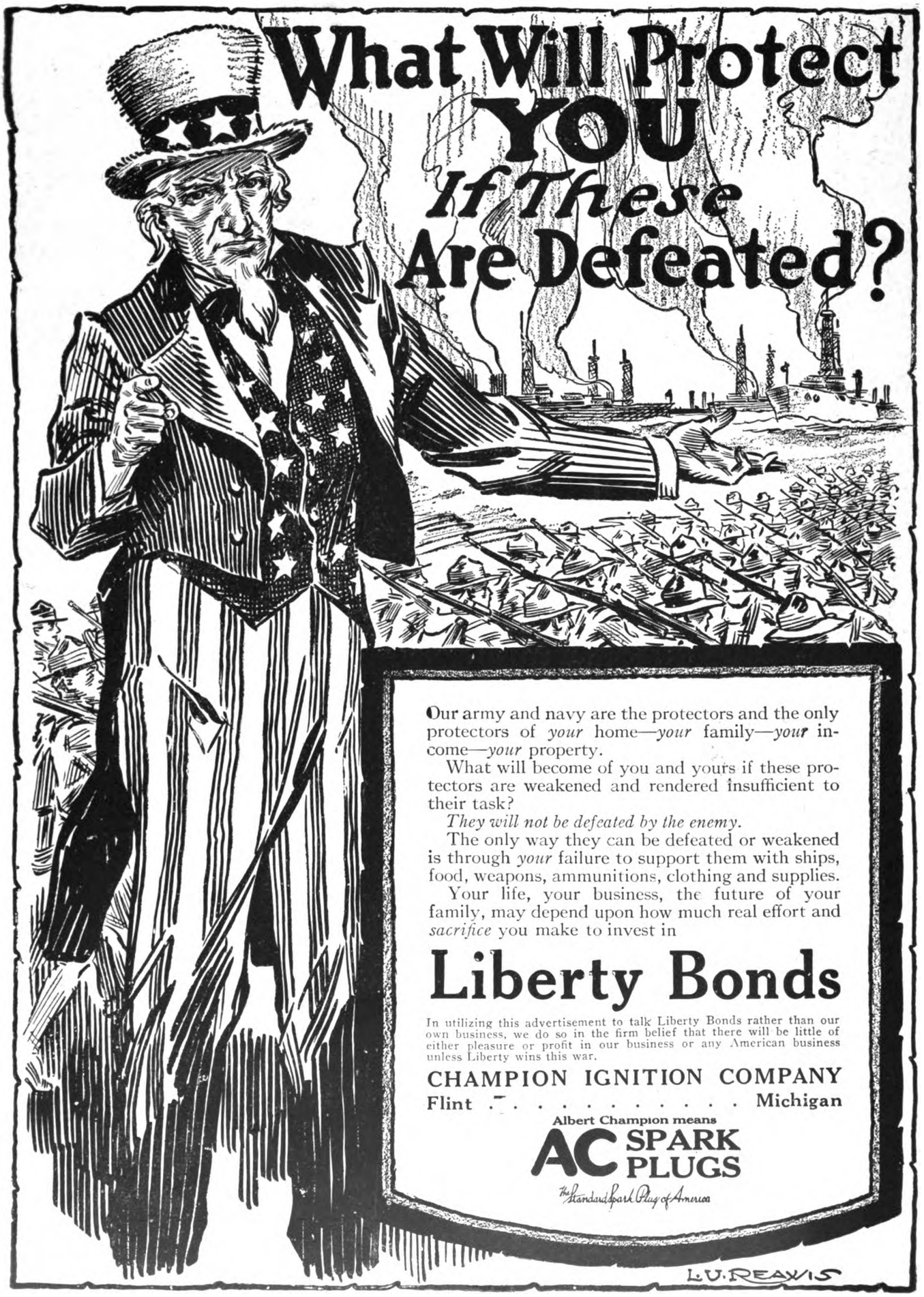
NORDYKE & MARMON COMPANY

Established 1851 : Indianapolis

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Where Your Money Goes



WE are now building more naval and merchant ships than we have constructed in the last generation.

We are building a vast fleet of airplanes, and enormous supplies of artillery, motor trucks, machine guns, rifles and ammunition. We are feeding, clothing and training an army of a million men, and preparing for a million more. We have loaned billions of dollars to our allies to be spent in the United States.

From the shipyards of the Pacific to those of the Atlantic; on our farms and in our mines, mills and factories in every state in the Union; back of the firing lines in France, where men are training, camps are being erected and railroads built, billions upon billions are being expended for labor, for transportation, for materials and supplies of every description.

The mind can hardly conceive the sums of money required for our war preparations. Yet these expenditures are absolutely essential. We must win the war quickly if possible; we must carry it on for years if necessary. We must do the job with American thoroughness, let the cost be what it may.

Remember, when you invest in your Liberty Bonds, that there is immediate, urgent, imperative need for every dollar you can possibly spare.

In co-operation with the Liberty Loan Committee this advertisement is published by

Duesenberg
The Power of the Hour

DUESENBERG MOTORS CORP. 120 BROADWAY, NEW YORK CITY
Contractors to the United States Government

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Put your money in this bank

It's the safest in the world. It pays you good interest. And your deposits in it help to insure a priceless heritage of freedom and peace for your children and your childrens' children.

To the limit of your resources

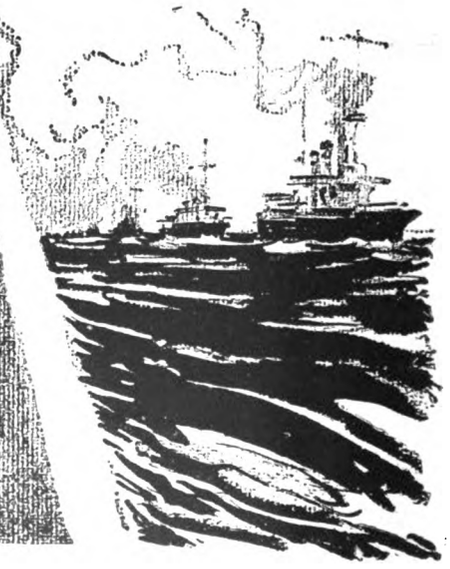
Invest in the Third U. S.

Liberty Loan

COLUMBIA'S BANK OF LIBERTY

The Third Liberty Loan is more important to us than our business—and we therefore cheerfully donate our space to help drive along this Loan to a Tremendous Success.

Permalife Storage Battery Co., Inc.
Poughkeepsie, N. Y.



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Will You Invest Your Money With Uncle Sam Now?



Or Let Germany Take It Away From You Later?



Be practical. Look squarely at the facts. We will either invest our money with Uncle Sam now, at good interest rates, to help him win this war, or we will give it up later to pay Germany's war cost—and as much more as Germany chooses to collect. **Invest in**

Liberty Bonds Today

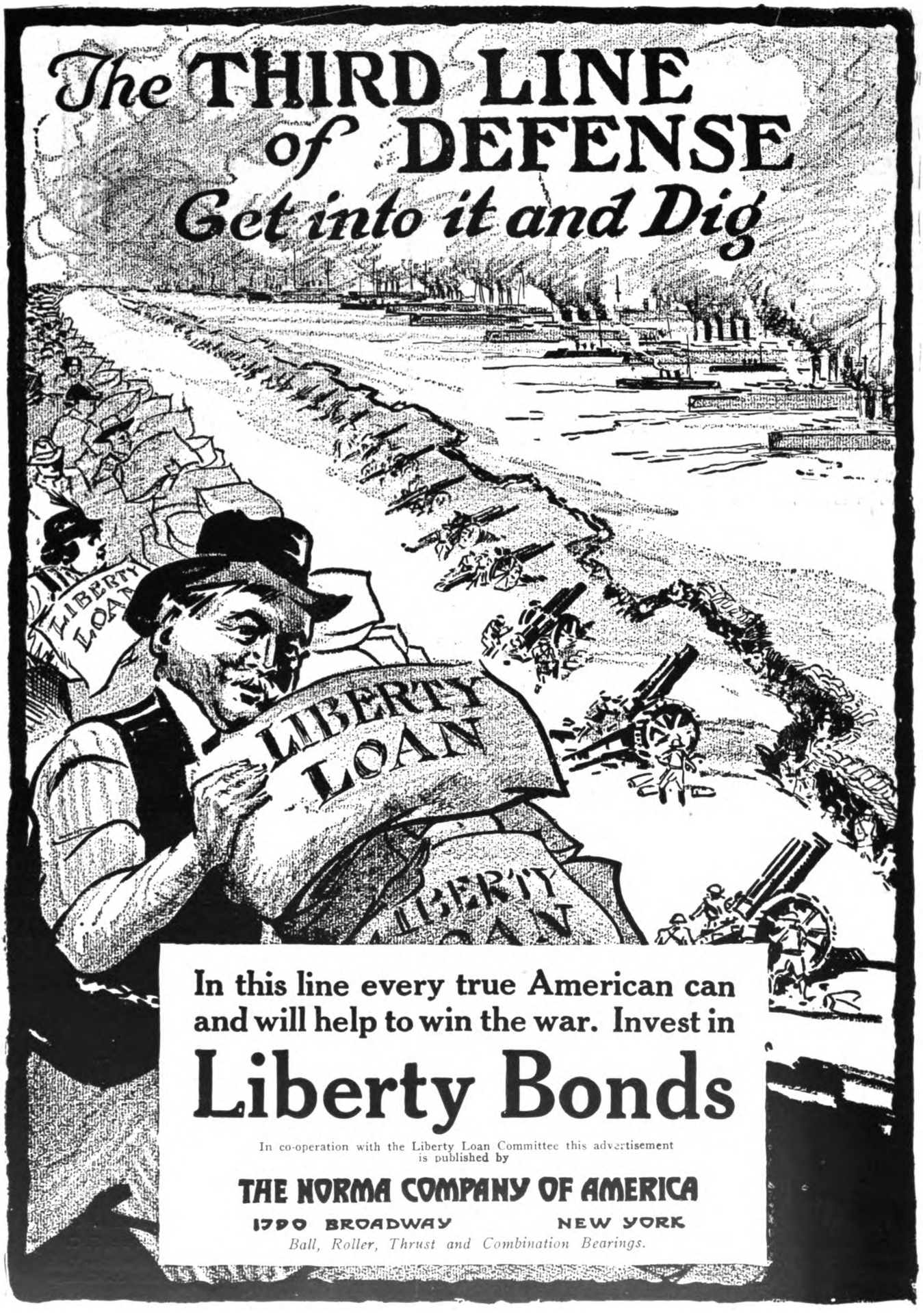
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GENERAL ASBESTOS & RUBBER CO.

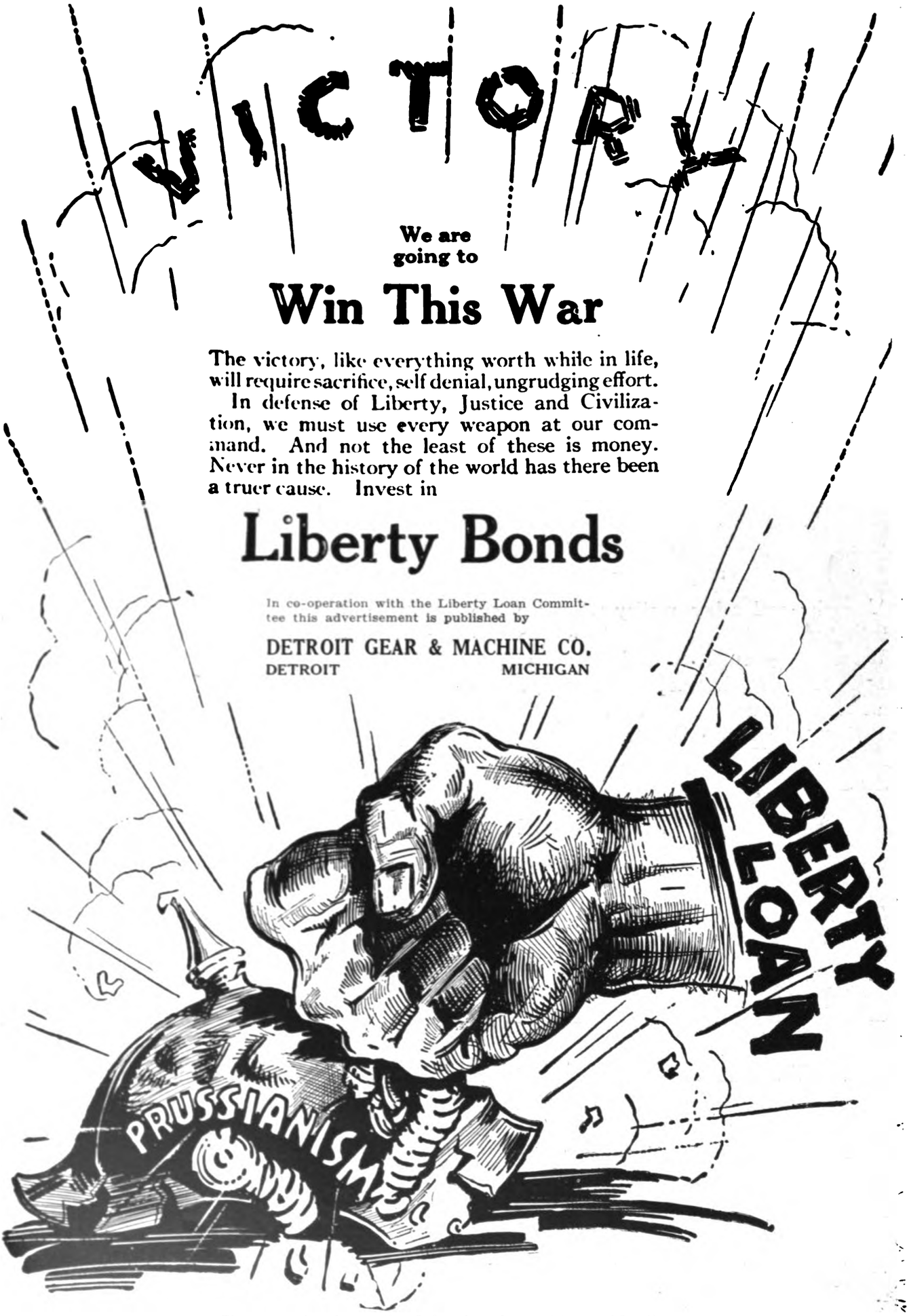
Main Offices and Factories, Charleston, S. C.

Branches and Complete Stock: 58 Warren Street, New York
311 Water St., Pittsburgh 106 West Lake St., Chicago

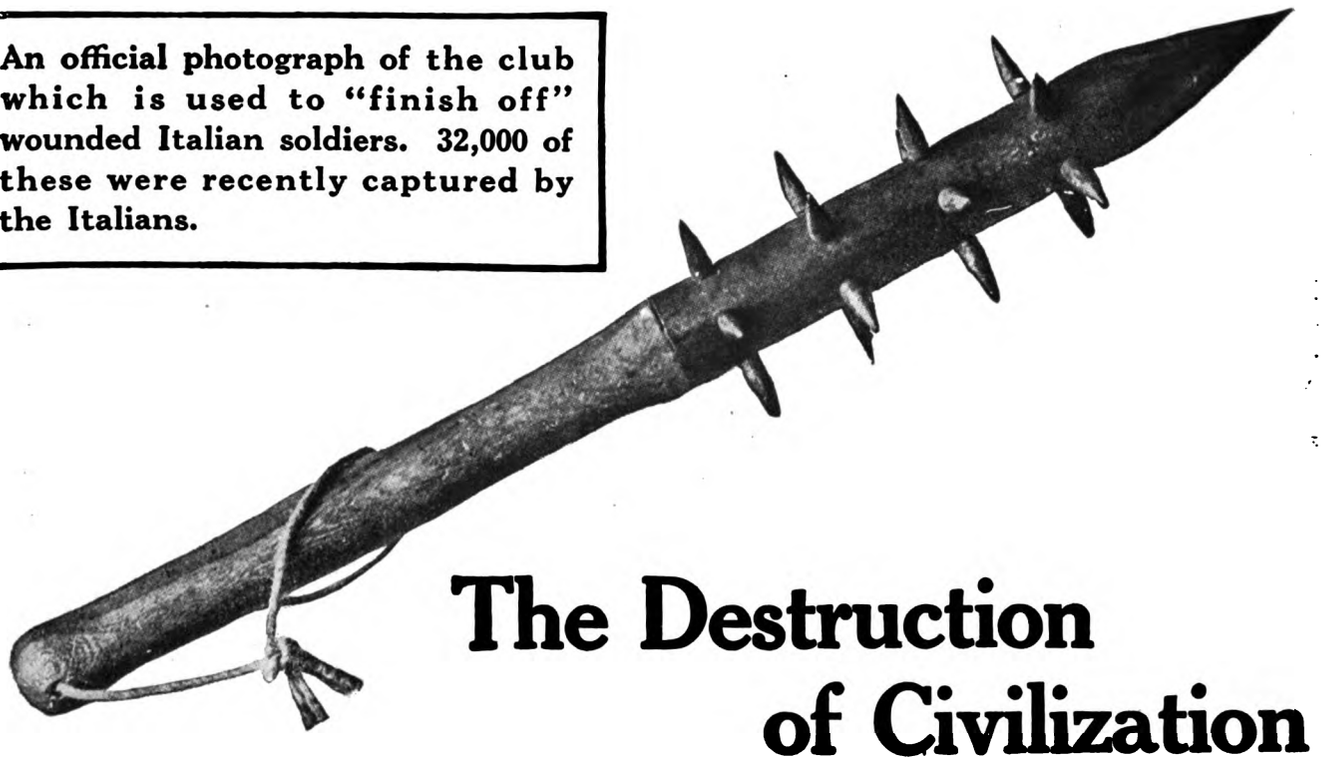
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An official photograph of the club which is used to "finish off" wounded Italian soldiers. 32,000 of these were recently captured by the Italians.

The Destruction of Civilization

is in grim and sober reality what we are fighting this war to prevent. The club pictured above—from an actual official photograph—might be the weapon of a savage cave man of five thousand years ago. It is in fact the weapon with which German soldiers "finish off" enemy wounded who have fallen on the battlefield.

There is only one answer to make to such methods—the defeat of the German armies. America has taken up the sword to give that answer. Our army is in France to help win this war on the battlefield—that civilization may be safe, that America may be safe.

You Can Have Your Share in America's Answer to German Savagery

The Third Liberty Loan is your opportunity. It is the most direct blow that can be struck at German military supremacy. It is the most powerful aid that can be given our soldiers in France. It means rifles and helmets and gas-masks—the best protection for our men from German brutality. It means big guns and shells and airplanes—and VICTORY.

Invest today in bonds of the Third Liberty Loan, and save the lives of American soldiers.

Save Civilization, Save America, Your Own Family and Your Own Home

In co-operation with the Liberty Loan Committee this advertisement is published by

AMERICAN TAXIMETER COMPANY

Superior Recording Instruments

Dreadnaught Indestructible Hub Odometers **Tape Recorders, Recordografs**

Broadway at 57th St., New York

Please mention Automotive Industries when writing to Advertisers

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How Much of Your Pay Do You Think You Can Keep if Germany Wins This War?

If, to help America win this war, you buy

Liberty Bonds

to the very limit of your ability you are not merely helping America. You are not merely making a good investment. You are not merely helping to bring peace nearer. You are doing all these things, and in addition you are buying the best protection for your own individual prosperity—yes, the *only* real protection you can buy.

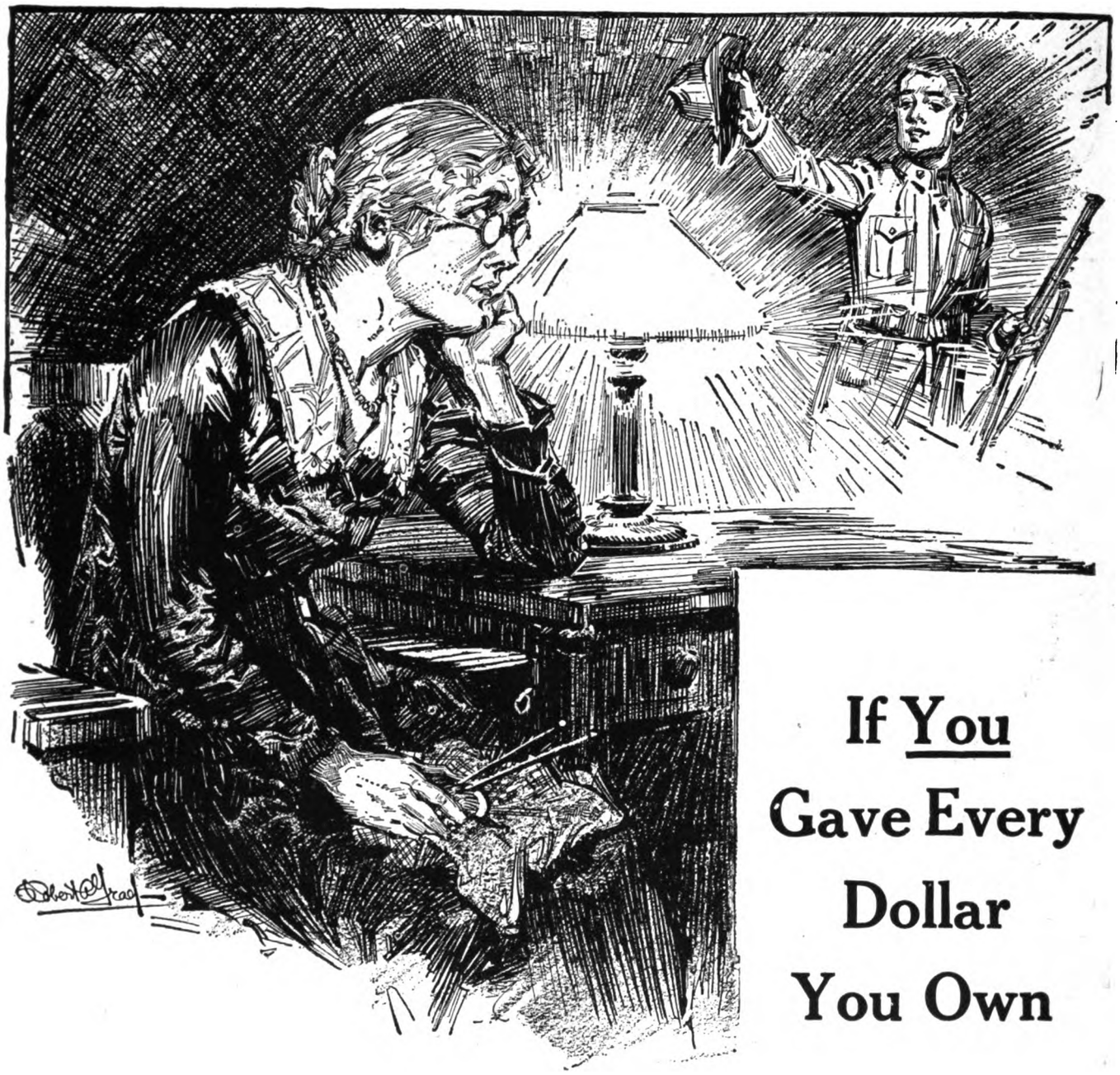


Universal Support of the Government is loyalty and patriotism and besides—if Uncle Sam is not victorious in this war there will be mighty little profit in business for U. S.—Autocracy is a close collector.

SHELDON AXLE & SPRING CO. *Makers of springs and axles for heavy duty service for more than fifty years.* **WILKES-BARRE, PA.**

Please mention Automotive Industries when writing to Advertisers

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If You Gave Every Dollar You Own

how little would the sacrifice be compared to theirs.

We are not asked to give. We are asked only to *lend*. To lend at good interest secured by the best collateral on earth

U. S. Liberty Bonds

We believe that Liberty Loans protect our homes.

G&O Radiators

Airplanes, Trucks, Tractors

G & O MANUFACTURING CO., NEW HAVEN, CONN.

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Worth Fighting For?

SHALL this little girl grow up in the sort of American home we know, healthy and happy? Shall she have the advantage of living and learning in a free land, under free institutions? Shall such children develop into Liberty-loving citizens that a free America may be proud of?

For over two hundred years Americans have fought valiantly, and died gallantly, to win for themselves and hand down to their posterity the blessings of liberty, justice, self-government and equal opportunity. This precious heritage, bought at so great a price, is now threatened.

The question which today confronts America as a nation, and you as an individual, is whether or not a free America is worth fighting for

Are American children in this and all future generations to receive unimpaired the legacy of freedom of which we are now the custodians, or shall their country be turned over bodily to the brutal, rapacious, power-mad enemy which has forced us into this war?

This question cannot be answered by word of mouth, but by deeds alone.

Let your answer be your investment in

Liberty Bonds!

In co-operation with the Liberty Loan Committee this advertisement is published by

Bound Brook Oil-less Bearing Company

Specialists in the manufacture of oil-less bushings for more than a third of a century

Bound Brook, N. J.

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YOU are asked to save every cent not needed for your reasonable support and physical well being—this is thrift



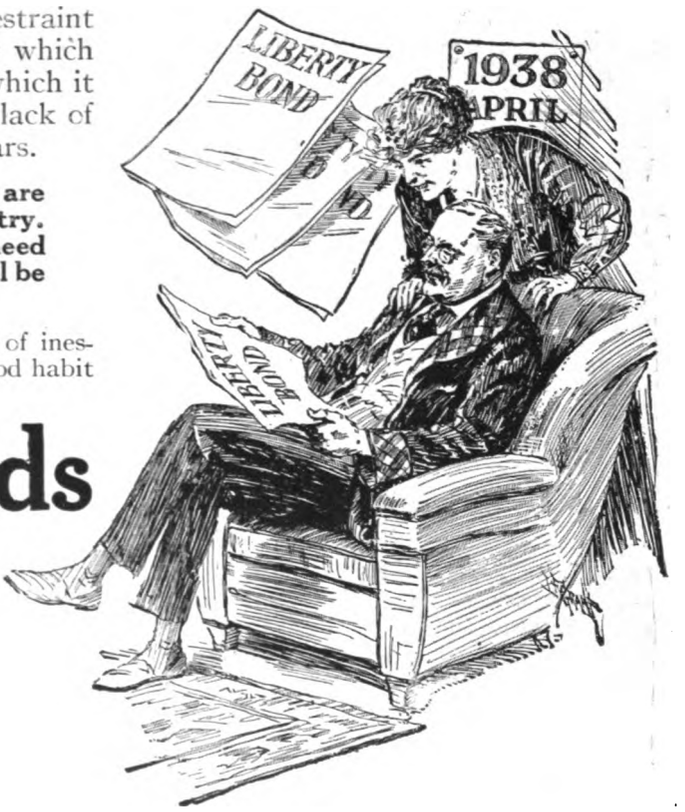
Bonds Are Not A Burden But A Blessing

THRIFT requires the exercise of restraint and self-denial—qualities without which you cannot achieve the success in life which it is your ambition to achieve, and for the lack of which you are likely to suffer in later years.

The money you acquire by thrift you are asked to loan—not give—to your country. It will come back to you when you may need it far more than you do now, and you will be paid interest for its use.

This war is a frightful thing, but it may prove of inestimable benefit to you, if it teaches you the good habit of thrift. Start the habit by investing in

Liberty Bonds



This page contributed to the Winning of the War by

SKF BALL BEARING CO.
Hartford, Conn.

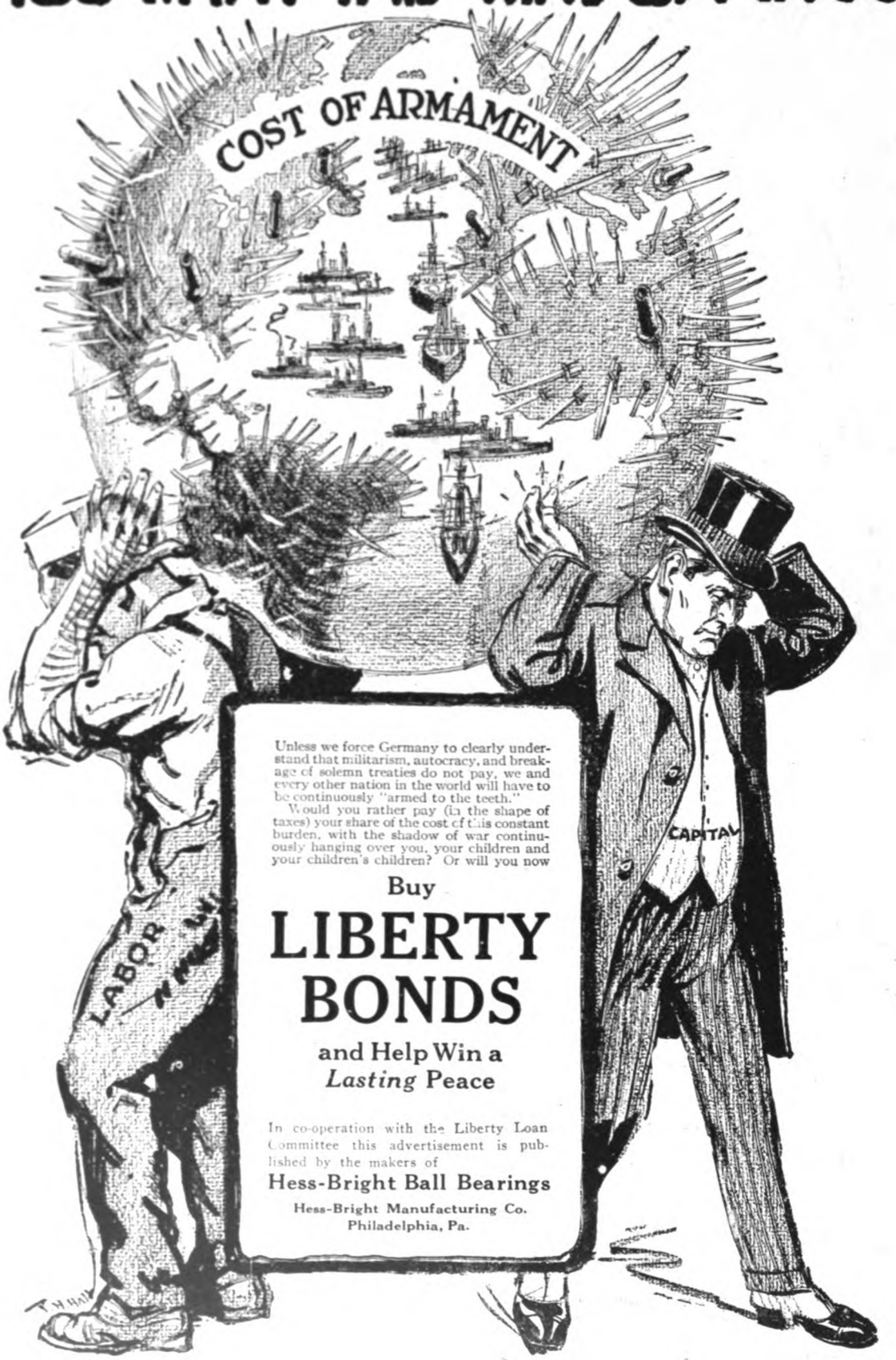
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DO YOU WANT THIS KIND OF PEACE?



Unless we force Germany to clearly understand that militarism, autocracy, and breakage of solemn treaties do not pay, we and every other nation in the world will have to be continuously "armed to the teeth."

Would you rather pay (in the shape of taxes) your share of the cost of this constant burden, with the shadow of war continuously hanging over you, your children and your children's children? Or will you now

Buy

LIBERTY BONDS

and Help Win a *Lasting* Peace

In co-operation with the Liberty Loan Committee this advertisement is published by the makers of

Hess-Bright Ball Bearings

Hess-Bright Manufacturing Co.
Philadelphia, Pa.

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Choose!

"Lend Me Your Money that I may equip my Army and Navy to insure for you and your children the blessings of Liberty."

"Give Me Your Money or Your Life"

Invest now to the limit of your ability in

U. S. Liberty Bonds

The Kaiser calls us "a nation of dollar chasers." Let us show him that we know how to use those dollars in the defense of Liberty and the overthrow of Prussianism.

JOHNSON COMPANY

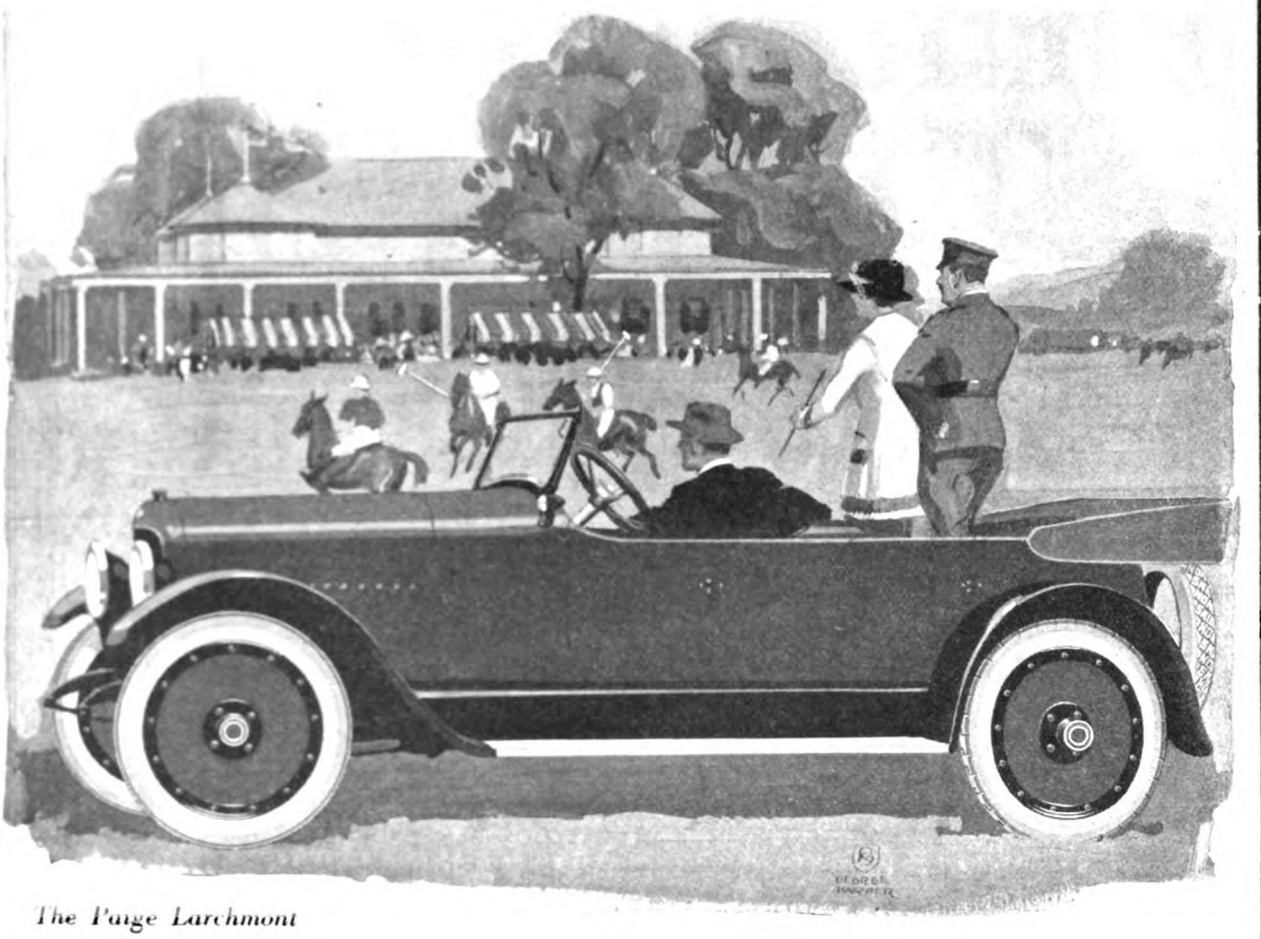
Makers of Superfine Instruments of Carburetion

DETROIT MICHIGAN

Please mention Automotive Industries when writing to Advertisers

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DISTEEL WHEELS



The Paige Larchmont

DISTEEL WHEELS

Disteel Wheel equipment makes easier the selling of medium and high-priced cars, because, Disteel Wheels not only bring out the beauty of the car, but very substantially improve the performance of the car and increase the safety, comfort and economy of motoring. With the advent of the Disteel, the wheel is no longer a primitive survival, but becomes one of the car's outstanding features of beauty and mechanical excellence. The Disteel Wheel is the wheel that completes the Car.

Dealers selling quality-cars to a discriminating trade will be interested in our proposition.

DETROIT PRESSED STEEL COMPANY

1800 Mt. Elliott Ave. Detroit, U.S.A.

DPS

Please mention Automotive Industries when writing to Advertisers

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The 1st of May Thrift Stamp Day In The U. S. A.

The Active Co-operation of Every Reader of AUTOMOTIVE INDUSTRIES Is Urgently Requested To Make It A Success

May 1st, 1918, will be observed throughout the United States as Thrift Stamp Day! On that day retail stores everywhere in every line of business will ask customers to take **part of their change in Thrift Stamps!** It will be patriotic for every man, woman and child to accept at least one Thrift Stamp as change on every purchase made that day—and to make as many purchases as possible on May 1st.

Here is a big, practical way of getting millions of Thrift Stamps into the hands of the people of the United States, and of insuring the success of the Government's War Savings Stamps campaign. Thrift Stamp Day will **help everyone.** It will prove a tremendous boost to business. On May 1st, 1918, the nation should do the biggest total retail business of any single day in our history! The beneficial habit of Thrift will be sown broadcast among the citizens of the U. S. A.! Most important of all, Uncle Sam will be furnished with the sinews of War and Victory!

American business must go "over the top" **at once** in a quick drive to make Thrift Stamp Day an overwhelming success. You wholesalers, you jobbers, you salesmen, must **talk** Thrift Stamp Day among your trade, arouse the **enthusiasm** of the retailers, the storekeepers, the clerks behind the counters. Uncle Sam **needs your help.** A practical **plan** has been prepared showing how each one of you can "do your bit" to make Thrift Stamp Day a red letter day in American business annals. **Write** for this plan **today without fail.** Remember, in helping Uncle Sam you are helping business and helping yourself. Address Mr. W. Ward Smith, National War Savings Committee, 51 Chambers St., New York City.

W.S.S. WAR SAVINGS STAMPS ISSUED BY THE UNITED STATES GOVERNMENT

NATIONAL WAR SAVINGS COMMITTEE

51 Chambers Street, New York City

THIS SPACE DONATED BY THE PUBLISHERS

W.S.S. WAR SAVINGS STAMPS ISSUED BY THE UNITED STATES GOVERNMENT

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There's money in the Maxwell Truck. Thousands of dealers will divide millions of profits this coming year—get some of it.

Here's a truck that pays its way from day to day and, besides, earns back its cost within a year. Its repair bills are a joke—gas consumption, 16 miles to every gallon—a tire niggard—so easy to run and keep in order that boys and women can drive it with ease—a truck with all essential features of the $5000 five-ton leaders: worm drive, electric lights and generator included, which you can retail at $1085—several hundred dollars less than any other truck of similar capacity.

10-foot loading space, 2500 pounds in weight, but built so cunningly, so honestly, so brilliantly that freight which would stagger a brewery team won't feaze it. A sound pair of horses is more expensive to buy and far dearer to board.

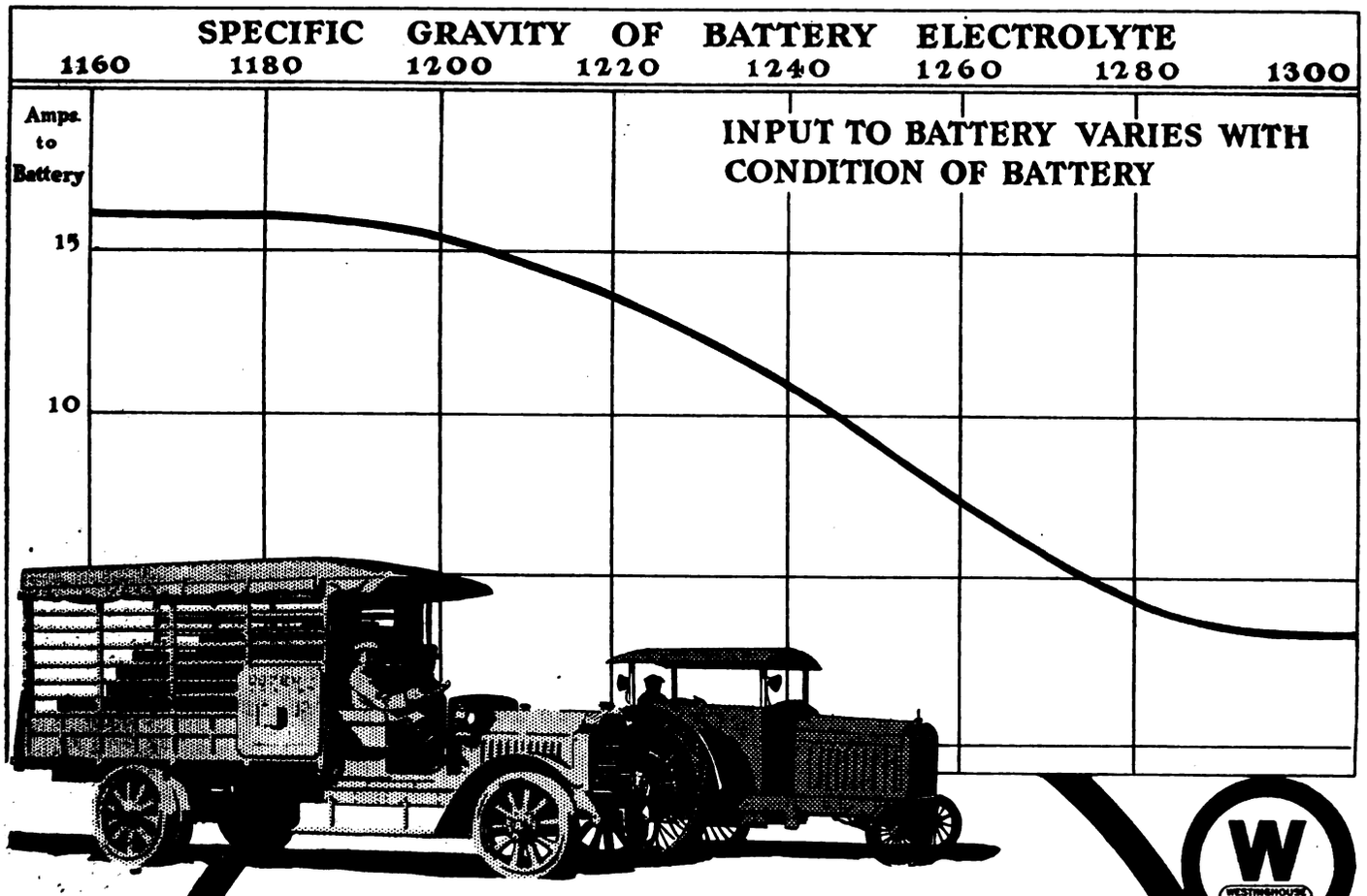
Goes wherever a delivery wagon can travel, and travels where heavier trucks won't follow. Can be sold wherever there's a sign in sight. Little business can't afford to be without it and big operators would rather have a fleet of Maxwells than costly five-tonners which can't serve half so many purposes.

Secure the Maxwell truck agency and get the bank balance habit.

MAXWELL MOTOR COMPANY, Inc., DETROIT, MICH.

Maxwell

Digitized by Google



For Truck and Tractor

The task of producing a generator that will vary the current to suit the battery charge is one that calls for the highest electrical engineering ability. First of all, the natural tendency of generator voltage to increase with generator speed has to be overcome, for this is the only protection against burned-out lights and ruined battery.

In the Westinghouse Regulator Generator this tendency is so well overcome that voltage is held practically constant. Lamps burn at full brilliancy without danger of sudden burnout, and charging current drops off smoothly with charge, as shown in the above curve.

There are many other features of Westinghouse Regulator Generators that will interest not only makers of trucks and tractors, but manufacturers of high-class passenger cars who realize the size of the job that lighting and charging put up to the generator.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
Automobile Equipment Department
Newark Works Newark, N. J.

NEW YORK CITY - 110 to 114 West 43rd St.
Cleveland, Ohio - - 2025 Euclid Ave.
Detroit, Mich. - - - Kresge Bldg.
Indianapolis, Ind., Merchants Nat'l Bank Bldg.

Westinghouse
STARTING, LIGHTING & IGNITION EQUIPMENT

Please mention Automotive Industries when writing to Advertisers

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KISSELKAR

The ALL-YEAR Car

BUY NOW—USE NOW

Gives full protection from spring rains and chilly winds. In summer it is quickly changed into an open roofless car. It looks like a permanently closed job—but the ALL-YEAR Top is built-in, not on, and entirely removable, **giving you two cars in one—and for the price of one.**

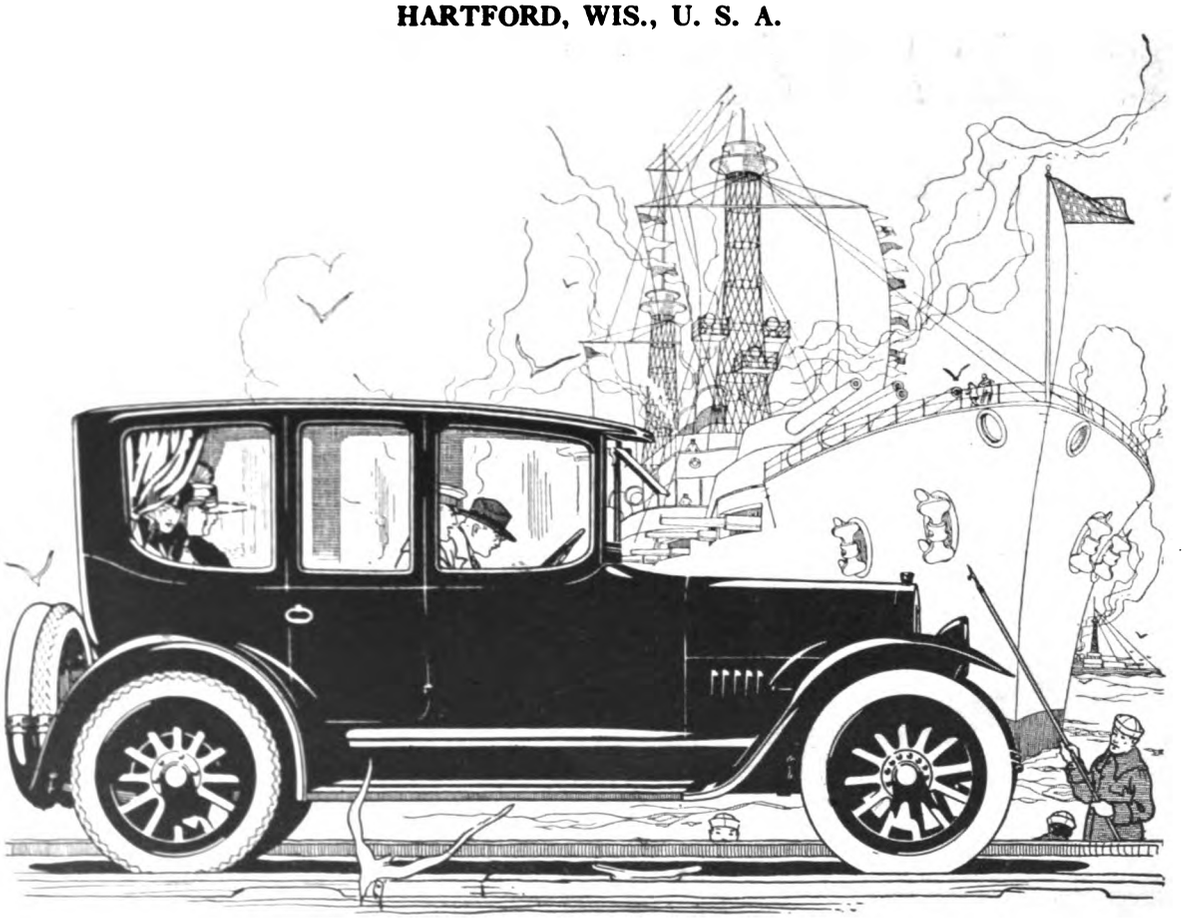
Hundred Point Six

The Kissel-built power-plant is of the high speed and high efficiency type. The chassis is mechanically perfect—the Kissel-built axles and brakes unusually dependable—its Hundred Quality Features proved out in over a year's service.

DEALERS—Splendid opportunities still open in good territory where demand for KisselKars insures a year-round profitable business. Write or wire us today.

KISSEL MOTOR CAR COMPANY

HARTFORD, WIS., U. S. A.



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STANDARD









A Dependable Source of Supply

A company is known by the customers it keeps.

The great majority of representative manufacturers of motor cars, motor trucks and other finished products of the automotive industries are our steady patrons.

All the resources of an extensive and efficient organization, including:
Large Manufacturing capacity
Well grounded engineering
Thorough laboratory work
Ample capital and
The economies of large buying power
Advantages of expert traffic management

Standard Parts For Motor Cars,

The Famous

Axles
Axles (dead rear)
Axles, trailer
Bock Bearings
Hubs
Perfection Springs
(regular and thin leaf)
Perfection Heaters

Rims—clincher, detachable and demountable for single and dual equipment
Clincher Rims
Detachable Rims for Wire Wheels, special
Millimeter Rims, all types
Rim Tools
Flanges and Fittings Solid Tire Demountable Equipment
Tire Bases in Demountable and Pressed on Channels

We also manufacture parts for Airplanes, Tractors, Motorcycles,

The Standard Parts Company,

Digitized by Google



for the Automotive Industries

Pleasant sales relations, and Both length and breadth of experience, are placed at their disposal.

Standard Parts products have contributed to the growth of many manufacturing enterprises. Similarly, these have contributed to the growth of the Standard Parts Company.

The same resources, the same efficiency and service are offered to all alike.

Our vast operations and the strategic location of our numerous factories merit the producer's confidence in our institution as a dependable, economical, efficient source of supply.

Trucks and Other Vehicles

Stanweld Products Including:

Brake Rod Assemblies, complete
Starting Cranks
Electric Welding of Parts
Exhaust Tubes
Forgings for Convertible Trucks
Bands S. A. E.
Formed Tubing
Ignition Wiring Tubes
Lamp Brackets
Mast Sleeves
Oil Tubes
Radiator Rods
Starting Gear Rings and Boxes
Straight Steel Tubing
Steering Gear Tubing
Tail Pipes
Torsion Tubes
Truss Rods
Tubing,
(straight and formed)

Bicycles, Fire Arms, Carriages, Wagons and other vehicles

Executive Offices, Cleveland, Ohio

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Cars That Run Well Are Half Sold

That is a reason why Maxwell sales have accelerated from 2,000 a year in 1912-13 to 100,000 for 1918.

And they have been so good that each year Maxwell dealers have laid by fortunes for rainy days.

Note these profits:

Maxwell dealers	MADE	*in 1913-1914 over*	$2,500,000
Maxwell dealers	MADE	*in 1914-1915 over*	$4,700,000
Maxwell dealers	MADE	*in 1915-1916 over*	$8,000,000
Maxwell dealers	MADE	*in 1916-1917 over*	$12,000,000

(In the last six months Maxwell dealers have made a proverbial killing on the Maxwell Truck.)

How much have you made?

Now is the getting-aboard time on Chalmers, for those Maxwell men and their plan which have put over Maxwell so big, are now running the Chalmers business. In two short months Chalmers sales have felt the leverage for they have spurted forward at a 200 per cent clip.

Better look into the Chalmers line before your business neighbor gets it.

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Inherent Speed and Power

Duesenberg

The Power of the Hour

Airplane Automobile Marine Engines

THE Duesenberg Factory, the Duesenberg Equipment and the Duesenberg Organization were peculiarly fitted to take over a certain highly specialized and important work for the United States Government.

This being the case, the entire resources of the Duesenberg Organization were concentrated on the prompt and efficient completion of this contract.

All commercial models of the Duesenberg Engine have been withdrawn from the market.

We Will Be At Your Service After The War Is Won

DUESENBERG MOTORS CORPORATION, 120 BROADWAY, NEW YORK CITY

Contractors to the United States Government

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THIS BLACKBOARD Lesson tells the story of Dohner Coupling production economy. More manufacturers and engineers are learning the lesson of Dohner economy every day, and through its use are enabled to cut down production costs. There is no getting away from the fact that the Dohner High Compression Coupling affords lower production cost, any more than there is any getting away from the fact that the Dohner coupling is the ONLY Leak Proof Coupling. Such facts as this are coming to our attention repeatedly:

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One Motor Car Company Has Cut $50,000 Annually Off Production Cost by Adopting Dohner High Compression Couplings

The Dohner Coupling is lighter. And it uses only about one-half the amount of brass used by the flared coupling, and costs about one-half as much. It has no washers. It requires no "flaring" and assembly work. A quick twist with a wrench or pliers only is required to tighten the coupling nut. Is it any wonder that the Dohner Coupling is saving one firm $50,000 a year and is saving far larger amounts for other companies?

IN FOUR YEARS, WITH 30,000,000 DOHNER COUPLINGS IN USE, NOT ONE REPORT OF LEAKAGE.

This remarkable fact is due to the Dohner design, which is according to correct, scientific principles. It consists of the main body of the coupling (brass) and the tapered nut (steel), and the tapered thimble (brass). The tubing slips through the main body of the nut and thimble into the body of the coupling up to the shoulder. The rings in the thimble "bite" into the tubing by compression, producing a practically welded joint.

The theory of the old fashioned flared coupling is wrong. It goes against scientific fact. The flaring operation stretches the tube and weakens it at the point where it must bear constant strain from vibration.

That's why 65% of flared couplings leak from the beginning and 80% eventually.

The Dohner Coupling is the only really effective coupling. Well engineered, efficiently produced motors, such as Maxwell and Buick, use Dohner Couplings exclusively. The Baldwin Locomotive Works is famous for careful engineering—after exhaustive tests it adopted the Dohner Coupling for its locomotives.

Dohner Couplings are particularly well adapted for aircraft because of their light weight, stability, quick reconnectability and efficiency. We will gladly supply further information on request. Note: The Dohner line is complete, including Unions, Ells, Tees, etc. Patented June 13, 1916.

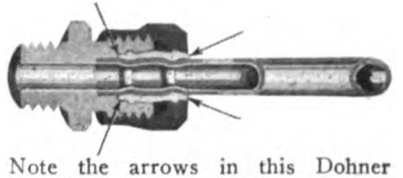
THE OHIO METAL PRODUCTS COMPANY

Sales Office:
616 Free Press Bldg., DETROIT, MICH.

Factory:
DAYTON, O.



Note the arrow,—it points to a common cause of leakage in the flared coupling. 80% of *all* flared couplings eventually leak. In the flared coupling pictured, the flare is not a perfect fit. It leaves room for the escape of fluids. Note the amount of useless material in the flared coupling.



Note the arrows in this Dohner Coupling. They point to where the rings of the thimble are pressed into the tubing. Every Dohner Coupling is air-tight. In Baldwin locomotives they are used for the passage of live steam. Dohner Couplings will withstand far more pressure than any other kind. Note comparatively small amount of material.



The Dohner Coupling consists of the main body of the coupling, the tapered nut and the tapered thimble.

The rings are important. They "bite" into the tubing. Without the rings, the coupling would not be effective.

DOHNER

HIGH COMPRESSION COUPLINGS

Please mention Automotive Industries when writing to Advertisers

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SRB Annular Ball Bearings (Single and Double Row)

SRB Improved Type Taper Roller Bearings

Standford SRB Taper Roller Bearings (Special for Fords)

STANDARD ALLOY STEEL BALLS

Rudge-Whitworth Wire Wheels

Factory resources and service go hand in hand with STANDARD ROLLER BEARING PRODUCTS

Sales Offices:

DETROIT	936 Woodward Avenue
CHICAGO	2206 S. Michigan Avenue
INDIANAPOLIS	822 Hume-Mansur Building
BOSTON	163 Massachusetts Avenue
CLEVELAND	2062 Euclid Avenue
SAN FRANCISCO	41 Spear Street

STANDARD ROLLER BEARING CO.

Philadelphia, U.S.A.

Are Your Needs *Similar?*

FIFTEEN Manufacturers have indicated to our CONTRACT WORK DEPARTMENT that they could use to advantage information as to where they could place the following lines of surplus manufacturing work:

Castings (steel, brass, bronze or aluminum)
Dies
Tool
Metal Stampings
Punch Press Work
Screw Machine Work
Machine Parts
Gear Cutting
Grinding
Cam Cutting
Bar and Clutch Work
Forgings
Drop Forgings
Lathe and Milling Machine Work
Patterns (wood & metal)
Plating
Automobile Stampings
and other lines.

In this connection you can consult with profit our ***Contract Work Department***, page 111 in this week's issue.

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JOHNSON CARBURETOR

Will Give the Highest Economy with Good Performance or Best Performance with Good Economy. No Carburetor Can Do More.

JOHNSON COMPANY

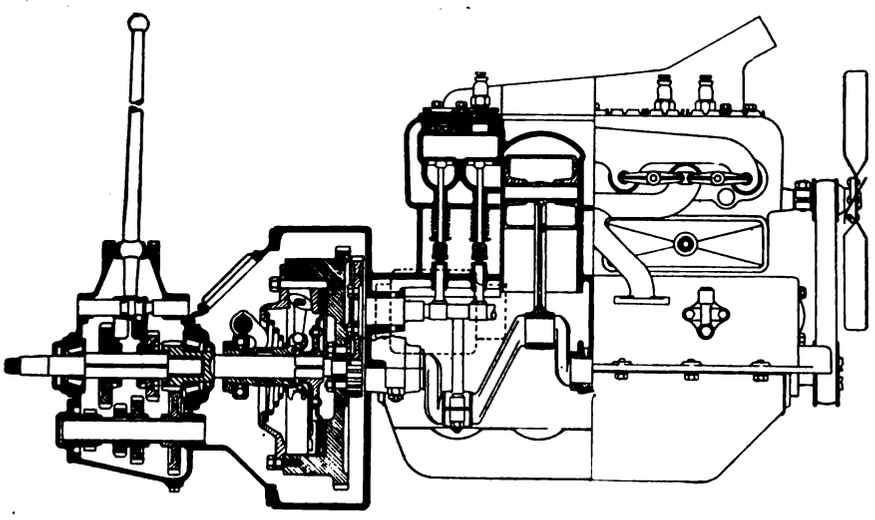
Makers of Superfine Instruments of Carburetion

DETROIT MICHIGAN

BUSINESS SOLICITED FROM MANUFACTURERS ONLY



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Motordom's Latest —the A. B. R. Unit Power Plant

A new but highly efficient power plant that is bound to become one of the most popular in the motor truck industry. Read over a part of the startling specifications:

30 H. P. (4 cylinders cast en bloc)

3¾ bore x 4" stroke

3 speeds forward—1 reverse

Non-adjustable Disc Clutch (own make)

Wright tapered Roller Bearings

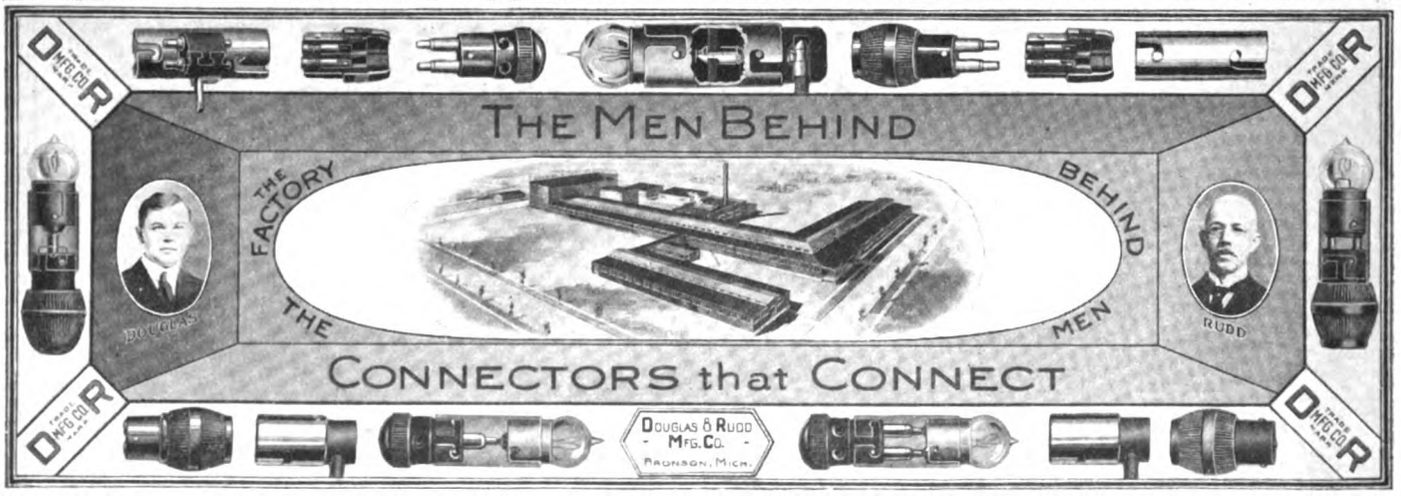
Splash and Pump Lubrication System

The complete A. B. R. Unit Power Plant includes spark plugs, wiring, generator and carburetor. Capacity production for 1918 20,000 units. Write today for complete specifications and literature.

A. B. R. Motor & Engineering Co.
Stamford, Connecticut

DOUGLAS & RUDD MFG. CO.

TRADE D MFG. CO. R MARK — Be Sure This Mark Is On Your Connections — TRADE D MFG. CO. R MARK



Over 500,000 PIECES Assembled Daily

WHICH INSURES *The Right Goods at the Right Price at the Right Time*

Used on Over 70% OF ALL AUTOS MANUFACTURED

BRONSON — Connectors That Connect — MICHIGAN

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ZAPON

DURABILITY

(the principal demand of service)

ZAPON LEATHER CLOTH has established its durability by continuous service—nearly 30 years.

A statement based on actual experience proves a fact.

Our customers' continued loyalty is the evidence.

ZAPON LEATHER CLOTH COMPANY

New York Detroit

SHIMS



On the firing line. Bearing adjustments must be made quickly and accurately. No time to file solid shims or fuss with loose-leaves. Army engineers depend upon LAMINUM. Read this from our British representative:

"All material (Laminated Shims) you have sent ... has been taken over by British Government Mechanical Transport Dept.

LAMINUM saves time and gives best results. Just peel off layers to required thickness. Repairmen, manufacturers, dealers and Government authorities prefer Laminated to old-fashioned shims. Let us send *you* a sample.

LAMINATED SHIM COMPANY, 533 Canal St., New York

ENGLAND: R. A. Rothernel, 6 Great Marlboro' St., London, W.

DETROIT: Dime Bank Bldg. ST. LOUIS: Mazura Mfg. Co.

LAMINUM

The MATERIAL for SHIMS

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Compare the End Thrust Capacity of the Schatz

"Universal" Annular Ball Bearing

with that of any other and you will find that the definitely located Three Area Contact of the "Universal" gives more than Three-Fold Capacity.

Internationally Standardized



Send for Catalog and Data Sheets

The Federal Bearings Co., Inc.
26 William Street Poughkeepsie, N. Y.
Gt. Britain: 37 Sheen Road, Richmond, London

Wartime Ignition

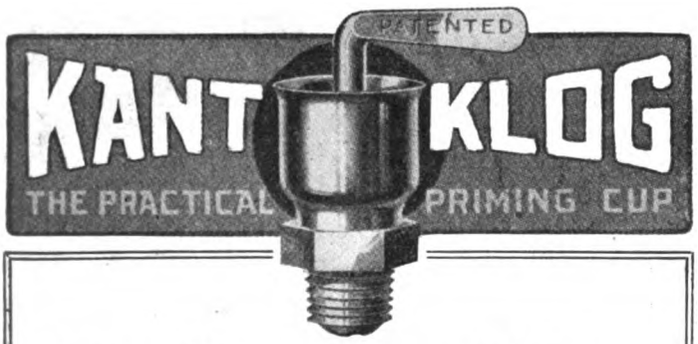


Depending upon no other factor than its reliable self, the Bosch Magneto should be the ignition system selected for the great work of today.

Costing a trifle more, perhaps, it is well worth it since ultimate results mean so much more than first cost.

BOSCH MAGNETO COMPANY
Main Offices: 220 West 46th St., New York
Branches: Chicago, Detroit, San Francisco
Works and Foundries: Springfield, Mass.

MORE THAN 3,000,000 BOSCH MAGNETOS IN USE



The Kant-Klog Primer

is rapidly being adopted as standard equipment by automobile builders because—

it is an innovation of efficiency and low cost—

it solves the problem of cold weather starting to the entire satisfaction of the user and can't clog with carbon because of its very construction.

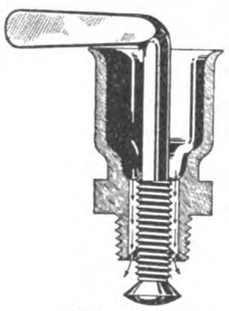
The simplicity of the Kant-Klog Primer is seen in the sectional view. No part of the valve is exposed. There is plenty of clearance for the free flow of gasoline direct without waste when priming. There is no chance of carbon getting past and collecting on the seat. There is no need of removal even after months of non-use.

The more Kant-Klog is used the better its seating action.

Quotations on variations of our standard design to suit different type motors—promptly furnished.

Kant-Klog prices are surprisingly low.

Write today for particulars and free sample.



Note the Simple Construction

The Taylor Machine Company
Cleveland, Ohio

"UNITED"

Chrome Vanadium Spring Steel

Springs made from our Type "D" steel for endurance, life and resistance to fatigue are recognized as being equal, if not superior, to any steel on the market.

In properly treated Chrome Vanadium Spring Steel the elastic limit is 20 to 30% greater than in the standard steels used in springs.

United Alloy Steel Corporation
Canton
Ohio

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PARK INTEGRALLY

COUNTER BALANCED CRANK SHAFTS

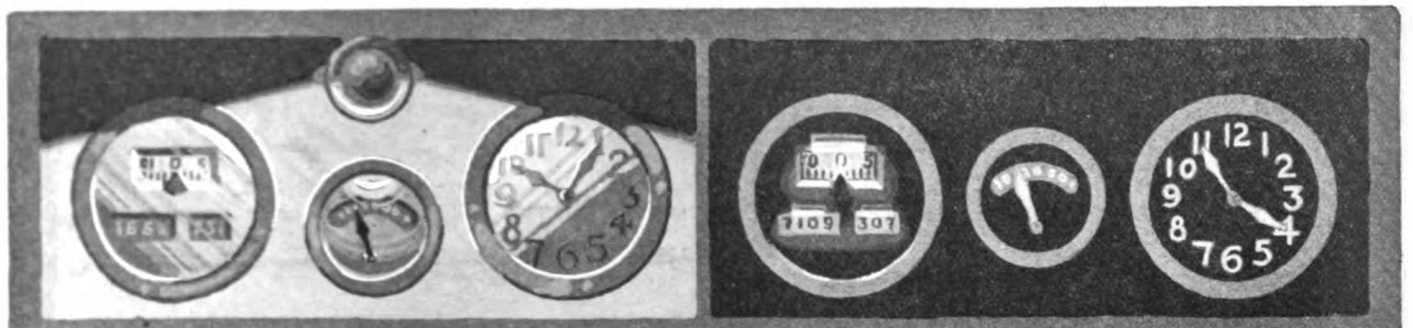
Patented July 10th, 1917



Quick Get-a-way
Higher R. P. M.
Reduced vibration
Smoother running motor
Eliminated bearing troubles

We have shipped 61,553 Counterbalanced Crankshafts to March 23rd, 1918

The Park Drop Forge Co.
Cleveland



THE DIAL'S GLARE? —or— THE INDICATOR'S MESSAGE?

When you try to read the indicators under a dash light, the dial throws off a reflected glare that is annoying and confusing.

When you use SELF LUMINOUS figures and indicators, the message stands out clear and distinct. No glare—for THERE'S NO LIGHT ON THE DIAL.

THIS IS WHAT THE 1918 CAR BUYER WILL LOOK FOR

RLM

No Wiring, Switches, Lamps

Ponder over this SALES FEATURE: a car whose instruments are lighted with never a thought from the driver, never a switch to turn, never a lighting circuit to care for, never a glare to annoy! It's going to be asked for on new cars, and demanded on replacements.

Guaranteed for Ten Years

Insist that the cars YOU sell be equipped with this unrivalled sales help. We have some literature that you will find very interesting and informative. Ask us for it, and for any special information you may desire to have. Write today, Dept. 3

Radium Luminous Material has proven its wonderful utility on thousands of Ingersoll Radiolite Watches and other dial instruments. It is permanently self-luminous, for the compound derives its vibration from the radium content. It will glow for years.

RADIUM LUMINOUS MATERIAL CORPOR'ON
Mines: Colorado—Utah

SEES AT NIGHT

FIFTY-FIVE LIBERTY ST.
NEW YORK CITY
Plants: Orange, N. J.
Boonton, N. J.
Elizabeth, N. J.

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TRADE DRIDEK MARK REG.

The Most Remarkable Top Material Yet Produced

DRIDEK with its leather finish will not chafe, crack or blister—and holds its color right through to the cloth lining.

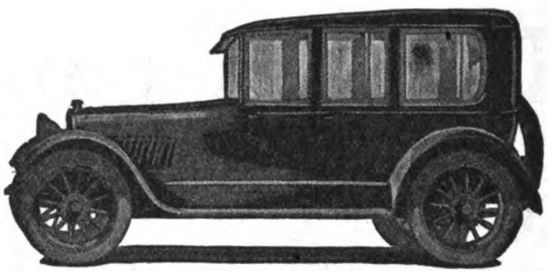
A DRIDEK Top is a credit to any car.

Special DRIDEK colors:

Battleship Gray
Maroon
Olive Green
Tans, Brown
Olive Drab Khaki

Send for samples and prices—today

L. J. MUTTY CO.
BOSTON, MASS.



Save Money Without Sacrificing Appearance

In this time of nation-wide economy, are you finding ways of cutting costs—and **still** retain **quality?** One item of saving—and it's no inconsiderable part of motor equipment either—is

GLASS

We have a highly acceptable substitute for Polished Plate, useful for closed cars, windshields, clock faces and oil gauges.

Write us your requirements, and let us tell you why this glass will serve your needs so well, why it costs less—and all about it.

AMERICAN WINDOW GLASS CO.
World's Largest Producer
General Offices, Farmers' Bank Building
Pittsburgh, Pa., U. S. A.

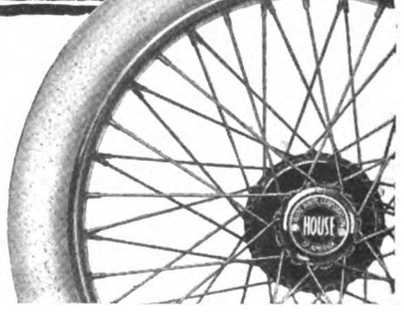


DEALERS!

Wire Wheels are *sellers!* Get particulars of wire wheel service and sales agent's propositions.

Ford distributors and accessory dealers should write for special service and sales proposition for HOUSE type Wire Wheels for *Ford* cars.

Wire Wheel Corporation *of* America
(Successors to Houk Mfg. Co.)
835 Eleventh Ave., at 57th St., New York



HOUSE TYPE for Fords

List price for set of 5 wire wheels, 4 inner hubs, 4 hub caps, hub cap wrench, spoke nipple wrench, 1 hub dust cover for spare wheel, $60. White, black, red. Color optional.

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Wanted—Men

One of the largest and most substantial truck manufacturers in the country, located in the Middle West, is combing the field for two men to fill very important positions in its Sales Department. They are

Assistant to the Sales and Advertising Manager-and-Sales Engineer

The men who will be chosen must be of good personality and high calibre.

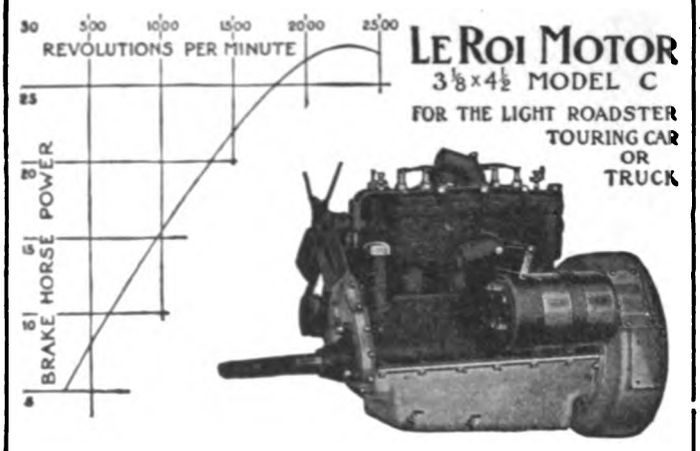
The former will have supervision over the advertising department and assist in sales correspondence. His duties will be many and varied.

The latter must be a transportation engineer—keen on construction and able to figure on the dollar and cents value basis. He, too, will have many duties thrust upon him.

Compensation will be liberal in each case. The future is measured only by each man's own ability.

The opportunity to associate yourself with a company of the highest standing in a capacity with an unlimited future, is an unusual one.

Your first letter must contain all information, including record, references and photograph. Don't forget to indicate which position you are interested in. Box S-M-T, care Automotive Industries, New York, N. Y.



Used by leading manufacturers of best-known American-made light trucks.

The business of manufacturing Le Roi Engines, formerly conducted by Milwaukee Machine Tool Co., is now carried on by

LE ROI COMPANY

Mitchell St. and 60th Ave.
MILWAUKEE, WIS.

Write for Complete Information

CABLE LE ROI MILWAUKEE



TANKS

Weapons of terrible destructiveness on the battle field.

Equally destructive of grease and oils in your cleaning department when filled with

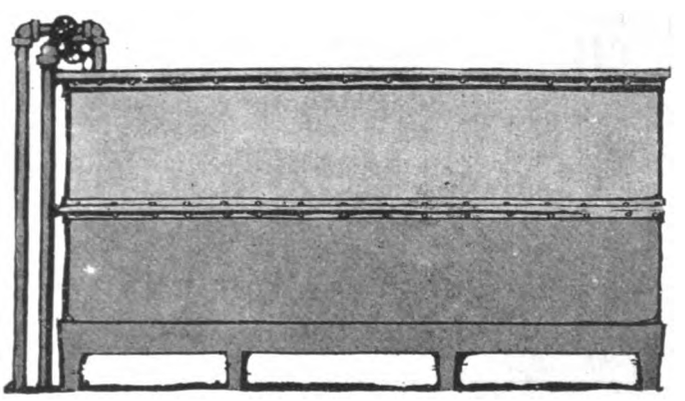
OAKITE

None of the oily, greasy substances encountered in the cleaning tanks can withstand the action of OAKITE. It removes them all—surely, quickly and economically.

Make your tanks plough right through work as they have never done before. OAKITE is the only ammunition you need.

Results with OAKITE are guaranteed. Ask us about it. Write to-day!

OAKLEY CHEMICAL CO.
28 Thames St. New York



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Steel for Service

A gear breakdown always means a new gear secured from the storeroom or from the manufacturer, and a loss of time while the machine is idle.

Many manufacturers are using gears made from

Carnegie Rolled Steel Blanks

because severe industrial use has proven that they wear three to seven times as long as cast steel gears. If properly heat treated they never break.

Protect your gears against breakdowns.

Carnegie Steel Company
General Offices, Pittsburgh, Pa.
1023

LIGHT AND HEAVY METAL
STAMPING



WORCESTER PRESSED STEEL COMPANY
WORCESTER MASS.

Kales Stampings

Sheet Metal Stampings
of all kinds
Washers, Shims, Hind View Auto Mirrors
Our complete plant, superior equipment and efficient organization means quick and satisfactory service. Send us your blueprints.

Kales Stamping Company, 441 Lafayette Blvd., Detroit.

Headquarters for the best
Enclosed Bodies,
Metal Stampings,
Pressings,
for the
Automobile
Industry

HALE AND KILBURN CORPORATION

Army,
Navy and
Aviation Metal
Parts Quickly
Produced in Large
Quantities.

Inquiries to nearest office
Philadelphia New York Detroit
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GREY IRON **CASTINGS** SEMI-STEEL

Quantity production and immediate delivery of castings for cylinders, gas engine parts and kindred work up to one ton in weight.

The most exacting physical and chemical requirements are complied with and constant inspection and tests of raw material, work in progress and finished product insure a minimum of defective castings and a saving of machine shop losses.

Daily Capacity 200 Tons

Campbell, Wyant & Cannon Foundry Co.
Muskegon Michigan

Union Drawn Steel Co

Beaver Falls, Pa.

Manufacturers of
BRIGHT FINISHED STEEL SHAFTING, SCREW STEEL, CHROME NICKEL and CHROME VANADIUM STEELS in FLATS, SQUARES, ROUNDS, HEXAGONS and SHAPES; also ELEVATOR GUIDES.

BRANCH OFFICES: Boston, Buffalo
BRANCH OFFICES AND WAREHOUSES: Chicago, Cincinnati, Detroit, New York and Philadelphia

GET IN TOUCH WITH

THE CROSBY COMPANY
BUFFALO, N. Y.

For Sheet Metal Stamping
of Auto Parts

A Complete Plant with Superior Equipment

Contract Work Department

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You will save time and money by consulting this Department.

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Cored Bars

HIGH SPEED NON-GRAN BEARING BRONZE

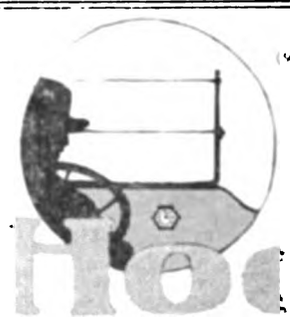
For Bushings

AMERICAN BRONZE CORPORATION
BERWYN, PENNSYLVANIA
Sole Manufacturers of Non-Gran and Largest Exclusive Manufacturers of Bearing Bronze in the World

Electric Auto-Lite
Starting—Lighting—Ignition

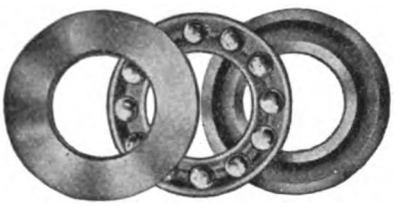
Electric Auto-Lite equipment for automobiles is as famous for the service that backs it as for the reliability and economy of its operation.

ELECTRIC AUTO-LITE CORP.
Home Office and Factory: Toledo, Ohio
New York Detroit Kansas City San Francisco



30,000,000 A YEAR
(95% of all automotive vehicles carry them)
Every tick of the clock means

Steel Balls made
HOOVER STEEL BALL COMPANY
Ann Arbor, Mich., U. S. A.



BALL THRUST BEARINGS
RETAINERS FOR CUP AND CONE, THRUST AND MAGNETO TYPE BALL BEARINGS.

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THE BEARINGS COMPANY OF AMERICA LANCASTER, PA.

EISEMANN MAGNETO
THE EISEMANN MAGNETO CO.
Sales & General Offices: 32 Thirty-third St., Brooklyn, N. Y.
Chicago, Ill. 910 So. Michigan Ave.
Detroit, Mich. 802 Woodward Ave.



Powerful
Durable
Dependable

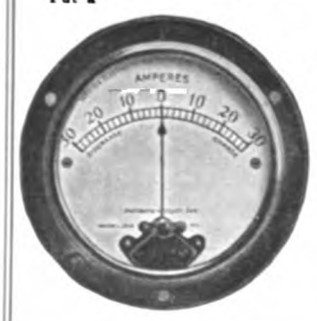
Standard Equipment for 117 Manufacturers

Under Nearly Every Hood
ECLIPSE-BENDIX DRIVE
Transmits Starting Power on 153 Makes of Automobiles

ECLIPSE MACHINE CO.
ELMIRA, N. Y.

No Lights! No Spark! Now What?

What if your electrical equipment should fail you on a black night, suddenly, without warning, on a bad part of the road? Don't let it happen! Put a



Weston
MODEL 354 AMMETER
On Your Dashboard or Cowl

It is the reliable means of determining the proper rate of charge or discharge of your battery for various speeds. It enables you to determine that the generator is working and that the storage battery is receiving its proper charge. *Write us!*

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23 *Branch Offices in the Larger Cities*

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OIL PANS
GEAR COVERS
GAS TANKS
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There is at your disposal a modern well-equipped plant of more than 15 acres of floor space. It will pay you to send your blue prints for estimates.

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G.P.&F. SERVICE
"KNOWING HOW SINCE '81"

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TRADE MARK
REGISTERED
Electric Starting and Lighting Systems
SINGLE UNIT and TWO UNIT Equipments
Booklet on Special Ford Equipment
DYNETO ELECTRIC CO., Syracuse, N. Y

KIMBALL TIRES
Are Doubling Profits for Some Dealers
Write for Our Interesting Offer
These tires are sold without a guarantee. Write and ask us how we do it. They are positively not seconds, but first-class fresh casings.

	Non-skid	Tubes		Non-skid	Tubes
30x3	$ 8.25	$1.90	32x4	$16.45	$3.10
30x3½	10.35	2.15	33x4	17.55	3.10
32x3½	12.45	2.85	34x4	18.25	3.20

Prices on Other Sizes in Proportion
Send us your order today, accompanied by cashier's draft on Chicago or New York, or money order. Large and small orders given immediate attention. Write today for territory. Prices will be advanced very shortly. Place your order now.
W. W. Kimball TIRE & RUBBER CO.
1469 Michigan Ave., Chicago
This "Straight Side" Type is Made Also in Clincher Type

"THE MASTER MOTOR"
There are BEAVER motors in a variety of sizes, suitable for TRUCKS, TRACTORS and PLEASURE CARS. Several new sizes for 1918 have been brought out and tested this summer. It will be worth your while to write us for full information on our line.
Model M. L. C.
4-Cylinder—4-Cycle
BEAVER MFG. CO.
Milwaukee Wisconsin

LYCOMING MOTORS
Nothing in the World like it -for Power-
Lycoming Foundry & Machine Co.
Williamsport, Pa.

America's Standard
CONTINENTAL MOTORS
Powering the Leaders of the Nation
AMERICA'S STANDARD
Continental Motors
Detroit Michigan

Sexton's
CASTOR MOTOR OIL
Keeps your motor young with a perfect film of oil around *all* working parts.
Greater viscosity—perfect heat resistance—two to three times more mileage—
At your dealer's
Send for Booklet A-108
SEXTON OIL CO., North Chicago, Ill.

For Trucks and Tractors
Waukesha
TRADE MARK
4-CYLINDER MOTORS
The Motors of Distinctive Character
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BEST PERFORMANCE
Miller Carburetor performance has proven its worth in every field. Greater simplicity and dependability—increased engine efficiency and economy—instant response to control—ability to use cheaper fuels of lower gravity than gasoline—all of these desirable features are to be found only in the
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SPRINGS IN STOCK FOR ALL CARS
90,000 Springs. 588 Types.
6—FACTORY BRANCHES—6
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THE Mercer shield is the badge of fastidious taste in automobiles. Mercer means the utmost in substantial smartness, riding comfort, and power. The possessor of a Mercer invariably feels a bit better satisfied than the owner of another car. Correspondence from dealers invited.

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STOP!
DETOUR to RIGHT

This sign can be seen perfectly with an E & J Spotlight No. 94, and the dangerous ditch that will upset you can also be avoided.

The E & J Spotlight has been approved by more drivers than any or all of the others

See your source of supply or write the

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437 Lawton Ave., Detroit, Mich.

Firestone

THIS name on any tire insures greatest satisfaction. The exactness of construction and the quality of materials have made Firestone the biggest word in tire building.

FIRESTONE TIRE & RUBBER COMPANY
Akron, Ohio Branches and Dealers Everywhere

TRADE MARK REGISTERED IN UNITED STATES PATENT OFFICE
NON-FLUID OIL

JUST the finest Pennsylvania oil brought to the scientifically correct density for bearings and gears by our special process.

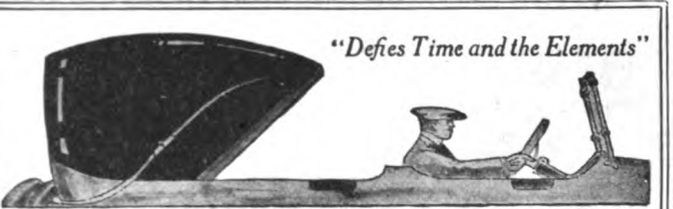
Contains none of the non-lubricating "fillers" which cause common grease to waste power and permit wear.

NON-FLUID OIL positively checks wear throughout the car and lessens repair and gasoline bills.

Try "K60 special" grade for gears, "K000" for bearings. At most dealers in orange-colored cans.

New York & New Jersey Lubricant Co.
165 Broadway, New York

"Defies Time and the Elements"



CHASE DREDNAUT Motor Topping

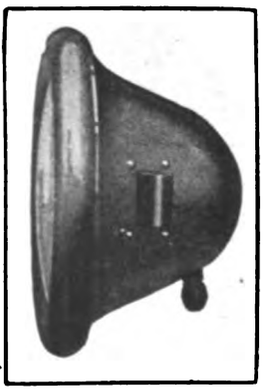
More "Chase" material is used on vehicles today than any other brand.

L. C. CHASE & CO., BOSTON
NEW YORK DETROIT CHICAGO
Leaders in Manufacturing Since 1847

Use Headlights That Identify Your Car

Distinctive types of electric headlights for all cars. Lights that identify your car. Built by the largest manufacturer of automobile lamps.

The John W. Brown Mfg. Co.
Columbus, Ohio
Detroit Office: Suite 411, Union Trust Building.





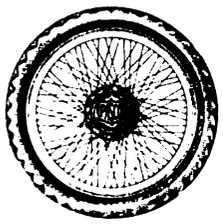
ZENITH CARBURETOR

KNOWN the world over as the *zenith* of carburetor efficiency. A long list of American builders of cars, trucks and aeroplanes believe this simple, plain tube device to be the best insurance for permanent carburetor satisfaction.

Zenith Carburetor Co.
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Pasco Wire Wheels



have three exclusive patented features which give a stronger web, a more dependable Hub Cap, and a greater factor of safety.

Pasco stands for strength, safety, economy and beauty.

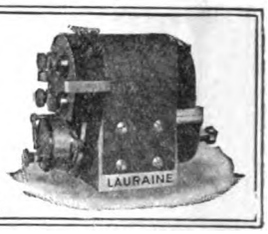
Dealers write for proposition

National Wire Wheel Works, Inc.
Geneva, N. Y., U. S. A.

THE MANSFIELD SHEET & TIN PLATE CO.

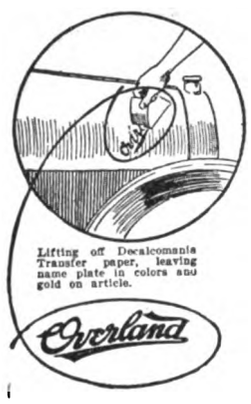
Manufacturers of
AUTO BODY AND FENDER STOCK
Mansfield Ohio

- Precision -
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MADE IN U. S. A.
- Quality -
1765 Broadway, New York



MEYERCORD

Decalcomania Transfer Name Plates

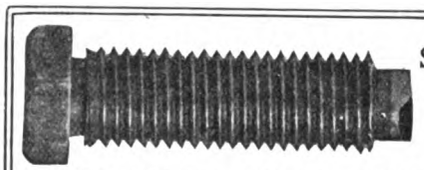


—will not tarnish, blacken, loosen, rattle or fall off. Unaffected by time, wear, tear, oil, water or grease. Simple to apply, decorative and permanent.
In use by leading automobile and accessory manufacturers, in place of brass name plates.
It will pay you to write today for full particulars. Let us show you how to solve *your* name plate problem at a decided profit to yourself. Send for the information now. There's no cost.

We make agency signs for manufacturers too

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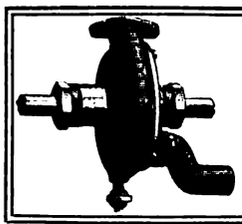
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SCREWS and RIVETS

Securely welded Iridio-Platinum heads. Standard sizes carried in stock. Other styles to order—any specifications, any degree of hardness.
Write us for prices and full information.

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Water circulating pumps for Gasoline Engines
Automobiles—Tractors—Trucks!
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THE FULFLO PUMP CO. Blanchester, O.

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Rear Axle Housings—Drop Forgings
Heavy Stampings
A. O. SMITH CORPORATION
MILWAUKEE

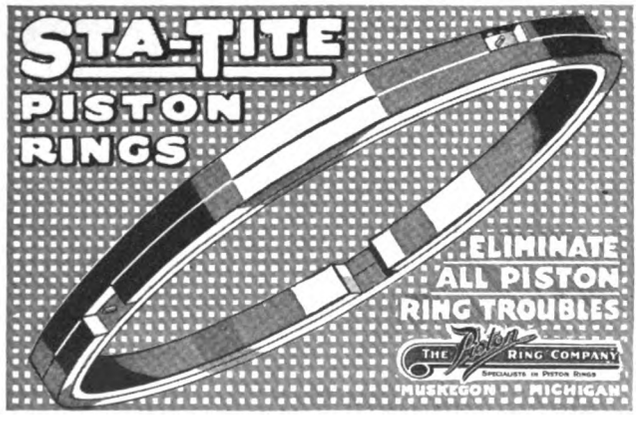
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The Industrial Authority in the Automotive Field
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The Premier Moulded Insulation
GENERAL BAKELITE COMPANY
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We are able to offer manufacturers universal joints manufactured by specialists in one of the largest plants in the world.

The wearing surfaces of HARTFORD UNIVERSAL JOINTS are hardened and ground after the gear blank is cut, also by a specially developed machine whose use eliminates depressions or elevations in common steel parts that have been simply reamed.

The reputation of your car demands the best universal joints that can be made, and we have them

Established 1906

The Hartford Automobile Parts Co.
Hartford, Conn.

82
WATCH THIS GROW

USING the BROWN Service as a factor of their plant.

Spring shackle bolts, valve lifts, bushings, wrist pins, harden and ground Truck and pleasure car parts.

Automatic machine pieces from ⅛" to 2". An organization backed by 10 years of successful manufacturing.

The BROWN Co.
200 Bellevue Ave., Syracuse, N. Y.



GEARS
COMPLETE DIFFERENTIALS
GEARS for transmissions; spur bevel and helical.
GEARS FOR ANY SERVICE
MADE TO ORDER — IN ANY QUANTITIES
NEW PROCESS GEAR CORPORATION
SYRACUSE, N.Y.

Complete Line of
GREASE CUPS, OIL CUPS AND OIL HOLE COVERS



SPRING SHACKLE BOLTS
HUB CAPS
METAL STAMPINGS
IN LARGE QUANTITIES
Manufactured by
Bowen Products Corporation



Plain Sectional
Successors to THE WINKLEY COMPANY
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CAR OWNERS
Send for a specimen copy of
MOTOR AGE
"The Motoring Authority of America"
It shows you how to get the greatest usefulness from your car at minimum cost—just the kind of a helpful magazine that every user of a car wants and needs.
MOTOR AGE
Mallers Building, Chicago, Ill.

Rockwood friction-transmission

Better Transmission

Fibre friction transmissions are Superior to toothed gears — because higher speed, quicker starts and instant stops can be secured — without damage to transmission or machine.

Fiber Friction Filler Repairs
We furnish friction fillers for all friction drive cars—Give name and model of car and if possible the approximate inside and outside diameter and face width of the ring.

Send for Free Book
"Friction Transmission." It contains valuable data and formulæ for engineer, designer, or manufacturer. Please mention firm connection.

The Rockwood Mfg. Co., 1917 English Avenue Indianapolis, Ind.

LIBERTY AXLES
A worm drive truck axle combining extreme light weight with exceptional driving power and load carrying capacity
WAGNER AXLE COMPANY
ANDERSON INDIANA

BURD
High Compression
PISTON RINGS
"The Accepted Standard"
BURD HIGH COMPRESSION RING CO.
ROCKFORD, ILLINOIS
Sales Offices in All Principal Cities

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For Parts, Accessories, Tires, Machinery, Rebuilding, Repairing, Welding and Used Cars. Also Help and Situations Wanted and Miscellaneous Classified Advertising.

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the entrance of the

George Shapland Company

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USED PARTS

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Buy, Sell or Exchange

There is nothing you want that we haven't got or nothing you have that we cannot use—

JOB LOTS ESPECIALLY WANTED

Largest Used Car Dealers Between N. Y. and Buffalo

GEORGE SHAPLAND COMPANY, Inc.
UTICA, N. Y.

DETROITER and BRIGGS-DETROITER
Motor Car Owners

NOTICE

During the past several months, owing to financial difficulties of the former management, there has been considerable confusion as to where Detroiter and Briggs-Detroiter repair orders should be sent.

With our acquisition of the Detroiter Motor Car Company, however, this condition is entirely overcome, and in the future all Detroiter and Briggs-Detroiter service will be given direct from our factory at Detroit. Therefore, to insure prompt attention and handling, repair orders and correspondence must be addressed (as before) to

Detroiter Motor Car Co.
584 Franklin St., Detroit, Mich.

PROPOSALS FOR INDIAN SUPPLIES.—Department of the Interior, Office of Indian Affairs, Washington, D. C., March 11, 1918. Sealed proposals, plainly marked on the outside of the sealed envelope: "Proposal for groceries" (or other class of supplies as the case may be), and addressed to the "Commissioner of Indian Affairs, U. S. Indian Warehouse, 308 South Green Street, Chicago, Ill," will be received until 10 o'clock a.m. on each of the following dates and on the class of supplies specified, and then opened: Dry goods, April 22, 1918; Underwear, hosiery, gloves, suspenders, hats and caps, April 26, 1918; Notions, April 29, 1918; Clothing and Piece goods, April 27, 1918; Groceries, April 19, 1918; Agricultural implements, wagons, etc., April 24, 1918; School books, etc., April 15, 1918; Chinaware, etc., April 17, 1918; Automobile supplies, April 15, 1918; Schedules covering all necessary information for bidders will be furnished upon application to the Indian Office, Washington, D. C., and to the U. S. Indian Warehouses at Chicago, St. Louis and San Francisco. The Department reserves the right to reject any or all bids or any part of any bid, and to post tentative awards promptly, subject to correction. CATO SELLS, Commissioner.

Motor Bargains

New Rambler Motors, $92.00.

Second-hand Rambler Motors, thoroughly overhauled, in first-class condition, $65.00.

Model RL Remy Magnetos, brand new, $6.50.

Coils for same, $4.00.

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CHICAGO, ILLINOIS

NEW
Westinghouse Lighting Generators
MODEL FRAME NO. 209R
6 VOLT WITH REGULATOR AND CUTOUT
$25.00 EACH
QUANTITY DISCOUNTS

PRESTO-LITE TANKS
In quantities at attractive prices. Send for complete list of bargains. No consumers' business accepted.

S. BREAKSTONE
1326 Wabash Ave., CHICAGO, ILL.

QUICK SERVICE

When you need it quickest, THEN we serve you best. Immense Stocks backed with our Guarantee of "Money Refunded if not Perfectly Satisfied." Buy where it is safest at a certain bargain of

50% TO 75% SAVING!!

FOR INSTANT SERVICE! WRITE, WIRE OR PHONE

AUTO WRECKING CO.
We tear 'em up and sell the pieces
13th and Oak Sts. Kansas City, Mo.

Pope-Hartford Parts

Parts for all models of Pope-Hartford Pleasure Cars, Trucks and Public Service Cars—made from the original drawings and patterns, with the original tools, fixtures, etc.—complete stock always on hand, prompt and satisfactory service.

The Hartford Motor Car Company
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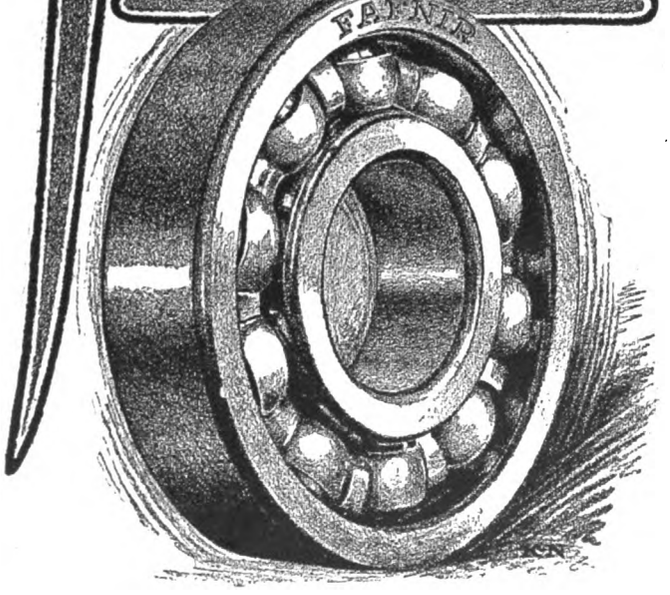
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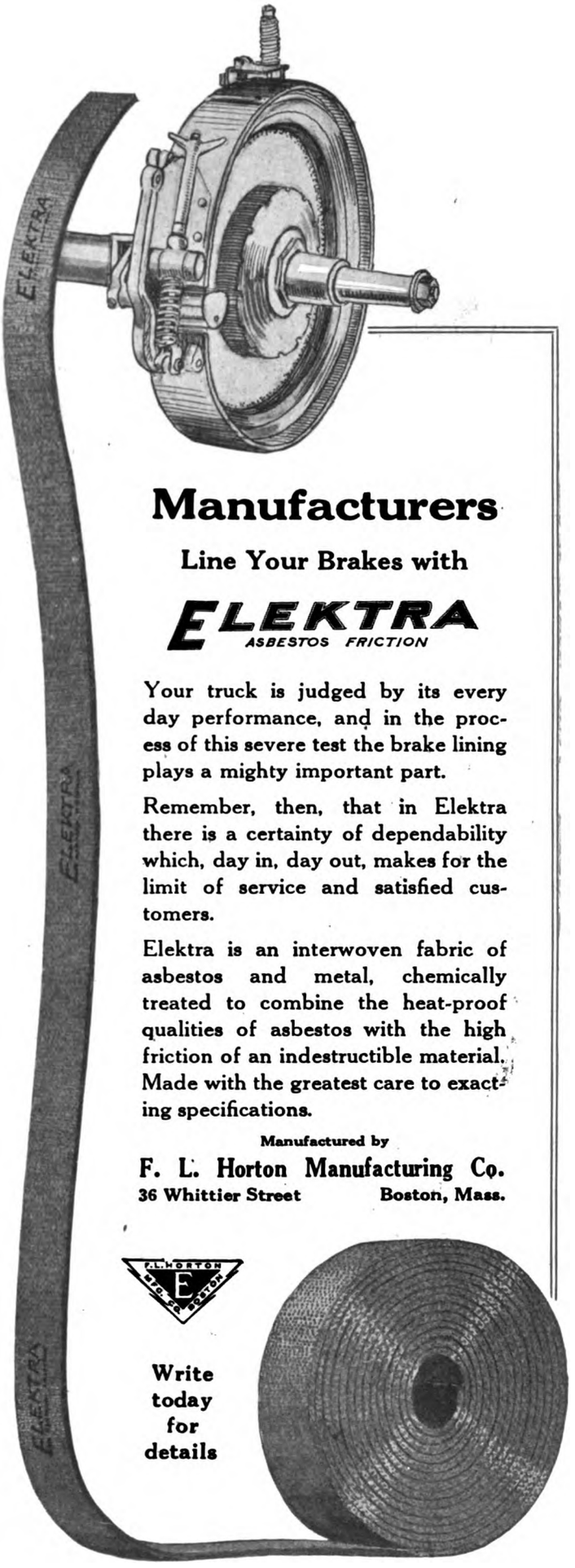
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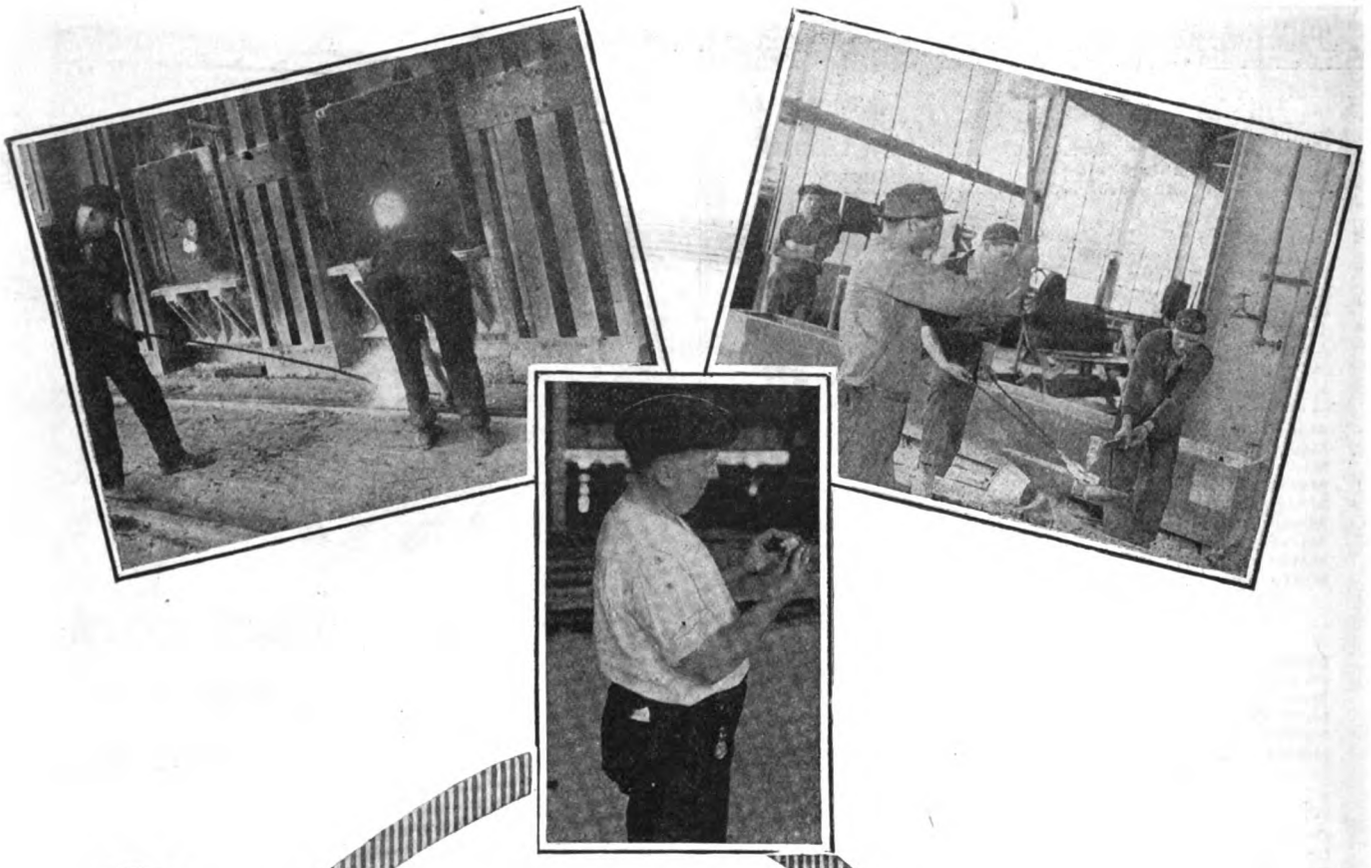
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